Iowa survey of computer-related technology use by K-12 teachers

Denise Ann Schmidt
Iowa State University

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Iowa survey of
computer-related technology use
by K-12 teachers

by

Denise A. Schmidt

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

MASTER OF SCIENCE

Department: Curriculum and Instruction
Major: Education (Curriculum and Instructional Technology)

Signatures have been redacted for privacy

Iowa State University
Ames, Iowa

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CHAPTER I. INTRODUCTION

It has been more than a decade since microcomputers became available as a new technology for schools. During this decade, computer-related technologies have become an integral part of the educational environment in schools throughout the United States. Many school districts have purchased large amounts of computer-related hardware and software, only to find that many teachers were uncertain of the potential instructional uses of these technologies. Becker (1990) stated that even though computer acquisition has continued to expand in most schools, there has continued to be a small minority of teachers using computers for instruction, learning, or productive work in the classroom. According to Becker's research, it is evident that teachers need to improve upon their use of computer-related technologies.

In order to establish successful plans and programs for such change in the use of computer-related technologies by teachers in the future, it is important to continually and accurately assess current teacher uses of computer-related technologies. Future plans for technology use may be based upon evaluations of the current status of computers within the educational environment (Biggs, 1988).

Survey instruments have been constructed to assess the uses of computer-related technologies by teachers and to assist in suggesting future implications for applying technology to enhance the learning process in schools. Various national and state surveys have been designed to assess how school districts and teachers have addressed specific computer-related technology issues in education (Becker, 1985, 1986, 1990; Bitter, 1980; Deasy, 1984; Jarchow, 1983; Kirby, Wilson & Smith-Gratto, 1988; Minnesota Department of Education, 1989;
Many of these national and state surveys have provided information regarding teacher utilization of computer-related technologies and have offered suggestions for future implications for these technologies in education.

From these surveys, specific common themes that are frequently noted by researchers can be cited. Four major areas were identified from the literature: (1) accessibility of computer-related technologies; (2) instructional uses of computer-related technologies; (3) computer inservice and staff development; and (4) teacher attitudes toward computer and computer-related technologies. One theme commonly found in surveys addressed the issue of the accessibility of computer-related technologies for teachers (Becker, 1985, 1986, 1990; Bruder, 1988, 1989; Minnesota Department of Education, 1989; Office of Technology Assessment, 1988). Accessibility referred to the following two areas: (1) the number of computer-related technologies in schools, and (2) the ease of accessibility teachers had to these technologies.

Another theme identified in surveys was the use of computer-related technologies for instructional purposes by teachers (Becker, 1985, 1986, 1990; Kirby, Wilson & Smith-Gratto, 1988; Minnesota Department of Education, 1989; Sheingold and Hadley, 1990). This theme involved the ways teachers used computer-related technologies for instruction. An equally important computer-related technology theme identified in surveys involved the computer training and inservice opportunities that were provided for teachers (Minnesota Department of Education, 1989; Morgan, 1983; Office of Technology Assessment, 1988; Winkler & Stasz, 1985). Finally, surveys also assessed teacher attitudes toward the computer and computer-related technologies in
education (Bitter & Davis, 1985; Ingersoll, Smith & Elliot, 1983; McCoy & Haggard, 1989).

In the following four sections, each of the four computer-related technology areas will be described; the focus of these sections will be on the topics researchers assessed in each of the four computer-related areas. The four areas related to computer-related technologies that will be discussed are: accessibility of computer-related technologies, instructional uses of computer-related technologies, computer inservice education and staff development, and teacher attitudes toward computers and computer-related technologies.

Accessibility of Computer-Related Technologies

If computer-related technologies are to be used effectively by teachers, these technologies must be readily available for them to use. In 1988 the report, "Power On! New Tools for Teaching and Learning," analyzed the distribution of hardware and software in schools and focused on how these distributions affected the accessibility to computers in elementary, junior high and high schools throughout the United States (Office of Technology Assessment, 1988). During the 1980's, the Center for Social Organization of Schools at John Hopkins University conducted three national surveys to gather longitudinal information on the instructional uses of computers in schools (Becker, 1985, 1986, 1990). Becker's three surveys, and other national and state surveys, have focused on counting the number of computer-related technologies in schools, the location of computers in schools, and the types of computers in schools (Bruder, 1988, 1989; McDermott, Dent & Sutherland, 1990; Minnesota Department of Education, 1989; Riccobono, 1985).
An equally important accessibility issue emerged from the Minnesota "Computer Usage Teacher Survey" (Minnesota Department of Education, 1989). In 1988, the Minnesota Department of Education conducted surveys of teachers and principals to determine the availability of computers for specifically for teacher use. Also, this survey focused on the types of computers available to teachers, the accessibility of school computers for teachers to use at home, and the number of teachers who had computers at home.

It is important to note that teacher accessibility to computer-related technologies does not necessarily guarantee use for instruction. Thus, the issue of instructional uses of computer-related technologies is considered separately.

**Instructional Uses of Computer-Related Technologies**

Before a more focused effort to substantially expand the use of technology in education can be efficiently and effectively planned, the current instructional uses of computer-related technologies in schools need to be assessed. Many researchers have surveyed administrators, computer coordinators and teachers to assess how computer-related technologies have been used for instruction in schools (Beal et al., 1983; Becker, 1985, 1986, 1990; Jarchow, 1983; Kirby, Wilson & Smith-Gratto, 1988; McDermott, Dent & Sutherland, 1990; Minnesota Department of Education, 1989; Morgan, 1983; Sheingold & Hadley, 1990; Office of Technology Assessment, 1988). Despite the increase in the number of computer-related technologies in schools since the early 1980's, just over fifty percent of the teachers indicated in 1988 they had ever used computers (Office of Technology Assessment, 1988).

Sheingold and Hadley (1990) surveyed experienced computer-using teachers to assess their current instructional practices that integrate computer-
related technologies into their classrooms. This survey, "A National Survey on the Integration of Computers into Schools: Teachers' Current Practices and Experiences," identified a number of different instructional uses of computer-related technologies, the barriers teachers encountered in using computer-related technologies, and how teachers' uses varied in relation to both the grades and curricula they taught. Teachers were also asked about computer applications they used most frequently and the approaches to and purposes for using the technology. Other researchers have assessed similar issues that addressed the instructional uses of computers (Becker, 1985, 1986, 1990; Gleason & Reed, 1982; Morgan, 1983; Riccobono, 1985).

Many states have become highly interested in assessing the uses of computer-related technology in their respective school districts (Beal et al., 1983; New York State Education Department, 1984; Deasy, 1984; Louisiana State Department of Education, 1985; McDermott, Dent & Sutherlin, 1990). State surveys have assessed the following areas related to the instructional uses of computer-related technologies: teachers' proficiency in using computer-related technologies; teachers' interest in using computer-related technologies; and teachers' instructional uses of computer-related technologies. Also, researchers were interested in determining if teachers had inservice opportunities available to them to acquire computer skills and if teachers were being supported in their use of computer-related technologies.

