Factors influencing classroom computer use by teachers

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Factors influencing classroom computer use by teachers

by

Mark Andrew Windschitl

A Thesis Submitted to the Graduate Faculty in Partial Fulfillment of the Requirements for the Degree of MASTER OF SCIENCE

Department: Professional Studies in Education
Major: Education (Research and Evaluation)

Iowa State University
Ames, Iowa

1992
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CHAPTER I
INTRODUCTION

Problem Background

Educational research and evaluation has, in the last 30 years, produced a proliferation in the number of vital innovations concerning every aspect of education. Methodologies such as cooperative learning, psychological discoveries in learning styles, and technological advances in the field of computers have all been popular ideas that have withstood the rigors of extensive field testing. As in commercial research and development, however, the periods of hypothesis testing, and popular embracement of the new idea, may or may not be followed by implementation.

What causes are ascribed to the general acceptance of new ideas and their implementation? There is a desire for novelty in classroom teaching techniques; perhaps only widespread trial and error may serve to separate fad from effective, substantive changes in the way instructors teach. Cooperative learning was winnowed from the multitude of other teaching techniques by virtue of not only its congruency with behavioral precepts, but also its successful track record in use. The concept of
learning styles has been accepted by the psychological and educational communities and has been incorporated into the machinery of mainstream classroom education. There are other examples of educational innovation that have been accepted by convention and have found a place in day-to-day teaching strategies.

Acceptance of innovation may be interpreted as its popular appeal on the lecture circuit or its stability under the rigors of scientific investigation, but in a utilitarian sense, acceptance means implementation. In the field of technology, one of the most important modern developments is the computer and its related services. There is ample support in research of the computer's effect on specific aspects of learning. School systems nationwide have been using computers in an increasing number of areas, such as clerical record-keeping, recording student grades by teachers, media management, and student use, which is itself becoming more varied. In many of these fields the use of the computer is mandated by necessity, but in the classroom itself the degree of implementation of the computer is often left to the teacher. Some teachers are attracted to the potential of the computer and are stimulated not only to utilize it in the classroom but to learn more
about the computer themselves. Are there common underlying characteristics among those classroom teachers who choose to implement computer technologies in their classrooms?

Basic Questions to be Answered

The first basic question posed by this study deals with computer use by teachers. Which of the following factors or combination of factors are significant predictors of the degree of classroom use of computers by teachers: teacher attitude toward computers, teacher accessibility to computers, teacher personal background, teacher-perceived barriers to computer use, and/or inservice opportunities for teachers?

Hypotheses

Because the variables of teacher attitude and teacher accessibility to computers are influenced directly or indirectly by the remaining variables, the hypothesis may be stated: Of teacher attitude toward computers, teacher accessibility to computers, teacher personal background, teacher-perceived barriers to computer use, and inservice opportunities for teachers, the variables that are the only predictors of the degree of classroom implementation of computers are teacher
attitude toward computers and teacher accessibility to computers.

An additional area of interest concerning use of the computer is the possible difference between the makeup of the teacher who uses the computer for record keeping or test scoring and the teacher who uses the computer for student-oriented activities such as drill and practice, simulations, or other computer-related technologies designed for use by the student. The second hypothesis of this study is: There will be significant differences between those teachers who use the computer primarily for clerical use, and those teachers who use the computer for student-oriented activities; these differences will exist only in teacher attitude toward computers and in teacher-perceived barriers to computer use. The methodologies of these different analyses are presented in detail in Chapter III.

When one considers that some of the mentioned variables may be highly correlated with each other, such as attitude and background or barriers and accessibility, a logical assumption is that a regression study using these variables could be followed up by a path analysis. This option, however, will be left for later research. The scope of this investigation will be limited to the
identification of the strength of contribution of variables to the use of computers by teachers and the comparison of the two groups of teachers concerning several variables.

Limitations of the Study

There are some limitations concerning this study. The researcher did not develop the data collection instrument, and therefore several items of interest could not be included in the study. Information concerning the number and types of computer classes taken in college was not solicited in the questionnaire. In addition, information about administrative support for the use of computers was not part of the questionnaire. These variables could have served as separate predictors for the dependent variable.

The survey was answered only by Iowa teachers and the generalization of these results back to all Iowa teachers is certainly warranted, but generalization to a population of Midwestern educators or teachers within the United States may not be considered valid.

Borg and Gall (1989) cite some limitations on the use of correlational methods. A variety of correlational methods are available to estimate the magnitude of the
relationships among variables. Prediction studies involve determining future behavior from variables measured previously. Multivariate correlational techniques are often used today because of the increasing tendency to measure the relationships among large numbers of variables. Correlational techniques can be used to explore cause-and-effect relationships between variables, but the results generally do not lead to strong conclusions. A significant relationship between two variables may suggest that A has caused B, but it may also mean that B has caused A. Another possibility is that a third variable, C, has caused both A and B. Some of the limitations may be mitigated by the fact that multiple regression offers partial correlations in the final regression equation. This serves to remove contribution to the relationship between one independent variable and the dependent variable that is not unique to that independent variable.

Assumptions

1. The subjects answered the items on the questionnaire honestly and accurately.

2. The composite scores used to identify constructs were reliable and valid indicators of those constructs.
Definitions

Accessibility. Accessibility will be defined as the freedom or ability to obtain or make use of microcomputers and software. This includes the availability of computers in the home as well as on the job.

Barriers. Barriers will be defined as factors that restrict the free use of microcomputers and their related technologies. The barriers cited in the questionnaire include impediments with elements such as hardware, software, peripherals, instruction, organization, and administration.

Computer. The term "computer" will be used to describe any form of microcomputer or personal computer. Computer-related technology refers to all methods and materials used in conjunction with the microcomputer. These include but are not restricted to peripherals such as videodisc players, CD ROM, and VCR units.

Implementation. The term "implementation" will be defined as the classroom use of the various forms of computer-based instruction, text processing tools, and information tools. Computer-based instruction includes
drill and practice, tutorials, simulations, teacher utilities, etc. Text processing tools include word processing and desktop publishing. Information tools include data bases, spreadsheets, and charting and graphing programs.

**Information from Related Study**

Denise Schmidt (1992) was the primary author of the instrument used in this study. Schmidt completed a large study in 1992 that described selected characteristics of a sample of K-12 classroom teachers in Iowa. The study described the sample in terms of educators’ attitude toward computer use, educators’ perception of barriers to computer use, educators’ accessibility to computers, educators’ exposure to computer-related inservices, and educators’ personal background. Tests were also run that compared elementary, junior high school, and high school teachers on all of the above variables.

To put this study in perspective, a literature review was conducted. Studies were selected for the review that give some evidence of the nature of the relationships not only between the dependent variables and the independent variables, but also among the
independent variables. The following chapter will offer some appraisal of the aforementioned variables.
CHAPTER II
REVIEW OF THE LITERATURE

Overview

In developing an assessment of the current research in classroom computer technology implementation, five potentially influential factors were investigated. Attitude, inservices/training, accessibility, barriers, and personal teacher characteristics were examined, not only to clarify their role in implementation, but also to investigate interrelationships among them as independent variables.

The review begins with a look at the state of computer resources at the national level, and the most common ways teachers use computer technology. Following that, computer resources in schools in Iowa are investigated. The chapter continues with a review of literature related to the independent variables as they relate to computer implementation, and these same independent variables as they relate to each other.

Computer Use Nationwide

Concerning the use of computers in the classroom, a study by Lehman (1985) investigated the degree to
which secondary school science teachers integrate the use of computers into their instruction. The study was nationwide, with 193 schools responding. Of the schools responding, 41% did not have a single science faculty member who used computers in the classroom. Rural schools were the worst offenders in this area, having 52% of their schools without a science teacher who used computers. The survey included a questionnaire given to individual teachers, and of 1,470 teachers, 77% did not use computers at all and only 6% used them on a regular basis. The 84 individuals who were regular users came from a total of 44 schools.

Greene (1991) conducted a study to find the number and characteristics of teachers who integrated computers into their teaching. The study excluded instructors who were computer science or information systems instructors, thereby effectively removing a potential bias in the results. The study was done at three medium-sized colleges, and 100 faculty members responded to the survey. Approximately half (49.4%) reported that they integrated computer technology into one or more of the courses they teach. Since it was suspected that the sample was biased in this regard, administrative records of student computer accounts and computer facilities
reservations at two of the institutions in the survey made possible a more objective estimation of the extent to which all faculty involve computer technology in the courses they teach. Results from that assessment revealed that only 17.6% of all faculty used computers in their courses. This study also provided insight into the teaching areas in which computers were most heavily used. Mathematics and physical sciences had faculty members who demonstrated the most involvement in the use of computers (32.1% of the faculty), with the humanities, as a group, much lower (3.5% of the faculty). It was found, however, that the impact of training was more evident in the humanities. Any type of computer training was found to roughly double the consequent amount of computer technology implementation in the classroom.

Because of the rapid expansion of computer technology in education at all levels, the trends consistently point to greater overall use of computers in schools, as well as use by an increasing percentage of teachers as time goes on. Some subject area instructors have traditionally been more involved with the use of computer technology from the outset.

The use of the computer has historically been "number crunching," the direct application to analyze
large amounts of data systematically and accurately. The
quantitative nature of these applications has given
incentive to faculty members in these areas to learn more
about computers, and utilize them more often. The amount
of software support for teachers in the humanities and
social sciences is growing yearly, but the historical
impetus is certainly with the fields of mathematics and
the physical sciences.