Computer Inservice Education and Staff Development

For computer-related technologies to be successfully and effectively utilized in schools, teachers must be provided with adequate training and support in order to use these technologies. According to the report, "Power On!
New Tools for Teaching and Learning," the majority of teachers today have had little or no training in the use of new technologies (Office of Technology Assessment, 1988). There is a need to assess the computer inservice opportunities and support programs provided for teachers so that future plans can be developed that encourage the integration of technology into the classroom. Teacher inservice training has been identified as a critical component in many computer surveys (Anderson & Smith, 1984; Jarchow, 1983; Morgan, 1983; Parr & Miles, 1985; Minnesota Department of Education, 1989; Winkler & Stasz, 1985). Computer inservice areas assessed in current surveys include: the existence of computer inservices for teachers; the type of computer inservices provided; instructors for the computer inservices; and the support available for teachers in schools.

Teacher Attitudes Toward Computer and Computer-Related Technologies

Teachers' attitudes toward computers may depend upon their ability to work with computers effectively, which may influence their effective implementation of computers in classrooms (Koohang, 1987). Pratscher (1981) attributed negative teacher attitudes toward computers as a major barrier for the effective use of computers in the classroom. Some surveys have examined teachers' attitudes toward computer-related technologies and teachers' confidence in their personal ability to use computers (Bitter & Davis, 1985; Lillard, 1985; McCoy & Haggard, 1989; Wright & Stone, 1983). These surveys assessed teachers' perceptions of the value of computers and computer-related technologies in education; and if teachers were confident in their own ability to use these technologies as effective instructional tools in their classrooms.
Statement of the Problem

Although techniques, themes and results of the use of computer-related technologies exist on a national level, these methods have not been utilized to assess the current use of computer-related technologies by K-12 teachers in Iowa. A survey instrument needs to be designed for Iowa teachers that will assess the accessibility of computer-related technologies, the instructional uses of computer-related technologies, the computer inservice opportunities for Iowa teachers, and the Iowa teachers' attitudes toward computers and computer-related technologies. It is proposed that assessment techniques from national and state surveys need to be adapted and used to construct an Iowa survey on the uses of computer-related technologies by K-12 teachers.

Purpose of the Study

The purpose of this study is to assess the current uses of computer-related technologies by K-12 teachers from Iowa. A survey instrument will be developed to address the following computer-related technology areas: accessibility to teachers, current instructional uses, teacher inservice and staff development opportunities, and teacher attitudes. The results from this survey will report the current uses of computer-related technology in schools by K-12 teachers. These results may be used to develop and plan for effective and efficient future uses of computer-related technologies in Iowa schools.
Research Questions

Accessibility of computer-related technologies

1. Do teachers have a computer at home to use?
2. Are teachers allowed to check out a computer from school to use at home?
3. Are computers available for instructional use at each level (elementary, middle/junior high, high school)?
4. What types of computers are available to teachers at each level (elementary, middle/junior high, high school) for instructional uses?
5. Where are computers for instructional use located in elementary, middle/junior high, and high schools?
6. Are computers designated for teacher use only available in the schools?
7. What other types of computer-related technologies are accessible to teachers in their school?
8. Is computer software available in schools for teachers to use?
9. How is computer software for instructional uses made available to teachers?

Instructional uses of computer-related technologies

10. How do teachers rate their proficiency in using various computer-related technology applications?
11. How do teachers at each level (elementary, middle/junior high, high school) rate their interest in using various computer-related technology applications?
12. Do teachers at each level (elementary, middle/junior high, high school) use or desire to use computer-related technology applications in their classroom or computer laboratory?

13. How frequently do teachers use computer-related technologies for instruction?

14. What barriers do teachers encounter when using computer-related technologies?

Computer inservice education and staff development

15. Are computer inservices, workshops and/or courses available for teachers?

16. How have computer inservices, workshops and/or courses been offered to teachers?

17. Who provided the instruction for the computer inservices, workshops and/or courses available to teachers?

18. What types of computer-related technology inservices would teachers like offered?

19. Are teachers aware if their district has a technology plan?

20. Do teachers have access to on-site support when using computer-related technologies?

Teacher attitudes toward computers and computer-related technologies

21. What are teachers' attitudes toward computers and computer-related technologies?

22. Do teachers have confidence in their personal ability to use computers and computer-related technologies?
Significance of the Study

Computer-related technologies have become an integral part of our educational environment. As the technical capabilities of computer-related technologies continue to evolve rapidly, so do their possible uses in education. Because of the increase in the number of computer-related technologies in schools throughout Iowa, it is extremely important to assess how various computer-related technologies are being used by K-12 teachers. This study will provide data on the current uses of computer-related technologies by K-12 teachers for the Iowa Department of Education, Area Educational Agencies and school districts. Information obtained from this study will allow these groups to evaluate the current uses of computer-related technologies by K-12 teachers and to develop comprehensive technology plans that will promote the use of these technologies in Iowa schools.

Definition of Terms

computer-related technologies - constantly evolving forms of computers, peripherals and supporting software used to enhance learning. Computer-related technologies include, but are not limited to: the computer, CD-ROM, videodisc, videodisc player, printer, modem, video camera, liquid crystal diode (LCD), optical scanner, audio synthesizer.
CHAPTER II. LITERATURE REVIEW

The survey developed for this study was based upon a review of the published results of state and national surveys that have concentrated on computer-related technology use in schools. The purpose of this chapter is to review the approach and results of computer-related technology surveys described in the literature. This chapter begins with a brief summary of the design and approach used in each of the major surveys used in this study. The results from all the surveys are then reported and organized according to four major themes: (1) accessibility of computer-related technologies, (2) instructional uses of computer-related technologies, (3) computer inservice education and staff development, and (4) teacher attitudes toward computers and computer-related technologies.

Design and Approach of Major National Surveys on the Use of Computer-Related Technologies

National surveys on computer-related technology use have appeared in the literature since the early 1980's. Through survey research, many researchers have evaluated the state of computer-related technologies in schools and described how that status has changed over time. In this section, the design and approach of the major national surveys will be described.

This section begins with a description of the work of Henry Becker. Becker is probably the one researcher who has conducted the most definitive studies on the patterns of computer use and effectiveness in schools throughout the United States. Becker conducted three comprehensive national surveys of school districts and teachers to determine how computers have been utilized in
One of the first major national surveys, "How Schools Use Microcomputers," was conducted by Becker during the 1982-83 school year and focused on elementary and secondary schools' instructional uses of microcomputers (Becker, 1983). A sample of 2,209 elementary and secondary teachers were selected from 1,580 public, private, and parochial schools throughout the United States. Specific themes addressed in the teacher survey included: the number of microcomputers in the schools; major microcomputer uses; number of student users; access time per student; areas of microcomputer impact as viewed by computer-using teachers; physical location of microcomputers in the schools and locational impact on use patterns; and acquisition and use patterns. Survey forms were mailed to and completed by principals and by teachers designated by their principal as their school's primary computer-using teacher. Seventy percent of the survey forms were completed by the primary computer-using teacher in the 1,580 schools. Sixty-six percent of the responding teachers were from secondary and middle schools, twenty-eight percent were from elementary schools and the remaining six percent of the respondents were from K-12 schools.

During the Spring of 1985, Becker conducted the "Second National Survey of Instructional Uses of School Computers" (Becker, 1987). Data from Becker's second national survey was gathered from more than 10,000 teachers and principals from a sample of 2,361 U. S. public and non-public elementary and secondary schools. This sample included 723 K-6 schools, 251 K-8 schools, 374 middle and junior high schools, and 1,013 high schools. Principals
completed a twelve page survey that supplied background data and basic information about each computer-using teacher selected at their school to complete the teacher survey. An eighteen page primary computer-using teacher questionnaire was completed by the primary computer-using teacher in the school who was identified by the principal. This survey requested extensive information about computer use in schools. Also, up to four other computer-using teachers and administrators completed one of seven different fourteen page user surveys that provided detailed information about the instructional uses of computers in the classes they taught. In some schools, a non-computer using teacher was given a survey that provided data that could be compared with the information given by the computer-using teacher at the same school.

Sixty-nine percent of the respondents returned the primary computer-using teacher survey after the first mailing. Approximately one-third of the questions on this survey were used for follow-up telephone interviews of the teachers who were non-respondents. This brought the overall response rate for the primary computer-using teachers' survey to 92%. Sixty-nine percent of the principals' questionnaires were returned by mail and follow-up telephone interviews increased the response rate to 97%.

"The 1989 Computers in Education Survey" was the third national survey conducted by Becker and focused on school and teacher practices regarding the instructional uses of computers (Becker, 1990). Data were gathered from a probability sample of principals, school-level computer coordinators, and both computer-using and non-using teachers in 1,416 United States schools. Each of the three school levels, elementary, middle and high school, made up one-third of the schools sampled. Those surveyed were grades 4 through 6 elementary teachers, secondary computer education teachers, and grade 8 and
grade 12 teachers of math, science, and English. Response rates for the mailed questionnaires averaged 76% and follow-up interviews with non-respondents increased the total response rate to 91%.

In addition to Becker's work, other national surveys on computer-related technology use have been documented in the literature. The following are descriptions of additional major national surveys that have contributed to this research study.

Beginning in 1981, Electronic Learning has conducted an annual national technology survey of state departments of education each year in all 50 states and the District of Columbia. The purpose of this annual survey was to provide a national assessment of the level of interest and commitment to educational technology in K-12 schools. Findings from these surveys also reported on the educational initiatives and projects that each state supported. Over the last ten years, the approaches taken to conduct these national surveys have changed. In 1983, Electronic Learning's "Third Annual Survey of the States" was conducted over a three month period through personal telephone interviews with state level computer coordinators or technology specialists at each state department of education (Christen & Gladstone, 1983). In 1989, the "Ninth Annual Survey of the States" was mailed to all 50 state departments of education, with 48 surveys being returned (Bruder, 1989). Each of the surveys, whether they were conducted by telephone or mail, focused primarily on five technology areas: computer literacy; teacher certification and training; trends, issues, and concerns; statewide efforts; and equipment, including hardware or software policies, and additional technology in the schools.

The "School Utilization Survey" in 1982-83 was a national survey co-sponsored by the Corporation for Public Broadcasting and the Center for
Statistics (Riccobono, 1985). This study reported on the availability, use, and support of instructional technology in schools throughout the United States. School district size and wealth, school socioeconomic status and grade level were examined by the survey in relation to the software available to teachers, teachers' instructional purposes for computer use, and teacher training in the instructional use of computers. The sampling procedure was designed to ensure that every teacher in public and parochial school districts with an enrollment of more than 300 had an opportunity to be selected for participation in the study. Surveys were developed to gather information at three levels: a superintendent questionnaire for district-level data, a principal questionnaire for school-level data, and a teacher questionnaire for classroom-level data. Questionnaires were mailed to 619 superintendents, 1350 principals, and 2,700 teachers and follow-up interviews were conducted with non-respondents to the mailed survey. Final response rates reported were 86% for the superintendents, 84% for the principals, and 80% for the teachers.

Data collected by the national survey, "Microcomputers in the Schools," addressed information concerning the implementation of microcomputer instruction in the schools and the procedural planning programs developed by schools to integrate microcomputer instruction into the classroom (Schimizzi, 1983). This survey was completed in 1983 at the State University College at Buffalo, New York by Ned Schimizzi, Associate Professor of Education. After visiting and interviewing key microcomputer educators in school systems and college teacher education department around the Great Lakes, a sixty item survey instrument was designed that contained fifty-nine multiple choice items and one essay question. The survey was sent to 400 randomly-selected school
districts in rural areas, small towns and cities, and medium and large cities in all 50 states. Thirty-five percent of the survey instruments were returned.

"Microcomputers in Schools" was the second national survey and analysis of microcomputers and their use in grades K-12 prepared by Market Data Retrieval (Hood & et. al., 1985). This national survey addressed the quantity of computers and the brands used by public schools and districts across the United States. Themes addressed in the survey included: microcomputer use by school type, micro-intensity by grade level and type of school, brand distribution, and growth trends. During the summer of 1984, the data were compiled from an annual telephone survey of all public school districts in the United States and were supplemented by a mail surveys to non-respondents the following fall. The combined response rate for both the telephone and mail surveys was 85%.

"A Survey of High Quality Elementary School Instructional Computing Programs" was conducted during the fall of 1987 and examined the aspects of successful elementary school instructional computing programs (Beaver, 1987). This study investigated the characteristics of selected high quality elementary schools across the nation known for their support of instructional technology. Seventy-three elementary schools believed to have developed outstanding instructional computing programs were divided into two groups according to the longevity of their instructional computing programs and surveyed to determine: the ratio of computers to teachers; the number of years for which instructional computing programs were planned; the extent of teaching staff involvement; and the allocation of computer time to programming, computer assisted learning, and other applications. Seventy percent of the elementary schools responded to the survey.
Upon request by the House Committee on Education and Labor of the U. S. Congress, the Office of Technology Assessment studied the potential of interactive learning tools for improving the quality of education, and analyzed the technological, economic, and institutional barriers that promoted the future use of technologies in schools (Office of Technology Assessment, 1988). This comprehensive national study, "Power On! New Tools for Teaching and Learning," reported survey data on the distribution and access to technology; studied patterns of technology use; reviewed research literature on the effectiveness of technology; conducted site visits to schools and research centers; interviewed publishers, vendors, researchers, policymakers, administrators, teachers, and students; developed case studies; surveyed state technology directors; and convened experts for workshops on educational software development and economics, teachers and technology, research and development of educational technology, and cost-effectiveness issues. Data were compiled using these various approaches and resulted in a 246 page written report that described interactive technology in schools, the impact of technology on learning, the cost-effectiveness of instructional technologies, the teacher's role, educational software, research and development, and technology and the future of classroom instruction.