Current State of Computer Use in Iowa

This literature review is a summary of the research
in computer use. Since the focus of this study is the
degree of implementation of computer technology by Iowa
teachers, the review will begin with current parameters
of computer use in Iowa.

The Area 11 Educational Agency of Iowa is located in
central Iowa, and includes urban as well as rural school
districts within its boundaries. This agency conducted a
survey in 1991 to gather information about computer
technology use in schools. The survey showed that of 213
schools responding to the survey, 78 had one computer
lab, 24 had two labs, and an additional 13 had three or
more labs. The average number of computers per lab was
found to be 13. Approximately 54% of central Iowa
schools had at least one computer lab. There were 92 schools with no computer lab at all. The survey results did not reveal why such disparity existed in computer availability among schools. Some schools certainly lack the financial resources to have fully stocked computer labs, but there are also organizational factors involved. With a well-developed technology plan, financial resources as well as personnel involvement could be planned for with reasonable commitments made on a year-to-year basis. This points to the unfortunate state still existing in schools today; there is a serious gap between those who commit to computer technology as a way to facilitate education, and those who do not. Schools that show no desire for the acquisition and implementation of computers may be at a loss now, but as links between the computer and other types of technology grow yearly they will be hard pressed to embrace these more advanced tools in the future.

The survey also showed that word processing by the teachers was the most common use for the computer in schools (199 schools reported this use), followed by student drill and practice (186 schools reported this use), and word processing by students (180 schools reported this use). These statistics are congruent with
reports from other states as far as the teacher uses for the computer. It is worth noting that there are uses for the computer that may not be considered "in classroom," since the teacher in many instances is using the computer for clerical work. Such tasks as typing tests and record keeping are not part of a student interactive environment with computer technology.

**Inservice/Training Influence on Computer Use**

One of the most popularly hypothesized influences on computer use is the amount of training that teachers are given. A 1987 study by the Office of Technology Assessment revealed that only about one-third of all K-12 teachers have had even 10 hours of computer training. Much of that had been at the introductory or basic computer literacy level. This helps to explain an additional finding in the study that only half the nation’s teachers report using computers in instruction. Glenn and Carrier (1988) surveyed 90 member institutions of the American Association of Colleges for Teacher Education, and most aspects of teacher preparation were found to be excellent. Technology preparation for teachers, however, received a failing grade, especially among the students themselves. Fewer than one-third
reported that they felt prepared to teach with computers. Fifty-eight percent of the faculty members thought their secondary education students were well prepared to teach with computers, versus 29% of the students themselves.

There appears to be no second generation of classroom instructors who have implemented computers into their curriculum, gained significant experience, and returned to colleges to share what they have learned.

A study involving the public schools in Denton, Texas, by Lumsden and Norris (1985) reveal that a vast majority (89%) of classroom teachers would like to attend inservice training on computer uses in education. This paralleled the 81% of instructors who agreed or strongly agreed that teachers should know how to use a computer in the classroom. There are, of course, many misconceptions on the part of computer novices as to what constitutes sufficient training. Some view training as a vehicle of relief from computer anxiety, while others, who are fewer in number, desire to investigate the more involved aspects of computer use.

The effect of computer training for teachers has been demonstrated to have a positive relationship with attitude toward computers (Gressard & Loyd, 1985; Madsen & Sebastiani, 1987). The study by Gressard and
Loyd concludes that a staff development program can effectively improve the attitudes of teachers toward computers. Confidence in using computers was increased and anxiety was significantly decreased. Similar results were found in the study by Madsen and Sebastiani. Their study involved 60 secondary school teachers from a suburban Pennsylvania school district. Half of these subjects were given a 15-hour computer literacy course, the bulk of which was devoted to hands-on use of computers. The gains in scores of knowledge and positive attitude were found to be significant for those who were exposed to the course. There was, however, no significant relationship found between the gain of knowledge scores and the gain of attitude scores. Of various pretest and posttest measures in cognitive and affective areas, the greatest change was in the relief of computer anxiety by the experimental group.

Wagschal (1984) found that a one-shot method of training was inadequate to affect attitude and use of the computer. The same study found that teacher preparedness was the most important factor in the actual use of the computer by the teacher. It was further found that there was a subconscious resistance to change, that computers will replace teachers, and that teachers perceive this is
happening in the business sector. Another teacher viewpoint noted by Wagschal was that computers were seen as an add-on rather than a utility to be integrated into the curriculum. It was not stated whether these were the views of the entire subject group, or just the most pessimistic. Psychological studies show that moderate familiarity with an entity usually results in lessened hostility or contempt, and the fears espoused by certain individuals about computers replacing teachers could certainly be mitigated by some degree of familiarity with computer technology.

A 1988 study by Stieglitz and Costa explored the question of voluntary selection of type of computer training. This study followed up an initiative by the state of Rhode Island to boost student competency in the use of computers. A total of 624 teachers were questioned as to their selection of training level in the statewide computer literacy program. Six workshops were offered in succession, the first being an introductory lesson, and each following lesson increasing in complexity and scope. The first three workshops involved 23 hours of instruction each. Teachers tended not to participate beyond the introductory level. An overwhelming majority of teachers elected to attend the
introductory sessions and did not even go on to the second of six levels of instruction. This may be due to any one of three factors. Some teachers voluntarily enroll in computer workshops simply to relieve a long-standing anxiety about computers, and when that need is met, their involvement is terminated. Perhaps teachers with little knowledge of computers feel that they only need the most rudimentary skills to utilize computers with students, especially younger students. Also, the length of the introductory course (12 hours) may have taxed the patience and free time of the participants, and discouraged them from continuing to the higher levels of instruction. This study also asked the question: "After participating in the training program, how are teachers apt to use microcomputers for instruction and/or other professional purposes?" Unfortunately, this question was posed as an intention of future use of microcomputers by teachers. A separate phase of this study done, perhaps, a year later might have gathered information about actual computer implementation in the classroom. The response to the question on intended future use showed that 68% of teachers thought their use would increase, 15% thought their use would remain the same, and 16% said they were not planning to use the computer at all.
One of the most problematical aspects of literature review was the lack of studies done concerning the actual implementation of computer technology as a result of some causal factor such as training or inservices. A problem faced by researchers pursuing this angle is the longitudinal characteristic of the hypothesis. Also, experimental studies are hard to construct since experimental groups and control groups within school settings create logistical problems; some teachers would have computer training, and others, perhaps in the same subject area, would not.

Considering training in the area of computer technology, some of the most accomplished technicians, software designers, and educators have been self-taught. Although the term "self-taught" lacks clarity, it may be construed as the education of self without the benefit of assistance or organized training.

In a study of school computer leadership, Bring and Nickman (1988) found that independent study was the type of training cited most often by computer leaders, but school-sponsored workshops and formal college classes were also mentioned. The computer leaders were also asked to give a weighted breakdown of which area contributed the most to their overall training.
Independent study was by far the highest contributor mentioned by the instructors.

Inservices for educators have the dual role of educating the individual in the use of computer technology, and causing an affective response. This response is hoped to be positive in nature; the reduction in anxiety and inspiration concerning the possibilities of technology are target reactions. Models of diffusion and adoption of innovations have consistently included training as a central feature (Bhola, 1984). Recommendations to school administrators for better adoption and implementation of innovations include employing educational technologists in the schools to act not only as inservice facilitators, but to act as agents of change within the school setting. This notion broadens the idea of inservices to include day-to-day reinforcement, both behavioral and technical, by available experts in the building.

Spitzer (1991) emphasizes the need for inservice training, and cites a critical difference between the educational and business aspects of training employees. In education, the link between training and on-the-job performance is often too weak to be of lasting value. Business tends to provide more followup and evaluation as
well as consistent reinforcement by managers. Computer training in education is prone to one weakness that is simply not present in the world of business. That weakness is that much of computer training in education is optional. Workshop notices often have sign-up sheets underneath them. If individuals want to avail themselves of the opportunity, they may opt to receive training that others with the same job description never receive. Some educators take college courses dealing with computers in education, but this is usually not a requirement for faculty. The inequity of expertise on a school staff may result in different situations. The in-house computer expert in a department may find her/himself a crutch for others who do not want to take the time to learn about computer technology, or they may find themselves the inspiration for other members of a department to learn more themselves. The less formalized modes of training, such as self-education and mentoring, hold promise for many individuals but mandatory inservice training is the only systematic way for active teachers to gain the knowledge they need for widespread implementation of computer technology.
Teacher Attitude Concerning Computer Use

Attitude is the pivotal variable in many computer use studies. It can be cited as a dependent or independent variable, possibly both in the same study. A positive attitude toward computer technology has been weakly linked to classroom computer use, and the converse has been shown to be true as well. Gordon (1986) describes attitudinal factors as being the largest single hindrance to computer use in community college classrooms. The negative manifestations of attitudinal factors are further categorized into apathy and lack of personal confidence.

Stieglitz and Costa (1988) found that even though a majority of teachers taking part in a training program indicated they had a positive attitude toward computers, less than half of them said they were using computers for classroom instruction or other professional uses.

Studies continue to show that computer training in preservice or inservice environments improves the attitude of the participants. This is related to factors such as improved knowledge of computer technologies and their application as well as reduced computer anxiety. There is little evidence that there are definitive causal
links among training, attitude, and actual implementation.