The purpose of the national survey for the Center for Technology in Education at Bank Street College of Education conducted by Sheingold and Hadley in 1989 was to identify a large number of teachers who were known for and experienced in the use of computer technology in their teaching (Sheingold & Hadley, 1990). Teachers selected for this survey, "A National Survey on the Integration of Computers into Schools: Teachers' Current Practices and Experiences," were not a representative sample of all teachers; they were a
group of teachers recognized for their significant accomplishments using computer technology. The sampling procedure used a referral process that included letters and phone calls to state and local directors of educational technology in all 50 states, hardware and software companies, professional organizations, leading educators and researchers in the field, and a magazine article. Over 1,200 teachers in grades 4 through 12 from urban, suburban, and rural public schools in all 50 states were selected from the recommendations received during the referral process. A questionnaire was constructed after reviewing related survey instruments by other researchers and interviewing groups of teachers in three states. This comprehensive 16 page survey included sections on: teacher's current practices using educational technology; ratings of barriers to integration in the past and present; ratings of incentives to integration; perceived changes in their teaching resulting from integration of technology; descriptive information about their own training, experience with computers, and point of view about computers; and demographics about themselves and their school. After an initial mailing of the survey and a follow-up mailing to non-respondents, surveys were returned by 608 of the participants from 576 different schools.

**Design and Approach of State Surveys on the Use of Computer-Related Technologies**

While these national surveys have provided information that described general trends in how computer-related technologies were used in schools nationwide, descriptive studies that summarized technology use were also necessary at the state level, because this level is important for planning and implementation decisions. For this reason, many states became interested in
designing and conducting their own surveys to access the state of computer use in their respective states. The following section describes the designs and approaches of some of the state surveys that were found in the literature.

In 1980, a questionnaire was designed to gather information from Arizona school districts concerning the following issues: to determine the scope of implementation of computers for instructional purposes; to determine specific types and numbers of microcomputers in schools; to determine the computer applications utilized by schools; to determine the interest in computer projects in cooperation with Arizona State; and to determine problems related to the use of microcomputers (Bitter, 1980). A staff member who was familiar with each district's computer program was requested to complete the "Computer Assisted Instruction Needs Assessment." A total of 46 school districts returned the survey.

In June of 1980, a survey instrument to gather information about the uses of computers in instruction in the state's public elementary and secondary schools was mailed to 1027 school superintendents in California (Stutzman, 1981). The information from the "Survey of Computer Support in Educational Programs in Elementary and Secondary Schools in California" provided a basis for designing teacher and administrator preparation courses about the instructional uses of computers. The purpose of this survey was to determine teachers' instructional uses of computers, to determine the teachers' anticipated instructional uses of computers, and to identify the computer areas of preparation that schools of education must provide to meet the needs of teachers. A follow-up letter and additional survey form was sent to each district not responding. Forty-four percent of the elementary school districts, sixty-two
percent of the unified districts and seventy percent of the secondary school districts returned the survey.

In 1982, a survey to assess the use of microcomputers in Washington State K-12 public schools was constructed based on responses from previous Washington state surveys, related literature, and professional opinions (Beal et al., 1983). "The State of Washington Computer Use Survey" was sent to 273 schools across the state of Washington and consisted of 17 questions that required a simple check of options or a written numerical response. An enclosed cover letter requested that the person most knowledgeable of the use of computers complete the survey. Six small school districts with less than 2,000 students and six large school districts with more than 2,000 students were randomly selected from nine Educational Service Districts in the state. Initial mailings of the survey were sent in April of 1982 and a follow-up mailing was conducted in May of 1982. There was a 61% response rate reported after the two mailings.

"Instructional Computing: A Needs Assessment of Iowa K-12 Teachers and Administrators" was conducted in 1983 to better understand the instructional computing needs of Iowa K-12 teachers and administrators (Jarchow & Hunter, 1983). Objectives of this assessment were: to determine the computer assisted instruction inservice needs and computer managed instruction inservice needs of teachers; to determine teacher and administrator perceptions of computer curriculum design; and to determine computer literacy characteristics for teachers. One questionnaire was designed to survey all Iowa school superintendents and a second questionnaire was designed to survey a sample of elementary and secondary teachers. The sample of secondary teachers included humanities teachers, math and science teachers,
physical education teachers, vocational teachers, and special education teachers. The sample size included 2190 teachers and 440 administrators. Fifty-five percent of the teachers responded to the teacher survey and seventy-one percent of the superintendents returned the administrator survey.

After being awarded a grant from the Ohio Department of Education, the Cincinnati Public Schools designed the "Survey of Educational Technology in Ohio School Districts" to assess how computers and other technologies were being used for instructional purposes in the Ohio school districts (Morgan, 1983). A comprehensive review was conducted of published reports and resources in the area of educational technology to develop a draft of the survey. This draft copy was then given to a panel of reviewers that included three superintendents, a university professor, local experts in educational technology, and a representative of the Ohio Department of Education. After revisions were completed, the final version of the survey was mailed in March to the superintendent of each school district in Ohio.

The "Survey of Computer Usage in Louisiana Schools" described the state of computer usage in Louisiana schools during the Spring of 1988 (Kirby, Wilson & Smith-Gratto, 1988). This study randomly sampled 50 elementary public schools and 129 secondary public schools. One survey was sent to the principal in the school selected and another survey was sent to the same school to be completed by a computer using teacher. Each school principal responded to a questionnaire about school size, socioeconomic status of the student population, the number of teachers certified in computer literacy and computer science, and the number of teachers who had received inservice training in computer usage. A computer-using teacher was designated to complete the second questionnaire that included specific questions about resources,
personnel, location of computers, funding sources, and access by various student groups.

In 1988, the Minnesota Department of Education conducted surveys of teachers and school buildings to determine the availability of computers and productivity software for teachers and to assess teachers' computer proficiency (Minnesota Department of Education, 1989). A "Computer Usage Teacher Survey" was sent to a 20% sampling of teachers from all Minnesota public school districts. The purpose of this survey was to determine teachers' access to computers and software, to access teachers' computer competencies and to determine teachers' interest in computer inservice. Forty-six percent or 3,432 of the surveys were returned. A separate questionnaire, "Computer Usage Building Survey," was sent to each principal of all Minnesota public schools that requested the person responsible for computers in the building complete the survey. The purpose of this survey was to determine teacher access to computers, software, training, and support. Out of the 1,506 schools surveyed, 962 or 64% of the building surveys were returned.

Beginning in 1983, microcomputer use in Arkansas schools has been closely monitored by conducting annual statewide surveys (McDermott, Dent & Sutherlin, 1990). "The 1990 Arkansas Microcomputer Survey" provided information about the brands and the number of computers in Arkansas schools. A survey form was sent to each of the 329 school districts in Arkansas to be completed by a principal or the superintendent of the district. The response rate for this survey after the first mailing was 70%, but increased to 100% after three mailings and numerous telephone calls. In addition to the microcomputer survey, school superintendents, high school principals and grades 7-12 classroom teachers completed the "Stages of Concern Questionnaire"
developed by Hall, Wallace and Dossett (1973). Data obtained from this questionnaire were used to describe the administrators and teachers awareness or concern about the use of computers. Responses from the "Stages of Concern Questionnaire" were received from 66% of the superintendents, 52% of the principals, and 48% of the teachers.

Summary

Procedures for the designs and approaches used by various researchers to develop surveys to assess the use of computer-related technologies by teachers are well documented in the literature. Although the majority of these national and state surveys were conducted by mail, some were designed to be conducted by telephone interviews. Some of the methods employed by researchers to increase the return rate included second mailings of the survey instrument, postcard reminders, and telephone interviews. Response rates reported in these studies ranged from 35% to 100%. Most of these surveys were sent to teachers who had computer experience and were using computer-related technologies in their classrooms.