Dalton (1989, p. 21) discussed how attitude can be a negative factor in the implementation of computers:

School districts and individual teachers often feel that it will be necessary to create or customize or create their own computer applications. This perceived need to "reinvent the wheel" is common to many new technologies, but is particularly acute with computers. In fact, many teachers equate using a computer with programming since early computer users seemed concerned only with programming which is, in a sense, inventing a new application at every sitting.

Dalton also mentioned the perceived lack of applicable software and how that view leads teachers to believe that they would have to handle some of this development themselves. This concern is quickly losing validity as software continues to be developed and satisfies the consumer's need for applicability as well as ease of use.

A study by Vermette, Orr, and Hall (1986) focused on the attitudes of elementary school students and teachers toward computers in education. Fifty percent of the teachers surveyed said that kindergarten is where computers should be introduced. Teachers and students were aware of the value of computer technology in education but were negative about the effects of
computers on them personally. It was found that the teacher attitude and the student attitude matched in most cases. If the teacher felt positive about computer technology, the students also felt positive. A negative attitude on the part of the teacher was also matched by the students. The study failed to identify the direction of causation, but it may safely be assumed that the instructor's attitude purportedly affected the student's attitude.

Teachers have been found to be less enthusiastic about computers than the general public (Lichtman, 1979). Teachers seemed to be wary of the relationship between computers and job skills. Some teachers felt threatened about learning the skills needed to utilize the computer in the classroom. The computer and its related technologies not only introduce a moderately complex new skill to learn on the part of the teacher, but also seem to some to be a modern version of the Skinnerian "teaching machine." The latter threat of a machine replacing a human as the primary vehicle of education is quite serious to some individuals.

The relationship between attitude and use of computers in the classroom can only be clarified by identifying the intervening influences on both variables.
A positive attitude may be generated through training, but in many cases the trainees are individuals who bias the sample through volunteerism. Other influences cloud the relationship between attitude and computer implementation, but at this point it is sufficient to acknowledge that a relationship does exist between attitude toward computers and the implementation of computers in the classroom.

Barriers to Implementation

Approaches to develop greater implementation of computers in the classroom may not only include the enticements of training and accessibility to computers, but also the investigation and consequent suppression of barriers to computer use. Barriers are not necessarily diametrically opposed to other variables such as accessibility or inservice training. Cited in this section are numerous examples of impediments that do not have valid positive counterparts under the headings of accessibility or training. Lack of administrative support and lack of peer recognition are examples of the unique conditions that will be included below as barriers.
Sturdivant (1989) studied the technology training in the Houston, Texas, school system and found the following to be significant obstacles to overcome:

1. Incentives are lacking for trainers and trainees
2. There is a lack of peer recognition
3. Teachers are overburdened with paperwork
4. There are limited opportunities to see model applications
5. Teachers are isolated and have few opportunities for sharing
6. Access to software is limited
7. Access to computers is limited
8. Teachers can’t provide quality training sessions for their peers because they have so little time to prepare

Other problems cited by this study involve district-wide concerns such as staff turnover, continuous needs assessment, and finding meaningful evaluation techniques. Even though these are cited as district-wide problems, the implications for the individual teachers are clear; hindrances always filter down to the classroom.

Continuous needs assessment means that some districts may not be able to adequately address the needs of schools, departments, or individual instructors. A lack of
meaningful evaluation techniques may hamper the introduction of new software of teaching techniques.

Suggestions by educators as to how to improve computer instruction also reflect perceived barriers to use. Eighty-nine primary and secondary teachers in a mid-Atlantic state (Reed, 1986) described the following ways to improve computer instruction:

1. Provide more machines
2. Provide more software
3. Provide a separate lab facility
4. Provide computer staff
5. Provide more teacher training

In a study done by Terry (1987), information collected by the Research on Equitable Access to Technology (REAT) project was reviewed to find what factors teachers found most helpful in reducing computer use barriers. The study was done at the Far West Laboratory and included 52 successful computer implementation programs across the country. The two key factors cited by the teachers in the study were support of the administration and availability of program materials.

As studies attempt to reveal the predisposing factors that lead to computer implementation, it may be
worth investigating the causal factors for the lack of implementation. Some of the barriers cited above may prove beneficial in finding the conditions under which computer technology is least likely to be used.

**Accessibility as a Factor in Computer Use**

Accessibility to computers and software has been postulated to be a primary influence on the use of computers by educators. Stieglitz and Costa (1989, p. 94)) found the following:

Access is a critical component in the assessment of microcomputer usage. If computers are not available during convenient times and/or software is unavailable in sufficient quantities or at an adequate level of quality, one should not expect high levels of usage regardless of level of interest in such use.

Lehman (1985) found that very few science teachers were regularly using microcomputers in their classrooms and there were three possible causes. One was inaccessibility of microcomputers for use within each classroom, and another was the minimal amount of quality software available. The third cause was lack of teacher training which was discussed earlier.
Personal Characteristics Influencing Computer Implementation

Other factors have been tested in correlation with computer usage. Personal characteristics such as age and gender have been examined as contributing influences on both teacher and student computer use.

Fulton (1989) suggests that younger teachers are more likely to have computer experiences as students and may transfer that experience to teaching. One estimate suggests that 60% of entering college freshmen have some computer experience. This, in addition to the growing computer literacy of most college faculty, points to the possibility of a broader appreciation of the computer as a learning tool by younger teachers. Current evidence, however, does not indicate a strong link between teacher age and the implementation of computer technology.

Gressard and Loyd (1985) found that age was not a contributing factor in the computer attitudes of teachers, in noteworthy contrast to research done in the business community. The authors of this study suggested that since teachers of all ages are engaged in the communications of information and skills to students, older teachers may have a more direct motivation than
their business counterparts to master new skills themselves.

A study by Jackson and Yamanaka (1985) of women's attitudes, goals, and literacy concerning computers showed that women from ages 19-23 were more knowledgeable about computers than any other age group. The women of age 49 and higher showed the least knowledge about computers, but the statistics concerning knowledge were highly correlated with computer use. The greatest factor found determining the future use of computers by women was their level of enjoyment. Women also perceived men to be more technologically knowledgeable concerning computers.

Gender accounts for little or no difference in the academic gains made by young students when using computers in the classroom. When students are given the option to use the computer or engage in some other activity, the male students tend to choose the use of the computer more often than female students. It remains unclear how this information translates to the role of the professional educator. Complicating factors abound with this variable, such as the preponderance of males in the science and math fields. These disciplines have been
linked strongly to the classroom use of computer technology.

**Characteristics of Computer Leaders in Schools**

Tenner (1984) noted in a study on the dramatic rise of computer use in schools: "All this suggests that by the early 1990's, nearly every educated person will have some computer experience" (p. 24). Bring and Nickman (1988) followed up on the implications of this notion with a study on the characteristics and managerial philosophies of computer leaders. Sixty-nine secondary schools from the Minnesota public school system were used in the study. It was found that 84% of the teachers who demonstrated leadership in the use of computers were male. More than 75% had mathematics undergraduate majors. Physics was the most often cited undergraduate minor. Of the individuals having graduate degrees, 51% of the majors were in mathematics. Those cited as computer leaders used the computer in their classrooms in a variety of ways. The greatest use was in programming. Sixty-six percent of the computer leaders had written their own software, most of it the drill and practice type.
This evidence points to a discipline-specific tendency for individuals to utilize computers. The indication is that college background is a strong determinant of computer involvement as instructors. The exposure to computers themselves, as well as the field of study in higher education, seems to predispose individuals to computer leadership in their careers.

Eighty-three percent of the leaders were not involved in extracurricular computing activities. Most of the computer leaders got their start in computer technology by being asked by their school to become involved. Fifty-eight percent of the computer leaders worked in secondary schools where the student population was between 100 and 500. Concerning the schools in this survey, the greatest support for computer acquisition and use came from the administration, followed by the students, teachers, and parents respectively. In schools where the computer leaders were not of a math/science background, the computers were used in a greater variety of ways. It should be noted, however, that schools with leaders having a math or science background had a greater percentage of computer use throughout the school than schools with leaders possessing different backgrounds.
In the computer leadership study, the leader’s managerial style showed no relationship to the school’s subject area of computer use. There was also no relationship between the managerial philosophy of the leader and the percentage of students who used computers in their classes.

Summary

Most of the research relating to the implementation of computers in the classroom focus on two causal factors: attitude toward computer technology and training. The training aspect includes not only preservice but also inservice/staff development programs. There have been numerous studies done on how training affects attitude toward computer technology, and these studies are in general agreement that the more training one receives, the more positive that individual's outlook is toward the use of computers. The reduction of computer anxiety, or perhaps more properly stated, "technology anxiety," is one of the specific effects caused by appropriate training.

The enhancement of positive attitude through training seems to be a terminal point in the research. There are few if any followup studies that report on the
"bottom line" of the efforts to train educators and improve their attitudes. This bottom line is the translation of these institutional efforts into real usage of computer technology in the classroom. Perhaps the longitudinal aspects of this type of followup research have dampened some of the efforts to commit to these studies.