The next four sections in this chapter describe the results reported from these national and state surveys and are organized according to the following computer-related technology themes: (1) accessibility of computer-related technologies; (2) instructional uses of computer-related technologies; (3) computer inservice education and staff development; and (4) teacher attitudes toward computers and computer-related technologies.
Accessibility of Computer-Related Technologies

One area that most surveys address is the accessibility of computer-related technologies. Accessibility relates to both the number and location of computers in schools. During the 1980's, researchers conducted numerous assessments on the availability and accessibility of computer-related technologies in schools. Many national and state surveys provided information on the number of computers and other computer-related technologies available in schools and how the accessibility to these technologies affected the amount teachers use them for instruction.

Schools purchased large quantities of computer-related technologies since 1980 in an attempt to make them accessible for teachers to use (Becker, 1983; Corporation for Public Broadcasting & National Center for Education Statistics, 1984). Although it is clear that schools are acquiring hardware at an increasing rate, it is still not clear whether teachers have an adequate number of computers available for instructional use. Even though computers have become more widely distributed in schools, teachers still do not have enough of them to make the computer a central element of instruction (Office of Technology Assessment, 1988). In some situations computers are located in schools, but not easily accessible to students and teachers. Teachers who do not have access to computer-related technologies are often discouraged and frustrated in their attempts to learn more about these technologies. It appears that computer accessibility is a continuing problem for teachers and is an area worthy of interest for survey researchers.
Number of computer-related technologies in schools

Describing the number of computers in schools and classrooms has been an area of continuing interest for researchers interested in computer-related technology use. Since 1980, schools have continually acquired more and more computer-related technologies. This increase in the number of computer-related technologies in schools has been well documented in surveys (Becker, 1985, 1986, 1990; Bruder, 1988, 1989; Office of Technology Assessment, 1988; Quality Education Data, 1985). Several of these national and state studies reported the number of computers that were being used in schools and identified the level of computer-related technology use (Anderson & Smith, 1984; Schimizzi, 1983). The three surveys conducted for the Center for Social Organization of Schools at John Hopkins University have reported a continual increase in the number of computers found in schools since 1981 (Becker, 1985, 1986, 1990). According to the Center for Social Organization of Schools' first national survey, "How Schools Use Microcomputers," fifty-three percent of the schools had a least one computer (Becker, 1985). In 1983, less than 10% of schools with computers had as many as 15 computers and the majority of schools with computers had fewer than five.

Data collected from over 10,000 teacher and principals in the "Second National Survey of Instructional Uses of School Computers" indicated that by 1985 ninety percent of the schools in the United States had at least one computer (Becker, 1986). Between the Spring of 1983 and the Spring of 1985 the number of computers in schools increased from 250,000 to over one million. Also, seventy-five percent of the schools that had reported in the first survey they were not using computers were using them in 1985. Elementary schools with five or more computers had increased from seven percent in 1983 to fifty-four
percent in 1985. Secondary schools with 15 or more computers increased from ten percent in 1983 to fifty-six percent in 1985.

Becker's third national survey, "Computers in Education," reported an increase in the number of computers acquired by schools between 1985 and 1990 (Becker, 1990). According to this survey, a typical high school was expected to have 45 computers by the Spring of 1990, compared to the 21 computers it had in 1985. Elementary schools were projected to have an increase from 6 computers in 1985 to nearly 20 computers per school. These three surveys were not the only national surveys that reported a continual increase in the number of computers in schools.

Other national studies have substantiated the findings about the continued increase of computers in schools documented in Becker's three national surveys (Bruder, 1988, 1989; Hood & et. al., 1985; Office of Technology Assessment, 1988). The "School Utilization Survey" provided data that indicated computers were in ninety-four percent of all the school districts across the nation in 1983 (Riccobono, 1985). Even though these findings indicated computers were available in most schools in 1983, only forty-four percent of the teachers surveyed reported having access to computers for classroom use. Computers were accessible to only forty-three percent of the elementary teachers, forty-seven percent of the middle or junior high teachers and forty-three percent of the high school teachers.

Findings from the study, "Power On! New Tools for Teaching and Learning," indicated the percentage of American schools having one or more computers for instructional use had increased from eighteen percent in 1981 to ninety-five percent in 1987 (Office of Technology Assessment, 1988). Similar findings about the availability of microcomputers in K-12 schools throughout
the United States were found in a comprehensive survey prepared by Market Data Retrieval (Hood et al., 1985). Information reported from the survey "Microcomputers in Schools 1984-85," indicated that ninety-four percent of the public, private and Catholic schools in the United States had microcomputers available for instruction in 1985. In summary, findings from these national surveys indicated that by 1987 the majority of schools in the United States had at least one computer available for instruction.

Specific information about the availability of computers in Iowa schools was last reported in 1983. Jarchow and Hunter (1983) conducted a statewide needs assessment on instructional computing of Iowa K-12 teachers and administrators. The survey "Instructional Computing: A Needs Assessment of Iowa K-12 Teachers and Administrators" indicated that eighty-nine percent of the teachers in Iowa had computers available in their building for instructional use. Although computers were available in the building, sixty percent of the teachers surveyed said that no computers were accessible in their classrooms for instructional use. According to the national survey conducted two years after the Jarchow study by Market Data Retrieval, however, 99.8% of the school districts in Iowa had computers available for instruction in 1985 (Hood et al., 1985).

Although earlier surveys of technology availability in school focused primarily on computers, some recent surveys have attempted to assess the number of computer-related technologies that are found in schools. These studies reveal that there has been an increase in the number of additional computer-related technologies, such as modems and CD ROMs, available in schools. Results from Electronic Learning's "Eighth Annual Survey of the States" in 1988 showed that not only have the number of computers increased,
but televisions, video cameras, CD ROMs, modems, VCRs and videodisc players have appeared in schools in increasing numbers (Bruder, 1988). The following year, Electronic Learning's "Ninth Annual Survey of the States" reported the number of additional technologies in schools continued to increase (Bruder, 1989). Of the 31 states that responded to the survey, televisions were present in 80% to 100% of the K-12 schools and video cassette recorders were present in 10% to 100% of the K-12 schools. Of the additional computer-related technologies available to teachers in schools, CD ROMs, modems, and videodisc players were reported to be found in the less than 10% of the K-12 schools. No information was documented in these two national surveys about the number of additional computer-related technologies in K-12 schools throughout Iowa.

A national study of more than 600 computer-using teachers was conducted by the Center for Educational Technology at Bank Street College of Education, New York in 1989 (Sheingold & Hadley, 1990). Questioned teachers, identified as accomplished computer users, to determine the range of teaching practices with technology and circumstances that promote or stifle technology use. Findings from accomplished computer users who completed "A National Survey on the Integration of Computers into Schools: Teachers' Current Practices and Experiences" indicated these teachers have more computer-related technologies available at their schools than most schools throughout the United States. Sheingold and Hadley (1990) concluded that because teachers in these schools used technology in the classroom, more computer-related technologies were purchased for them to use. Some percentages of computer-related technologies available at these schools included: hard disk drives (56%); laser printers (37%); optical scanners (23%); voice synthesizers (30%); and video disc players (33%).
The location of computers in schools

In addition to obtaining data on the number of computer-related technologies in schools, careful consideration should be given to the most effective and efficient arrangement of computers in schools. Becker (1986) concluded that the location of computers in schools has an impact on the accessibility of computers for teacher and student use. Computers are located in various places within schools. Locations often cited in reports include; one computer in a classroom, one computer on a portable cart, clusters of computers in libraries or classrooms, and computer laboratories.