There are many studies concerning the relationships between attitude and other variables. Gender and training are commonly associated with attitude in research. The actual implementation of computers in the curriculum has not been associated clearly with other variables, and these associations have not been quantified with respect to each other. The body of literature concerning the use of computers in the classroom abounds with evidence of intercorrelations between attitude and gender, training and accessibility, attitude and barriers, and many more combinations. Parcelling out these influences and assessing the role that they play both individually and collectively in classroom implementation will help clarify these relationships and, perhaps, lead to a greater understanding of computer use in education.
CHAPTER III
METHODOLOGY

Overview of Instrument

In the spring of 1991 the Iowa Department of Education and Iowa State University's College of Education jointly sponsored a survey of computer-related technology use by K-12 teachers in Iowa. The survey addressed the following themes of computer-related technology use: teacher background information, accessibilities of technologies for teachers, current instructional uses of technologies, teacher inservice and staff development opportunities related to technology, teacher attitudes toward computers and related technologies, and teacher visions for future educational applications of technologies.

Sample

The Iowa Department of Education supplied demographic information on all of Iowa's K-12 public school teachers. From this population of approximately 30,000 instructors, a representative sample of 3,001 was drawn. The complex random sample used was constructed by the Statistical Laboratory staff at Iowa State
University. It was designed so that the primary researcher would be able to make comparisons within Area Educational Agency districts, grade levels, and school enrollment sizes.

Instrument Development

The development of the instrument was a cooperative effort involving personnel from the Iowa Department of Education and the College of Education at Iowa State University. Individuals from the Department of Education included the administrator of the division of planning and accountability, the state technology coordinator, the consultant for instructional improvement, the consultant for educational media, and two members of the state technology committee. Members of the development committee from Iowa State University included a professor of curriculum and instructional technology in the College of Education, and one graduate student from the College of Education. The constitution of this committee helped ensure the face validity of the instrument.

Some of the items on the questionnaire were developed from similar items on other state or national surveys. A review of related literature provided the original questions. The committee assessed the
appropriateness of the potential items as they related to several major research questions of interest. Special attention was paid to the element of construct validity in this process.

After the instrument was drafted, it was given to 14 individuals for review and commentary. The members of this group included 6 Department of Education representatives, 2 professors from Iowa State University, and 6 Iowa State University graduate students. This group recommended some revisions of the instrument, and following these revisions a pilot test was conducted. The pilot test was run with 11 graduate students from the College of Education at Iowa State University. The final revisions were made following this administration of the questionnaire.

In accordance with standards used in experimentation involving human subjects, the Committee on the use of Human Subjects in Research from Iowa State University reviewed the study and approved it. The final form of the questionnaire was entitled, "Iowa Survey of Computer-related Technology Use by K-12 Teachers." It was organized into five sections, each having a theme related to the use of computers and their related technologies.
In April of 1991, 3,001 teachers in Iowa were sent the questionnaire, and of that number, a total of 1,934 individuals responded to the survey. The final response rate was 64%.

Because of the broad nature of the survey, only selected parts of the instrument were used to investigate the research problem.

The entire instrument is contained in a Master's thesis entitled Iowa Survey of Computer-Related Technology Use by K-12 Teachers; this thesis can be found at the Iost State University Library.

**Dependent Variable: Degree of Computer Related Technology Implemented**

The dependent variable in the first hypothesis was the degree of implementation of computer technologies in the classroom by the teacher. Operationally, this variable was a composite of two sets of summed scores on the survey. One of these summed scores was derived from a section called "Your use." This section asked teachers about their use of different types of computer-based instruction, computer tools, and other technologies. Since the results of the statistical analyses of this research problem are to be generalized to a broad
cross-section of Iowa K-12 teachers, only items that had pertinence to that population were used. In the "Your use" section, there were 12 applicable questions. The values of 12 such questions in the "Your use" section were summed. Another section of the survey, entitled "Your frequency of use," asked the respondent about the frequency with which he/she used computer-related technologies for instruction. The values for the questions dealing with frequency were summed and combined with the sum of the values from the section on use. They formed the additive composite that was used as the independent variable, to be referred to from this point as "use."

Higher sums for respondents reflect a greater degree of use of computers and related technologies.

**Teacher Background Information**

Teacher background information was solicited in the survey. Background factors potentially influencing classroom computer use were included in the analyses. One aspect of background was level of education. Levels of this variable were: BA/BB, BA/BB+15, MA/MD, MA/MD+15, and PhD/EdD. Two other variables in background were gender and age. Gender was left as a categorical
variable (female = 0, male = 1) in the analyses, and age was not recoded, but left as a continuous variable. A fourth variable from teacher background was grade level currently taught by the teacher. The four possibilities here were Elementary, Middle/Junior High, High School, or Complete School K-12. The final variable used in teacher background was years of teaching experience, which was left as a continuous variable.

Survey Questions Concerning Accessibility to Computers

A group of questions from the survey were used as items for a composite independent variable, accessibility. Some of these questions dealt with having a computer in the home, or being able to check out a computer to take home. Other questions about accessibility dealt with the number of computers available for use in the building, or in the classroom. Questions were also included about software availability. Recoding was done to convert responses to computer availability questions from letters to specific values. Affirmative responses which were marked "a" on the instrument were recoded as "1," responses of "Don’t know"
or "No" were recoded from their lettered responses to "0."

The mean score was the value used in the analyses; higher mean scores indicate a greater amount of teacher accessibility to computers and related technologies.

Survey Questions Dealing with Barriers to Implementation

The variable of teacher-perceived barriers to computer use was formed by the mean score on a section of the survey addressing the barriers to using computer-related technologies. Questions here dealt with difficulties in keeping hardware in working order, limited capabilities of the hardware, difficulty levels of the use of software, manuals and support materials not being useful, lack of teacher instruction, poor building organization, and lack of administrative support.

Higher mean scores on this variable reflect a greater perception of existing barriers to computer use by that teacher.

Inservice/Training Questions

The amount of inservice or staff development time was used as a variable. Questions were asked about inservices or workshops being offered to teachers in the
district, the appropriateness of these opportunities, and the availability of on-site support and advice for the integration of computers into the curriculum.

The value used for this variable in the analysis was the mean score. Higher mean scores indicate a greater degree of inservice/training opportunities available for that respondent.

Questions Concerning Attitude toward Computer Technology

Attitudes toward computers and computer-related technologies constituted another variable in the analyses. There were 23 attitude questions, and these had response possibilities of 1 to 5 on a Likert scale. The mean of the scores in this section was the value that was incorporated into the analyses. Questions of a negative attitudinal nature were recoded (1 = 5, 2 = 4, 5 = 1). Higher mean scores reflect a more positive attitude toward computers and their related technologies on the part of the respondents.
Statistical Analyses

Analysis Concerning First Hypothesis

With the variable defined as such in this section, an analysis using multiple regression was conducted. The main hypothesis involves finding which factor or combination of factors significantly influence the dependent variable, degree of implementation of computer-related technologies in the classroom by the teacher. Multiple regression was selected as an analytical technique for several reasons. It can handle interval, or categorical data, both of which are present in this study. Regression also provides information concerning the statistical significance of relationships among variables, as well as the magnitude of these relationships.

The independent variables used in the analysis were: (a) level of education (of teacher), (b) gender, (c) age, (d) grade level taught, (e) number of years of teaching experience, (f) accessibility, (g) perceived barriers, (h) inservices/staff development, and (i) attitude.

The dependent variable was the degree to which the teacher implemented computer-related technologies in the classroom.
The variables were entered into the regression in a stepwise fashion; this was done to determine the most powerful predictor of the dependent variable first, and to discover any other variables that could improve upon the prediction achieved by the first variable.

Four steps are recommended in the strategy for conducting a multiple regression analysis (Hinkle, Weirsm, & Jurs, 1988). The first step involves determining the model to be used, and consequently, the regression coefficients and constant. The second step is to determine the multiple correlation coefficient (R) and the proportion of shared variance (R²). The third step is to assess whether the multiple R is statistically significant; this is the testing of the null hypothesis H₀: Rₚₒₚ = 0. The final step is to determine the importance of independent variables; testing individual regression coefficients for statistical significance.

A correlation matrix was formed using several of the independent variables as well as the dependent variable (computer use). This was done to check for intercorrelations among the independent variables. Partial correlations were not calculated because the regression equations include adjustment for effects of
variables if there is more than one independent variable in the equation.

Analysis Concerning Second Hypothesis

An additional area that was investigated involved use of the computer as dependent variable being separated into two constituent variables. The "use" variable was separated into clerical use and classroom use. Clerical use was defined as the use of teacher utilities, the frequency of using the computer to manage student information, and the frequency of using the computer to score tests. Classroom use was defined as student-oriented implementation of computer technologies such as drill and practice, desktop publishing, tutorials, simulations, etc.

The means were calculated for the composite variables; higher mean scores reflecting greater amounts of use in that particular area.

Two groups of respondents were established. One group was composed of individuals who fell above the mean score for all respondents in "Clerical use," and below the mean for "Classroom use." The second group was composed of individuals who fell above the mean score for
all respondents in "Classroom use." The groups are mutually exclusive.

Independent t-tests were conducted using the two groups to determine if there were significant differences (at the .05 level of significance) in the following variables: teacher attitude, teacher inservice/training, teacher perceived barriers to computer use, teacher accessibility to computer technology, gender, level of education, age, grade level taught, and years of teaching experience.

A chi-square test was also run to determine if the type of computer use was independent of gender.
CHAPTER IV
FINDINGS

Overview

This chapter contains the results of the statistical analyses proposed in Chapter III. The information is displayed in tabular format, accompanied by some descriptive text.

Demographic Data

It was of interest to note the demography of the sample; the range, mean, standard deviation, and other statistics were calculated and are contained in Tables 1 and 2.

Table 1

Demographics: Descriptive Statistics

<table>
<thead>
<tr>
<th>School District Enrollment of Survey Participants</th>
<th>Teacher Age in Years of Survey Participants</th>
<th>Years of Teaching Experience by Survey Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4,245.98</td>
<td>41.78</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>6,722.80</td>
<td>9.86</td>
</tr>
<tr>
<td>Median</td>
<td>1,415.00</td>
<td>41.00</td>
</tr>
<tr>
<td>Range</td>
<td>30,832.00</td>
<td>44.00</td>
</tr>
<tr>
<td>Minimum</td>
<td>56.00</td>
<td>22.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>30,888.00</td>
<td>66.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>46.00</td>
</tr>
</tbody>
</table>
Table 2
Demographics: Descriptive Data

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grade Level Taught:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary</td>
<td>928</td>
<td>48.0</td>
<td>48.0</td>
</tr>
<tr>
<td>Middle School/Junior High</td>
<td>412</td>
<td>21.3</td>
<td>69.3</td>
</tr>
<tr>
<td>High School</td>
<td>519</td>
<td>26.8</td>
<td>96.1</td>
</tr>
<tr>
<td>Complete school K-12</td>
<td>36</td>
<td>1.9</td>
<td>98.0</td>
</tr>
<tr>
<td>No response</td>
<td>39</td>
<td>2.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Totals</td>
<td>1,934</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Teacher's Level of Education:</strong></th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA/BS</td>
<td>380</td>
<td>19.6</td>
<td>19.6</td>
</tr>
<tr>
<td>BA/BS+15</td>
<td>905</td>
<td>46.8</td>
<td>66.5</td>
</tr>
<tr>
<td>MA/MS</td>
<td>297</td>
<td>15.4</td>
<td>81.8</td>
</tr>
<tr>
<td>MA/MS+15</td>
<td>317</td>
<td>16.4</td>
<td>98.2</td>
</tr>
<tr>
<td>PhD/EdD</td>
<td>7</td>
<td>0.4</td>
<td>98.6</td>
</tr>
<tr>
<td>No response</td>
<td>28</td>
<td>1.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Totals</td>
<td>1,934</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Gender of Survey Participants:</strong></th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>1,327</td>
<td>68.6</td>
<td>68.6</td>
</tr>
<tr>
<td>Male</td>
<td>588</td>
<td>30.4</td>
<td>99.0</td>
</tr>
<tr>
<td>Did not respond</td>
<td>19</td>
<td>1.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Totals</td>
<td>1,934</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>
The size of the districts from which the participating teachers came was measured by student enrollment. The mean size was 4,245.98, but due to the number of smaller school district representatives, the median size was 1,415. The smallest district enrollment was 56 students; the largest was 30,888.

Another frequency count was constructed for the grade level that the individual was currently teaching. Elementary teachers comprised 48% of the sample, with Middle School/Junior High and High School making up 21.3 and 26.8% of the sample respectively.

A frequency distribution of teacher education level reveals the most common level to be BA/BS+15, with 905 of the 1,934 responding teachers at that level. Of note was the fact that there were more individuals with MA/MS+15 (317) than with MA/MS (297). There was a precipitous drop from the MA/MS+15 level to the PhD/EdD level where only 7 individuals were located. Considering the amount of time and effort required to attain the PhD/EdD level, these results are not unusual.

Of the 1,934 respondents, 1,327 were female, 588 were male, with 19 respondents choosing not to answer the gender question.
Teacher age was also solicited in the survey. The mean teacher age was 41.78; the minimum age reported was 22, and the maximum age reported was 66.

The mean number of years of teaching experience by the respondents was 16.03, with a minimum of 1.00 year, and a maximum of 46.00 years.

**Descriptive Statistics**

The dependent variable used in the main hypothesis, as well as all the independent variables, had their means, standard deviations, minimum values, and maximum values calculated. These results are contained in Table 3.

The minimum and maximum values here are of note when referring to t-test results described later in this chapter and shown in Table 6.

**Multiple Regression Concerning Main Hypothesis**

The main hypothesis was stated as follows: Of teacher attitude toward computers, teacher accessibility to computers, teacher personal background, teacher perceived barriers to computer use, and computer inservice opportunities for teachers, the only significant predictors of the degree of classroom
computer use by teachers are teacher attitude toward computers and teacher accessibility to computers.

Table 3

Descriptive Statistics of Independent Variables

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>n</th>
<th>Mean</th>
<th>S.D.</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher attitude toward computer</td>
<td>1,917</td>
<td>3.92</td>
<td>.54</td>
<td>1.68</td>
<td>5.00</td>
</tr>
<tr>
<td>Teacher perceived barriers</td>
<td>1,916</td>
<td>2.90</td>
<td>.54</td>
<td>1.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Teacher access to computer</td>
<td>1,130</td>
<td>.09</td>
<td>.29</td>
<td>.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Teacher inservice opportunity</td>
<td>1,919</td>
<td>.64</td>
<td>.29</td>
<td>.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Grade taught by teacher</td>
<td>1,895</td>
<td>1.82</td>
<td>.90</td>
<td>1.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Educational level of teacher</td>
<td>1,906</td>
<td>2.30</td>
<td>.98</td>
<td>1.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Teacher age</td>
<td>1,872</td>
<td>41.78</td>
<td>9.86</td>
<td>22.00</td>
<td>66.00</td>
</tr>
<tr>
<td>Gender</td>
<td>1,915</td>
<td>.31</td>
<td>.46</td>
<td>.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Years of teaching experience</td>
<td>1,906</td>
<td>16.03</td>
<td>9.25</td>
<td>1.00</td>
<td>46.00</td>
</tr>
<tr>
<td>Teacher computer use</td>
<td>1,906</td>
<td>13.77</td>
<td>10.55</td>
<td>.00</td>
<td>63.00</td>
</tr>
</tbody>
</table>

Using the stepwise method, the first variable entered was teacher attitude toward computers. It
accounted for 28.54% of the variance in the dependent variable, teacher computer use. The second variable entered in the formula was teacher accessibility to computers. It added approximately 6% to the level of accountability for teacher computer use variance, bringing the total to 34.86%. The third variable entered was the teacher-perceived barriers toward computer use. This brought the accountability for variance up to a total of 38.40%. The fourth variable entered in the equation was teacher inservice/workshop opportunities. This variable brought the accountability to 39.30%. The grade level taught by the teacher was the fifth variable entered and this variable raised the accountability to 39.98%. Teacher's educational level was the sixth variable entered. It raised the accountability to its final total of 40.21%. These results may be found in Table 4. It should be noted that teacher educational level was only borderline in significance, with a significant t value of .04.

The variables that were not used in the equation were gender, age, and teaching experience.

The primary hypothesis of this study, that teacher attitude and teacher accessibility to computers would be the only significant predictors of teacher classroom
Table 4

Linear Regression on Amount of Computer Use by Teachers

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple R</td>
<td>0.634</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R Square</td>
<td>0.402</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R Square</td>
<td>0.399</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Error</td>
<td>8.178</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analysis of Variance

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>6</td>
<td>48942.59</td>
<td>8157.10</td>
</tr>
<tr>
<td>Residual</td>
<td>1088</td>
<td>72773.31</td>
<td></td>
</tr>
<tr>
<td>F = 121.95</td>
<td></td>
<td>Significant F</td>
<td>.00</td>
</tr>
</tbody>
</table>

Variables in the Equation

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>t</th>
<th>Sig t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Attitude</td>
<td>8.95</td>
<td>.48</td>
<td>18.64</td>
<td>.00</td>
</tr>
<tr>
<td>Teacher Accessibility</td>
<td>9.73</td>
<td>.92</td>
<td>10.63</td>
<td>.00</td>
</tr>
<tr>
<td>Perceived Barriers</td>
<td>-3.11</td>
<td>.50</td>
<td>-6.19</td>
<td>.00</td>
</tr>
<tr>
<td>In-services</td>
<td>3.00</td>
<td>.92</td>
<td>3.25</td>
<td>.00</td>
</tr>
<tr>
<td>Grade Taught</td>
<td>-1.13</td>
<td>.29</td>
<td>-3.86</td>
<td>.00</td>
</tr>
<tr>
<td>Teacher Ed. Level</td>
<td>.59</td>
<td>.26</td>
<td>2.07</td>
<td>.04</td>
</tr>
<tr>
<td>(Constant)</td>
<td>-14.29</td>
<td>2.85</td>
<td>-5.02</td>
<td>.00</td>
</tr>
</tbody>
</table>

computer use, was not supported by the results. The null hypothesis was retained because other factors such as
teacher-perceived barriers to computer use, inservice opportunity, grade level taught, and teacher educational level were also found to be significant contributing predictors of teacher computer use in addition to the two hypothesized factors.

To clarify the nature of the relationships among all the variables involved in the study, Pearson product-moment correlations were calculated, and a correlation matrix was produced. It may be found in Table 5.

**t-tests Concerning Secondary Hypothesis**

The secondary hypothesis is: There will be significant differences between those teachers who use the computer primarily for clerical use, and those teachers who use the computer for student-oriented activities; these differences will exist only in teacher attitude toward computers and teacher-perceived barriers to computer use.