In recent years there has been an increase in the number of computers placed in computer laboratories, but Becker (1990) indicated most computers are still located in teachers' classrooms. Forty percent of the computers located in elementary schools are in computer labs compared to fifty-six percent of the computers located in labs in the high schools. Becker (1990) noted that computers in elementary and middle schools are used more often when they are placed in computer laboratories. At the high school level, computers are used approximately the same amount of time whether they are in the classroom, library or computer laboratory.

The types of computers in schools

Although there are various types of computers found in elementary and secondary schools, surveys reported that schools had acquired a greater percentage of Apple II family computers than any other type (Becker, 1985, 1986, 1990; Hood et al., 1985; McDermott, Dent & Sutherlin, 1990; Quality Education Data, 1985; Schimizzi, 1983). Results from the "1989 Computers in Education Survey" indicated that seventy-five percent of computers in K-6 schools were
Apple II's (Becker, 1990). Respondents from elementary schools also indicated they would continue to purchase Apple II family computers at least until 1991. Elementary teachers indicated that acquiring more computers was a higher priority for them than purchasing powerful computers. The future instructional uses of computers may be limited because of the teachers' decision to purchase older generation machines. Becker (1990) stated that "in many cases the software designers and producers are severely strained to provide substantial intellect-enhancement under the constraints of the older machines" (p. 10).

Although elementary schools have continued to purchase older generation computers, high schools have begun to purchase more powerful computers. MS-DOS and Macintosh computers were more likely to be available in high schools than in elementary schools (Becker, 1990). High schools tended to have various types of computers accessible to teachers and students. Respondents reported in Becker's "1989 Computers in Education Survey" that thirty percent of the computers in high schools were MS-DOS computers, but at least one Macintosh computer could be found in twenty five percent of the high schools. Also, high school teachers expected to purchase more Macintosh computers during the 1989-90 school year and nearly fifty percent of them intended to purchase more MS-DOS computers. In general, state surveys' that included information about the types of computers found in schools concurred with Becker's national findings about the type of computer in schools (McDermott, Dent & Sutherlin, 1990; Parr & Miles, 1985; Beal et al., 1983).
Computers available for teacher use only

In addition to being available for students, computers must be available for teachers to use (Minnesota Department of Education, 1989). Teachers are considered the major information source in the classroom, yet their access to computers in schools has been limited at best. Turkle suggests that the educational system "is the only institution that provides tools for its clients rather than its workers" (Rhodes, 1986, p. 13). Only one survey, the Minnesota state survey, reviewed in the literature specifically addressed the topic of availability of computers in schools for teacher use only (Minnesota Department of Education, 1989). One objective of the 1989 Minnesota survey, "Computer Usage Teacher Survey," was to determine if computer work stations for teacher use only were available in buildings. Fifty-three percent of the teachers stated that computers for teacher use only were not available in their buildings. The percentage of teacher computer work stations at elementary schools was significantly less than at the middle and high school levels. Thirty-five percent of the elementary classroom teachers reported having access to teacher use only computer work stations, while sixty-two percent of the middle school teachers and sixty percent of the high school teachers had access to teacher use only work stations. Teacher use only computer work stations were generally located in a workroom or office and the work stations were usually equipped with an Apple II family computer.

Teachers with access to computers at home

In addition to the availability of computers in schools, it is important to understand teachers use of computers at home. It has been suggested by Turkle that every teacher should be issued a computer to use at home (Rhodes, 1986).
Some school districts have established computers for teachers programs the have given teachers computers to use at home. Shoreline School District in Seattle, Washington began an "Apple for the Teacher Program" in the fall of the 1989/1990 school year (Schlumpf, 1991). One goal of this computer program was for teachers to become empowered to utilize the computer as a productivity tool to design classroom applications of technology. A personal computer was distributed to each of the 600 elementary and secondary teachers in the school district to use at home or in the classroom. Schlumpf (1991) stated that, "giving teachers direct access to their own computer seemed the most logical and obvious step towards facilitating the professional development and maintaining the excellence of our staff" (p. 81). Other successful examples of computers for teachers programs included the programs initiated in Lake Washington School District, Washington and various school districts in New Hampshire.

Although some school districts provided opportunities for teachers to have access to a computer at home, the real issue that needs to be addressed is whether or not teachers have taken advantage of these opportunities to have a computer at home. In the "Computer Usage Teacher Survey," Minnesota teachers were asked if they had ever taken a computer home to assist them with teaching associated work (Minnesota Department of Education, 1989). While 82% of the schools permitted teachers to take home computers, 33% of the teachers indicated that they had taken computers home. Also, this survey indicated that secondary teachers were more likely to take a computer home than middle school or elementary teachers.

In addition to school supported programs, some teachers have purchased their own computers. Findings from the "Computer Usage Teacher Survey"
indicated that about one-third of Minnesota teachers owned a computer (Minnesota Department of Education, 1989). Of the teachers that had purchased a computer, seventy-three percent of them had purchased an Apple II family computer. According to the "Instructional Computing: A Needs Assessment of Iowa K-12 Teachers and Administrators" survey, eighty-seven percent of Iowa teachers did not own a computer in 1983 (Jarchow & Hunter, 1983).

Although computer accessibility is a significant issue and needs to be measured and evaluated, computer accessibility alone does not guarantee wise instructional uses. Even though most teachers have access to computers in schools, relatively few teachers have made the most advantageous use of the computer (Becker, 1986). A focused effort is necessary to substantially expand the use of technology in education and attain integrated applications across the curriculum (Office of Technology Assessment, 1988). The instructional uses supported in the integration of technology in schools is critical in determining its success and data must be collected on these evolving uses.

Instructional Uses of Computer-Related Technologies

As more computer-related technologies become accessible in schools, teachers could have the opportunity to develop effective and innovative approaches for using technology. To assess how teachers are currently using computer-related technologies, it is beneficial to look at both how teachers have used these technologies in the past and how the visions for future instructional uses of technology are changing and can change over time. When schools first began purchasing computers, typically only one or two computers were available for 25-30 students to use. Most of the computer software programs available at this time were mathematic and language arts programs that
duplicated worksheet activities students were already doing in the classroom (Becker, 1991). These type of activities were only providing opportunities for students to use computers to practice lower level cognitive skills.

In the 1990's, technology has the potential to create experiences in the classroom to supplement and enhance the curriculum. Some educators believe that students could design creative productions using interactive technologies in classrooms, but teachers have to know what equipment to use and how to use it (Brunner, 1990). Successful integration of technology "might be characterized by the ability of teachers and students to know when technology is the appropriate tool for a task, determine which technology should be used, then use that technology to successfully complete the task" (See, 1991, p. 22). Before this change in the use of technology takes place in schools Becker (1991) notes,

As we enter the 1990's, it is important to understand how much of that early limited reality still remains and to understand how much of the idea of transforming teaching and learning through computers remains plausible. We need to assess what needs to be done - and by whom - to attain an intellectually rich school life that integrally incorporates technology (p. 6).

Reviewing early computer-related surveys helps to determine how computers were first used by teachers for instructional purposes and if their uses of computer-related technologies has changed over time.
Early surveys on the instructional uses of computer-related technologies

Many of the early national and state surveys included sections to assess how teachers were using computers for instructional uses. One of the first comprehensive national surveys on how teachers were using microcomputers in schools was the "How Schools Use Microcomputers" survey conducted by Becker during the 1982-1983 school year (Becker, 1985). Of the elementary and secondary teachers surveyed, the three most common instructional uses of computers identified by both groups were: to provide computer literacy instruction, to teach programming skills, and to practice basic skills through drill and practice computer programs. Other instructional uses mentioned, but not used extensively, were recreational games, simulations, administrative uses and word processing. The most regular instructional use of computers, cited by 85% of the secondary teachers and 64% of the elementary teachers was to use the computer to teach computer literacy skills to students. Seventy-six percent of the respondents from secondary schools listed computer programming as the next preferred computer use activity. Elementary school respondents (59%) cited drill and practice as their second most popular use of computers in the classroom.

By 1985, data had been collected for the "Second National Survey of Instructional Uses of School Computers," Becker's follow-up survey on school computer use (Becker, 1986). Compared to the first national survey, the instructional uses of computers were beginning to change between the different school levels. Fifty-six percent of elementary teachers were using computers for computer-assisted instruction activities like drill and practice and tutorial programs. Less time was spent on other computer activities such as discovery learning-problem solving (17%), programming (12%), word processing (9%),
and other computer activities (6%). High school teachers spent forty-nine percent of their computer time using them for programming and only sixteen percent of this time on computer-assisted instruction. Word processing was used by high school students for twenty percent of their computer using time. Becker (1986) noted that "across all school levels, about one-third of student instructional time on computers is for computer-assisted instruction, one-third is for programming, and one-third is for all other academic work, including discovery learning and word processing" (p. 5).

Early in the decade, other national surveys reported similar instructional uses of computers as those found in the two early national surveys conducted by Becker (Chambers & Bork, 1980; Riccobono, 1985; Schimizzi, 1983). These national surveys indicated the instructional uses of computers in schools focused primarily on computer assisted instruction, programming, and computer literacy in the early 1980's. Data from the "School Utilization Survey 1982-1983," indicated that the most frequent instructional uses of computers across all school levels were for enrichment in special subject areas (59%), to challenge high achievers (47%), and to teach computer literacy (46%) (Riccobono, 1985). The most frequent use of the computer in elementary (65%) and middle/junior high schools (57%) was for enrichment in subject areas. However, high school teachers reported using the computer most frequently for teaching computer literacy. Word processing and advanced problem solving was used by 34% percent of the high school teachers, 20% of the middle/junior high teachers, and 15% of the elementary teachers. During the 1982-83 school year, thirty-nine percent of the high school teachers were using computers to teach programming, compared to thirty-six percent of the middle or junior high school teachers and seventeen percent of elementary teachers.
Results from early state surveys designed to assess the instructional uses of computers in schools clearly reflect the findings from early national surveys (Bitter, 1980; Morgan, 1983; Parr & Miles, 1985; Beal et al., 1983). In the "Survey of Educational Technology in Ohio School Districts," information about three categories of instructional uses of computers was collected: computer-assisted instruction, computer-managed instruction, and computer-based learning (Morgan, 1983). Each of these three computer instructional use categories identified specific computer applications. Computer-assisted instruction included drill and practice, tutorial, and remediation. Sixty-nine percent of the Ohio school districts used the computer for drill and practice, sixty-one percent used the computer for remediation, and fifty-two percent used the computer for tutoring. Computer applications included in the computer-managed instruction category were student testing, generation of student reports and the development of instructional prescriptions for student improvement. Computer-managed instruction was not used as frequently by teachers in the Ohio school districts: 14% percent of the teachers used computers for generation of student reports, 12% for student testing, and 8% for the development of instructional prescriptions. The third category of instructional use identified in this survey was computer-based learning which included computer literacy, computer programming, word processing, simulations and problem-solving. Over 90% of the teachers within the Ohio school districts used computers to teach computer literacy, 86% to teach programming, 60% to teach problem solving, 38% to use word processing and simulations.

A survey was conducted on the use of microcomputers in Washington State public K-12 schools (Beal et al., 1983). By averaging the results reported at all levels, programming was found to be the most frequently used application in
schools. Approximately 81% of the high schools, 53% of the junior high schools and 52% of the elementary schools used computers to teach programming. The second most frequent use of computers cited by teachers was computer-assisted instruction. Although elementary schools used computer-assisted instruction seventy-one percent of the time, only fifty-three percent of the junior high schools and forty-five percent of the senior high schools used computer-assisted instruction. Using computers to teach computer literacy was mentioned by fifty-six percent of the schools.

Results from surveys administered during the first part of the 1980's indicated that the instructional uses of computers in schools focused primarily on computer literacy, programming and drill and computer assisted instruction. Limitations for use such as insufficient access to computer hardware and software, maintenance of the computer hardware, insufficient technology funding and teacher training affected how teachers used computer-related technologies in schools during the early 1980's (Becker 1985; Gleason & Reed, 1982; Morgan, 1983; Schimizzi, 1983). These limitations reflected how teachers were able to incorporate the computer into the curriculum. As the decade progressed, a gradual change began to occur in how computers were used for instructional purposes in schools. Instructional uses such as programming and computer assisted instruction that were popular earlier in the decade, began to decline in use. Instead, the less frequently used and "new" emerging applications like word processing, database management and desktop publishing programs began to be used more by teachers.
Current data on the instructional uses of computer-related technologies

The Office of Technology Assessment (1988) reported "that the varied capabilities of technology are the key to their power" in instructional settings (p. 9). Word processors, simulations, databases, and telecommunication technologies were some of the emerging applications of computer-related technologies listed in the report "Power On! New Tools for Teaching and Learning" (Office of Technology Assessment, 1988). Researchers and practitioners became interested in determining if teachers' use was evolving from early practices and how this use was evolving. The goal of many current surveys on instructional uses of technology was to assess if teachers were using computer-related technologies differently than they had in the past.

During the 1987-1988 school year, seventy-three elementary schools were identified as schools that had developed outstanding instructional computing programs (Beaver, 1989). A survey was designed to gather data on computer uses considered by teachers as the most important in facilitating student learning. Respondents' answers to survey questions about computer use were divided into the following categories: computer-assisted learning (e.g., drill and practice, tutorials, simulations, educational games), computer applications (e.g., word processing, databases, spreadsheets, printing utilities), and computer programming. Of the time allocated for computer use, approximately 55% was used for computer-assisted learning, 29% for computer applications, 14% for computer programming and 2% for other computer uses. In the computer-assisted learning category, the most frequently used application was drill and practice programs and these accounted for 24% of the time. The most frequently used computer application program by teachers was word processing 18%, with databases used for 3% of the time. No respondents reported using spreadsheets.
at all. When asked to focus on visions for the future, respondents indicated that they would like to devote less time to computer-assisted learning and more time to computer application programs.