As specified in the secondary hypothesis, t-tests were conducted between two sub-groups in the sample. The constitution of these groups are discussed in Chapter III. The results of nine separate t-tests are presented in Table 6.
Table 5

Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>Use of Computer</th>
<th>Inservice Opportunity</th>
<th>Perceived Barriers</th>
<th>Teacher Attitude</th>
<th>Teacher Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of computer</td>
<td>--</td>
<td>.199</td>
<td>-.324</td>
<td>.534</td>
<td>.334</td>
</tr>
<tr>
<td>Inservice opportunity</td>
<td>.199</td>
<td>--</td>
<td>-.357</td>
<td>.059</td>
<td>.062</td>
</tr>
<tr>
<td>Perceived barriers</td>
<td>-.324</td>
<td>-.357</td>
<td>--</td>
<td>-.231</td>
<td>-.107</td>
</tr>
<tr>
<td>Teacher attitude</td>
<td>.534</td>
<td>.059</td>
<td>-.231</td>
<td>--</td>
<td>.161</td>
</tr>
<tr>
<td>Teacher access</td>
<td>.334</td>
<td>.062</td>
<td>-.107</td>
<td>.161</td>
<td>--</td>
</tr>
<tr>
<td>Teacher educational level</td>
<td>.070</td>
<td>.144</td>
<td>.009</td>
<td>.040</td>
<td>.034</td>
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<tr>
<td>Gender</td>
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<td>-.085</td>
<td>.056</td>
<td>-.064</td>
<td>.154</td>
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<tr>
<td>Age</td>
<td>-.091</td>
<td>.188</td>
<td>-.014</td>
<td>-.207</td>
<td>.003</td>
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<tr>
<td>Grade</td>
<td>.006</td>
<td>-.086</td>
<td>.012</td>
<td>.068</td>
<td>.273</td>
</tr>
<tr>
<td>Years of teaching experience</td>
<td>-.081</td>
<td>.192</td>
<td>-.003</td>
<td>-.204</td>
<td>.015</td>
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</tbody>
</table>

Means Comparison on Teacher Access to Computers

There was a significant difference between the clerical use group and the student use group on the mean
Table 6
Comparisons of Means between Teacher Use Type Groups

<table>
<thead>
<tr>
<th>Mean Composite Score</th>
<th>n</th>
<th>Mean*</th>
<th>S.D.</th>
<th>t value</th>
<th>2-tail prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access to computer:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clerical use group</td>
<td>104</td>
<td>.010</td>
<td>.098</td>
<td>-7.320</td>
<td>.001</td>
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<tr>
<td>Student use group</td>
<td>719</td>
<td>.124</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Teacher attitude about computers:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clerical use group</td>
<td>222</td>
<td>4.025</td>
<td>.462</td>
<td>-3.580</td>
<td>.001</td>
</tr>
<tr>
<td>Student use group</td>
<td>907</td>
<td>4.149</td>
<td>.464</td>
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<td></td>
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<td><strong>Teacher perceived barriers:</strong></td>
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<td></td>
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<td>Clerical use group</td>
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<td>5.530</td>
<td>.001</td>
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<tr>
<td>Student use group</td>
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<td>.549</td>
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<td><strong>Teacher inservice opportunity:</strong></td>
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<td>.662</td>
<td>.284</td>
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<td>Student use group</td>
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<td>.278</td>
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<td><strong>Gender:</strong></td>
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<tr>
<td>Clerical use group</td>
<td>220</td>
<td>.445</td>
<td>.498</td>
<td>5.090</td>
<td>.001</td>
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<td>Student use group</td>
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<td>.259</td>
<td>.438</td>
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<td><strong>Grade level taught:</strong></td>
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<tr>
<td>Clerical use group</td>
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<td>2.119</td>
<td>.854</td>
<td>5.910</td>
<td>.001</td>
</tr>
<tr>
<td>Student use group</td>
<td>891</td>
<td>1.723</td>
<td>.896</td>
<td></td>
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</tbody>
</table>

*Minimum and maximum values for these means can be found in Table 3.
Table 6 (Continued)

<table>
<thead>
<tr>
<th>Mean Composite Score</th>
<th>n</th>
<th>Mean*</th>
<th>S.D.</th>
<th>t value</th>
<th>2-tail prob.</th>
</tr>
</thead>
</table>

**Years of teaching experience:**

<p>| | | | | | |</p>
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<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clerical use group</td>
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<td>15.658</td>
<td>8.531</td>
<td>.750</td>
<td>.454</td>
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<tr>
<td>Student use group</td>
<td>896</td>
<td>15.156</td>
<td>8.965</td>
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<td></td>
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</table>

**Teacher educational level:**

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<tbody>
<tr>
<td>Clerical use group</td>
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<td>2.388</td>
<td>.986</td>
<td>.820</td>
<td>.411</td>
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<tr>
<td>Student use group</td>
<td>897</td>
<td>2.327</td>
<td>.994</td>
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</tbody>
</table>

**Teacher age:**

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clerical use group</td>
<td>218</td>
<td>41.275</td>
<td>9.088</td>
<td>.680</td>
<td>.497</td>
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<tr>
<td>Student use group</td>
<td>881</td>
<td>40.784</td>
<td>9.650</td>
<td></td>
<td></td>
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</tbody>
</table>

amount of access to computers. The teacher access scores were mean scores on survey questions dealing with teacher access to computers and their related technologies. The minimum possible mean score was 0, and the maximum possible mean score was 1.00. The 2-tailed probability for this comparison was .001. The student use group had a higher mean score (.124) than the clerical use group (.010), but both means were very low considering the maximum possible mean could have been 1.00.
Means Comparison on Teacher Attitude About Computers

Teacher attitude scores were mean scores on survey questions dealing with teachers' attitudes toward computers. The minimum possible mean score was 1.00 and the maximum possible mean score was 5.00.

In a comparison of teacher attitude toward computers, the student use group had a more positive attitude. The student use group had a significantly higher mean (4.149) than the clerical use group (4.025). The standard deviations were similar, .462 for the clerical use group and .464 for the student use group. The 2-tailed probability was .001.

Means Comparison on Teacher-perceived Barriers

Teacher-perceived barrier scores were mean scores on survey questions dealing with teacher-perceived barriers to the use of computers. The minimum possible mean score was 1.00 and the maximum possible score was 5.00.

In a comparison of teacher-perceived barriers to computer use, the clerical use group perceived more barriers to the use of computers. The clerical use group had a significantly higher mean score (2.955) than the student use group (2.751). The 2-tailed probability was .001.
Means Comparison on Teacher Inservice Opportunity

Teacher inservice opportunity scores were mean scores on survey questions dealing with teacher inservice opportunities to learn more about computers. The maximum possible mean score was 0 and the maximum possible mean score was 1.00.

In a comparison of teacher inservice opportunities, the student use group indicated that they had more inservice opportunities than the clerical use group. The student use group had a significantly higher mean score of .690 compared to the mean of the clerical use group of .662. The 2-tailed probability was .001.

Means Comparison on Gender

Concerning gender in the statistical analysis, males were coded as 1 and females were coded as 0.

In a comparison of gender between the two groups, the clerical use group had a significantly higher mean of .445 as compared to the student use group with a mean of .259. The 2-tailed probability was .001.

Chi-square Comparison on Gender

Because of the dichotomous nature of the gender variable, a chi-square test of independence was run. The probability was .001.
Means Comparison on Grade Level Taught

Concerning mean grade level taught, the description of the coding of the variables can be found in Chapter III, Methodology. The grade levels were not taken in raw form, i.e., a grade level of 2 does not reflect a second grade teacher. The average clerical user had a mean of 2.119, indicating a classification of Middle School/Junior High teacher. The student use group had a mean of 1.723, indicating a classification of Elementary teacher. The 2-tailed probability was .001.

Means Comparison on Years of Teaching Experience

There was no significant difference found between the two groups concerning number of years of teaching experience. The 2-tailed probability was .454.

Means Comparison on Teacher Educational Level

The coding for teaching educational level is described in Chapter III, Methodology. There was no significant difference between the two groups concerning teacher educational level. The 2-tailed probability was .411.
Means Comparison on Teacher Age

There was no significant difference between the two groups concerning teacher age. The 2-tailed probability was .497.

Retention of the Null Hypothesis

The secondary hypothesis stated that there would be differences between the two groups only in the areas of teacher attitude and perceived barriers. Since there were significant differences in the areas of teacher access to computers, inservice opportunities, gender, and grade level taught, as well as the two hypothesized areas, the null hypothesis was retained.

A discussion of these results, and suggestions for possible research topics for the future can be found in Chapter V.
CHAPTER V
DISCUSSION AND CONCLUSION

Discussion of Results Concerning Primary Hypothesis

The first question this study asked was as follows. "Which of the following factors are significant predictors of the degree of use of computers by teachers: teacher attitude toward computers, teacher accessibility to computers, teacher personal background, teachers perceived barriers to computer use, and inservice opportunities for teachers?"

The empirical hypothesis asserted that of all the independent variables listed above, only teacher attitude toward computers and teacher accessibility to computers would be significant predictors of the degree of use of computers by classroom teachers. This came from an experiential base and was reinforced by a review of literature.

Statistical analysis of the data, using linear regression (with an alpha level of .05), showed that teacher attitude toward computers and teacher accessibility to computers were indeed significant predictors of computer use by teachers (Table 5). The
regression analysis, in which variables were entered in a stepwise fashion, revealed teacher attitude toward computers to be the strongest predictor of computer use by teachers. The $R^2$ value, the amount of variance in the dependent variable accounted for by teacher attitude, was 28.5%. The next most significant factor in prediction was teacher accessibility to computers, which, together with attitude, brought the $R^2$ value up to 34.9%.

The hypothesized variables were then found to be significant predictors of the degree of computer use by classroom teachers, but additional variables were also found to be significant contributors to the prediction. The stepwise analysis continued, and included teacher-perceived barriers to computer use as the next predictor, raising the $R^2$ value to 38.4%. The next significant predictor was inservice opportunities for teachers, raising the $R^2$ value to 39.3%, followed by grade level taught by teacher which raised the $R^2$ to 40.0%, and finally the education level of the teachers themselves, which raised the $R^2$ to 40.2%. These additional four variables, however, raised the $R^2$ only a total of 5.3%. 
The independent variables left out of the final equation were: gender, age, and years of teaching experience.

The null form of the first hypothesis could not be rejected because even though the variables of teacher attitude toward computers and teacher accessibility to computers were found to be significant predictors of teacher computer use, other variables were also found to be significant contributors.

To further clarify the nature of the relationships between the dependent variable and all of the independent variables, as well as the relationship among independent variables, Pearson product-moment correlations were calculated among all variables used in this study. This information is displayed in Table 5.

Teacher attitude toward computers had the highest Pearson r value in association with use of computers; the value was .53. Accessibility to computers had the second greatest relationship with computer use with a value of .33, and teacher-perceived barriers had the next greatest relationship to computer use with a Pearson r value of -.32. The relationship between inservice opportunities and computer was only .20, and the rest of the
relationships between the remaining independent variables and computer use fell below .10.

Practical Significance

Attitudinal and accessibility factors stand out not only as statistically significant factors in predicting computer use by teachers, but also as practically significant factors. Administrators and Boards of Education may utilize this type of information to maximize the return on tremendous financial investments in computer hardware and software. Individuals who demonstrate a positive interest in computers and computer-related technologies are prime candidates to receive preference when the time comes to provide new computer resources, especially when those resources are limited.

Besides identifying those individuals who already have a positive attitude toward computers, efforts could be made to generate more positive attitudes in all teachers.

Inservices could change the teacher's focus from the serial dispensation of knowledge to the cultivation of a sense of positivism toward computers. Fostering this sense of wellbeing with the hardware and software
requires a different approach, and instructional techniques should be adjusted to serve the very real needs of teachers in this area.

Accessibility to computers, related technologies, and software, appear to be an essential influence on computer use by teachers. On the surface it may seem obvious that teachers who have ready access to computers and have computer-related technologies readily available will tend to use them. There is, however, the complicating relationship between accessibility and attitude. Perhaps a positive attitude toward computers is directly affected by the familiarity with the hardware and the software. The converse of this situation also has its implications. The frustration that many teachers feel when hardware is unavailable to them certainly sours their attitudes toward technology.

What positive steps could be taken to increase accessibility? This is a question best left to individual administrators, but there are general conditions which would undoubtedly enhance accessibility to computers and their related technologies in any school. Teachers could be allowed to take hardware and software home with them, keys to areas in the school where computer resources are kept could be dispensed to
proper faculty, the number of places in schools where computer resources are kept could be increased, and the hours that these facilities are open could be extended. These measures for greater accessibility are not without their drawbacks. Insurance costs would increase in proportion to the accessibility, and supervision of facilities would be an additional consideration. Dollars and man-hours are easily calculable but there are also some costs, not so easily measured, that are associated with failure to realize the maximum potential of computer technology extant in the schools.

**Future Research Topics**

There are many possibilities for future research related to the topics of this study. Even though teacher's attitudes are significantly positively correlated with use of the computer and related technologies, no causal connection has been made in this study. The hierarchy of research methodology dictates the use of descriptive studies in areas of novelty where little research has previously been done, followed by correlational or causal-comparative studies, followed by experimental studies to establish some causality among key variables. The high correlation between teachers’
attitude toward computers and teachers' use of computers found in this study may be looked upon as a supplement to the substantive evidence of relationship between attitude and other variables, such as teacher training in computer technology, accessibility to computers, and administrative support for the use of computer technology. A point of debate in many correlational studies is the direction of causality between two variables. It is a reasonable assumption that a more positive attitude toward computers and their related technologies causes individuals to use computers more often and in a greater variety of ways. It is arguable that teachers who use computers more often develop a familiarity with the technology and find themselves gaining a more positive attitude about computers. Furthermore, it is plausible that a third variable is responsible for causing both positive attitude toward computers and a greater use of computers. This third variable could be accessibility, inservice experiences, or any one of a number of others. Experimental studies in these areas could bring more precise relationships among these variables to light.
Discussion Concerning Secondary Hypothesis

The secondary hypothesis indicated that there would be a difference in the amount of computer use between those teachers who use the computer primarily for their own clerical use and those teachers who were the greatest users of the computer for student-related activities. These differences were hypothesized to exist in teacher attitude and teacher accessibility to computers, but not in inservice opportunities, teacher-perceived barriers to computer use, or teacher personal background variables such as educational level, age, gender, grade taught, or years of teaching experience.

Independent t-tests were run on the two groups of teachers with two-tailed probabilities used to determine whether significant differences existed between the groups.

Comparisons on Teacher Accessibility to Computers

Separate variance estimates were used with this variable. There were significant differences between the two groups at the .05 level of probability, as hypothesized; the student use group had a mean of .1238 and the clerical use group had a mean of .0096.
Considering that the maximum possible mean score for an individual was 1, the accessibility scores were extremely low.

Clerical use of the computer is probably less involved than student-oriented use of the computer with respect to the amount of learning and preparation necessary on the part of the instructor. It may be possible that teachers who have greater access to computers and their related technologies feel more uncomfortable with the utilization of computer technology in their classrooms.

Comparisons on Teacher Attitude About Computer Use

A pooled variance estimate was used to determine the significance of this t-test. Since the standard deviations were very similar (.4620 for the clerical-use teachers, .4640 for the student-use teachers), a slightly higher mean score for the student-use teacher group was enough to be significant at the .05 level of probability. The mean for the clerical-use group was 4.0251; the mean for the student-use group was 4.1493. The maximum possible mean score for this composite was 5.
One explanation for the more negative attitude rating from the clerical-use group could be that some schools have a mandate from the administration to utilize the computer to keep student records and test copies on file. This would place individuals from these institutions in the high clerical use category, but this type of use would not be reflective of a more positive attitude toward computer technology. It is worth repeating, however, that the differences in attitude between the two groups were minor.

**Comparisons on Teacher-perceived Barriers Concerning Computer Use**

With a maximum possible score on this composite of 5, the average score for the clerical-use group was 2.9545, and the average score for the student-use group was 2.7506.

Separate variance estimates were used in determining the probability of these results. The clerical-use group had a significantly different mean score than did the student-use group, and in this instance the clerical use group’s mean was higher.

The results of the analysis of the teacher-perceived-barriers comparison may be related to the
attitude comparison. Since a higher score indicated an awareness of more barriers to the use of computer technology, the clerical-use group which previously produced a lower attitude score toward computers also produced a higher mean score on the perception of barriers to computer use. Whether teacher attitude toward computers and teacher-perceived barriers have a causal effect on the types of computer use by these teachers, or whether the converse is true, is a topic for future studies of an experimental nature.

Comparisons on Teacher Inservice Opportunities

With a maximum possible mean score of 1, the clerical-use teacher group had a mean of .6615, and the student-use teacher group had a mean of .6902. These scores were not found to be significantly different at the .05 level of probability.

These results were readily explainable, due to the fact that inservice opportunities are not as much offered to faculty as they are imposed. Regardless of the type of computer use by teachers, the same types of inservices would be experienced by all staff members.
Comparisons Concerning Teacher Background Characteristics

Although it is not always desirable to use a dichotomous dependent variable, differences in gender were assessed with a t-test. In the survey, the females were assigned a value of "0," and the males were assigned a value of "1." The mean value for the clerical-use group was .4455, and the mean value for the student-use group was .2589. Using separate variance estimates, the difference between the two groups were found to be significant at the .05 level of probability. A consideration for future study would be to use the chi-square technique to clarify the relationship between the types of teacher computer use and gender.

Comparisons between the two use groups were also done by the grade level taught. Elementary teachers were assigned a value of "1," middle/junior high a value of "2," high school a value of "3," and K-12 school a value of "4." The average for the clerical-use group was 2.1187, and the average for the student-use group was 1.7228. Using a pooled variance estimate, this difference was found to be significant at the .05 level of probability. The high variance for these groups tends to indicate that teachers at all grade levels were part
of both use groups. Computer use of any kind by teachers is not necessarily more prevalent at one level than another. A possible explanation for the higher grades taught by the clerical users is that computerized grading and test typing are many times not relevant to primary educators. The attention to clerical duties is more obvious at the higher grade levels.

Comparing the two use groups on years of teaching experience revealed that the means were similar; the clerical-use group had a mean of 15.6575, and the student-use group had a mean of 15.1563. This dependent variable was left as continuous from the survey responses. There was no significant difference found between the two use groups at the .05 level of probability.

Educational level was another background variable that was used in comparing the two use groups. There was no significant difference found between the two groups at the .05 level of probability.

The final dependent variable to be analyzed was teacher age. Left as a continuous variable from the survey responses, the mean age of the clerical-use group was 41.2752, and the mean age for the student-use group
was 40.7843. This difference was not significant at the .05 level.

It is interesting to note that one of the most pervasive ideas in computer technology in education is that the younger instructor is the one who will be more apt to utilize computer technology in the classroom. The last three dependent variables mentioned were all associated in some respect with age. Years of teaching experience, educational level, and age itself were all found to be insignificant in determining whether teachers use the computer for clerical use or student-oriented use.
REFERENCES


APPENDIX A

TEACHER PERSONAL BACKGROUND QUESTIONS

1. What is your highest level of education?
   a. BA/BS
   b. BA/BS+15
   c. MA/MS
   d. MA/MS+15
   e. PhD/EdD

2. What is your gender?
   a. Female
   b. Male

3. What is your age? ______

4. What grade level are you currently teaching?
   a. Elementary
   b. Middle/Junior High
   c. High School
   d. Complete School K-12

5. How many years have you taught? (include this year) ______
APPENDIX B

SURVEY QUESTIONS DEALING WITH ACCESSIBILITY
OF COMPUTER-RELATED TECHNOLOGIES

1. Do you currently have a computer in your home which you use?
   a. Yes
   b. No

2. Are teachers in your district allowed to check out school computers to use at home?
   a. Yes
   b. No
   c. Don't know

3. Have you ever taken a computer home in order to perform teaching-related tasks?
   a. Yes
   b. No

4. Are computers available for instructional use in your building?
   a. Yes
   b. No
   c. Don't know
5. Do you have any computers in your classroom now?
   a. Yes
   b. No

6. How many computers do you have in your classroom?

7. To what extent do you have access to computers in your building for professional use?
   a. Unlimited access. I can use the computer any time (days and evenings).
   b. Easy access. I can use the computer any time during the school day.
   c. Limited access. I can use the computer only on specified days and/or specified hours of the day.
   d. No access. I do not have access to a computer in my building.

8. Are there computer work stations in your building which are for teacher use only?
   a. Yes
   b. No

9. Do you have computer software available in your building to use?
   a. Yes
   b. No
APPENDIX C
SURVEY QUESTION DEALING WITH COMPUTER USE

Circle the proper response:

1 = Do not use at all/No desire to use
2 = Would like to use
3 = Currently use

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<td>6</td>
<td>Teachers utilities</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Word processor</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Writing tools (e.g., spell-checker, thesaurus)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Desktop publishing</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>Databases</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>Spreadsheets</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>Charting/graphing</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Circle the proper response:

1 = Not familiar with this terminology
2 = Never
3 = Sometimes (1-4 times a year)
4 = Often (5-10 times a year)
5 = Very often (more than 10 times a year)

1. I provide opportunities for my students to use drill and practice programs .................................. 1 2 3 4 5
2. I provide opportunities for my students to use tutorial programs ............................................. 1 2 3 4 5
3. I provide opportunities for my students to use a word processing program as a writing tool .... 1 2 3 4 5
4. I provide opportunities for my students to take tests or quizzes on the computer .............. 1 2 3 4 5
5. I provide opportunities for my students to use spreadsheet programs .................................. 1 2 3 4 5
6. I provide opportunities for my students to use data base management programs to store, access, and manipulate information .................................................. 1 2 3 4 5
7. I use a computer to demonstrate an idea or skill to the entire class ................................. 1 2 3 4 5
8. I provide opportunities for my students to use simulation programs .................................. 1 2 3 4 5
9. I provide opportunities for my students to use desktop publishing programs . . . . . . 1 2 3 4 5

10. I use the computer to teach problem solving skills . . . . . . 1 2 3 4 5

11. I provide opportunities for my students to work on the computer in groups . . . . . . 1 2 3 4 5

12. I use on-line databases and/or bulletin board systems . . 1 2 3 4 5

13. I provide opportunities for my students to use interactive videodisc systems . . . . . . 1 2 3 4 5

14. I use the computer to help manage student information . . . 1 2 3 4 5

15. I provide opportunities for my students to use art/graphic programs . . . . . . . . . . . . 1 2 3 4 5

16. I provide opportunities for my students to use telecommunication devices to communicate with others . . . . . . . 1 2 3 4 5

17. I use computers to score tests . . . . . . . . . . . . . . 1 2 3 4 5

18. I provide opportunities for my students to use any type of CD ROM application . . . . . . . 1 2 3 4 5

19. I provide opportunities for my students to use hypermedia applications (e.g., Hypercard, Hyperstudio, Linkway) . . . . . . . 1 2 3 4 5
APPENDIX E
SURVEY QUESTIONS DEALING WITH BARRIERS TO COMPUTER USE

Circle the proper response:

1 = Strongly Disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly Agree

1. There are too few computers for the number of teachers needing access to them .... 1 2 3 4 5

2. There are too few printers or other peripherals (e.g., videodisc player, CD ROM, VCR) .... 1 2 3 4 5

3. It is difficult to keep the hardware in working order .... 1 2 3 4 5

4. The computers I have access to have limited capabilities (out of date, not enough memory, incompatible with software, etc.) .... 1 2 3 4 5

5. There are not enough instructional computer software programs available for me to use .... 1 2 3 4 5

6. There are not enough copies of computer software programs for me to use .... 1 2 3 4 5

7. Most instructional computer software programs are too complicated for me to use .... 1 2 3 4 5
8. Most computer software programs are not adaptable for my particular classes or programs.

9. The instructional software available for me is of poor instructional quality.

10. The manuals and support materials that accompany the computer software programs are not useful.

11. There is not enough information available about how to use the instructional software in my classroom.

12. I lack enough time to develop lessons that use computer-related technologies.

13. I find it too difficult to fit activities that use computer-related technologies into the prescribed curriculum.

14. There is not enough freedom for me to use computer-related technologies the way I want.

15. I am not interested in using computer-related technologies.

16. I have doubts as to whether students are learning more or differently when computer-related technologies are used in instruction.

17. There is not enough space in my building for computers.
<p>| | | | | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>18.</td>
<td>There is not enough help for operating and maintaining computers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>19.</td>
<td>There are problems scheduling enough computer time for my class</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>20.</td>
<td>There is poor administrative support or initiative from my school district</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>21.</td>
<td>There is inadequate financial support for computer-related technology use from my school and/or school district</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>22.</td>
<td>There is inadequate district level development of goals or plans for computer-related technology use</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>23.</td>
<td>There is inadequate communication throughout my school system about computer-related technology information and experienced</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
APPENDIX F

SURVEY QUESTIONS CONCERNING INSERVICE OPPORTUNITIES

1. Have computer inservices, workshops, and/or courses been available to teachers in your school district?
   a. Yes
   b. No
   c. Don’t know

2. Do you think that an adequate number of computer inservices, workshops, and/or courses have been available to teachers in your school district?
   a. Yes
   b. No

3. In general, have you been able to find computer inservice opportunities appropriate for your needs?
   a. Yes
   b. No

4. Have you ever participated in any computer inservice, workshop, and/or course?
   a. Yes
   b. No
5. Have teachers at your school had on-site support and advice for the use and integration of computers into the curriculum?

a. Yes

b. No
APPENDIX G

SURVEY QUESTIONS DEALING WITH TEACHER ATTITUDE TOWARD COMPUTERS

Circle the proper response:

1 = Strongly Disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly Agree

1. I think that computers make my professional work more difficult . . . . . . . . . . 1 2 3 4 5

2. I am comfortable in using computer-related technologies for my own work . . . . . . . . 1 2 3 4 5

3. I think computers make work more enjoyable . . . . . . . . . . 1 2 3 4 5

4. It has been a struggle for me to learn how to use a computer successfully . . . . . . 1 2 3 4 5

5. Teachers do not need to know how to use a computer . . . . . . . . 1 2 3 4 5

6. Computer-related technologies are an important part of the future for improving the quality of education . . . . . . . 1 2 3 4 5

7. I lack confidence in using a computer to complete my work . . 1 2 3 4 5

8. I would like to improve my skills in the area of computer-related technologies . . . 1 2 3 4 5

9. I don’t feel threatened by computers . . . . . . . . . . . . 1 2 3 4 5
10. The computer is useful for accessing and organizing information ... 1 2 3 4 5

11. Word processing makes writing more difficult ... 1 2 3 4 5

12. Computers are valuable tools that can be used to improve the quality of education ... 1 2 3 4 5

13. Computer-related technologies should be used to improve learning throughout the curriculum ... 1 2 3 4 5

14. Computers are useful for teaching thinking and problem solving skills ... 1 2 3 4 5

15. Computer-related technologies should be used by teachers more often than they are now ... 1 2 3 4 5

16. My teaching is positively affected when using computer-related technologies ... 1 2 3 4 5

17. I do not feel comfortable using computer-related technologies in my teaching ... 1 2 3 4 5

18. Computer-related technologies are unnecessary luxuries in most school settings ... 1 2 3 4 5

19. Computers are of little value in education because they can only be used to teach one or two subjects ... 1 2 3 4 5

20. The computer helps me obtain diagnostic information from student test scores ... 1 2 3 4 5
21. Overall, I think the computer is a very important tool for instruction in my classroom... 1 2 3 4 5

22. Computer-related technologies are of little value in the classroom because they are too difficult to use... 1 2 3 4 5

23. I would like to use computer-related technologies more in my teaching... 1 2 3 4 5