Becker's (1990) third national survey, "1989 Computers in Education Survey," indicated that teachers instructional uses of computer had made only modest changes between 1986 and 1989. Even though computer assisted instruction and computer literacy still dominated instructional computer use, teachers were beginning to use computers as general intellectual and informational resource productivity tools. Changes since the "Second National Survey of Instructional Uses of School Computers" show computers being viewed more as a productivity tool for teachers and students. In Becker's third survey, secondary math teachers, science teachers, and third through sixth grade elementary teachers believed the primary function of computers in their classrooms was to help students master basic facts or skills. However, the data also revealed that even though elementary teachers believed that enrichment of basic skills was still the primary use of computers, more elementary teachers viewed computers as a productivity tool than in the 1985 survey. Between 1985 and 1989, elementary teachers indicated that they had increased the amount of time they spent using keyboarding and word processing programs in the classroom. In high schools, forty-nine percent of the teachers indicated that computers would function best as a productivity tool, compared to forty percent who believed the computer could best be used as a resource to learn about computers. One of the most dominant trends in computer use between 1985 and 1989 noted by Becker, was the increase in use of word processing programs as a productivity tool. Although teachers mentioned using other productivity-oriented computer programs such as databases, spreadsheets, graphics and
publishing programs less often than word processors in their classrooms, they expected to increase their use of these computer applications in the future. Research by Becker indicated teachers were gradually beginning to use computers as a multipurpose tool in classrooms.

In the national survey conducted by Sheingold and Hadley (1990), accomplished computer-using teachers did not use computers for just a single purpose. They used computers as multipurpose tools that were used in many ways in their classrooms. Generally, the experienced computer-using teachers identified by Sheingold and Hadley used computer software for content-specific applications and tools. Ninety-five percent of the teachers said they used word processing and other text-processing tools. However, elementary teachers used word processors significantly less than high school teachers. Instructional software such as problem solving, tutorial and drill and practice programs were used by 89% of the teachers surveyed. The use of analytic and information computer tools such as databases and spreadsheets increased significantly with grade level. Seventy-two percent of the teachers used databases, fifty-six percent used spreadsheets and forty-five percent used charting or graphic programs. Some of the other computer-related technologies used by teachers were desktop publishing (54%), telecommunications (49%), multimedia (25%) and HyperTalk (10%).

Clearly, important trends identified in the "A National Survey on the Integration of Computers into Schools: Teachers' Current Practices and Experiences," illustrated a shift over time in how accomplished computer using teachers were utilizing technologies (Sheingold & Hadley, 1990). Some teachers indicated they were no longer using some of the applications they had used in the past. Thirty percent of the teachers said they were no longer teaching
programming. Also, 15% of the teachers indicated they were no longer using keyboarding, drill and practice, tutorial and recreational programs. Teachers also expressed interest in using telecommunications, multimedia, statistical programs, music composition programs and HyperTalk in the future.

Recently, some states have applied assessment techniques similar to those used by national researchers to determine how computers were used in schools in their state. Kirby, Wilson & Smith-Gratto (1988) asked a key computer-using teacher from various Louisiana schools to answer questions about how computers were used by classroom teachers. At the elementary level, 93% of the respondents reported that teachers were using computers for drill and practice in reading, mathematics and English. Other computer uses at the elementary level cited by respondents were instructional games (74%), computer operation (40%), problem solving (36%), word processing (19%), and simulations (8%). According to this survey, Louisiana high school teachers were using the same type of computer applications, but using them more extensively than elementary teachers. At the secondary level, computers were being used most frequently in computer classes that emphasized literacy or programming skills and business classes that taught word processing.

Respondents stated that over 70% of the high school teachers were using drill and practice programs and instructional games. Computers were being used by 70% of the teachers to teach problem solving and 40% of the teachers were using them to run simulations.

One of the state surveys examined how frequently teachers used computers. The "1989 Survey on Computer Use in Arkansas Secondary Schools" conducted by the Arkansas State Department of Education asked classroom teachers grades 7-12 to indicate how often they use computers
(McDermott, Dent & Sutherlin, 1990). Of the randomly selected teachers, fifty-one percent of them indicated they used computers very little or not at all. The teachers who indicated high or very high use of computers were those who taught business, vocational or computer science courses.

Respondents were also given several suggested uses of computers and then were asked to list their specific uses of computers. Word processing was the most frequently used application, mentioned by forty-four percent of the teachers. Drill and practice programs were being used by 30% of the teachers, spreadsheets by 21%, databases by 20%, programming by 12%, simulations by 11%, and desktop publishing by 4%. Also, the number of instructional uses was reported by each teacher and tallied. Four percent of the teachers reported using computers in 10 or more different ways, twenty-nine percent in 5-9 different ways, thirty-six percent in 1 to 4 different ways and thirty-one percent of the teachers reported no uses at all.

Minnesota's survey, "Computer Usage Teacher Survey," assessed how proficient teachers were in using computer productivity tools (Minnesota Department of Education, 1989). The purpose of this survey was not to assess how teachers were using computer-related technologies, but rather to assess teachers' proficiency for using and interest in learning various computer productivity tools. These computer productivity tools included word processing, databases, graphics, desktop publishing, online communications, gradebook software, authoring systems, and instructional management systems. Word processing was the only computer productivity tool K-12 teachers rated themselves as having high or medium proficiency in using. Sixty-five percent of the teachers rated their proficiency in using databases, graphics and electronic grade books as low or unfamiliar. Over 80% of the teachers surveyed rated their
skills as low or unfamiliar with online communications, desktop publishing and authoring systems. Although teachers rated their proficiency in using most of the computer productivity tools as low, they were highly interested in learning how to use these tools. Word processing, databases, graphics, desktop publishing and grade book software were the productivity tools teachers were most interested in learning to use. Teacher interest was quite low in learning more about online communications and they did not indicate any interest in learning about computer authoring systems. Teachers reported their interest in learning about these computer productivity tools as low; this could have been due to the fact that so many of the teachers had indicated they were unfamiliar with this productivity tool in the proficiency section of the survey.

Results from these national and state surveys have indicated that the uses of computer instructional have changed over time. Late in the 1980's, teachers demonstrated an awareness that computers could be used as productivity tools rather than instructional tools used to teach computer literacy and programming or instructional tools for drill and practice. In some classrooms, teachers provided opportunities for their students to use word processors to develop writing skills, to use databases to access and manipulate information, and to use interactive multimedia to create dynamic educational projects. According to Becker (1990) and Sheingold and Hadley (1990), teachers were beginning to find more integrated and varied instructional uses for the computer-related technologies because more teachers were using these technologies as productivity tools in classrooms.

Although the changes in how computers are used in schools has been modest, there are increased efforts to use computers as productivity tools. There are teachers who continue to use computers for drill and practice, programming
and computer literacy, but many have realized there are other more powerful instructional uses for computers in schools. Educators have become aware of the fact that computers can be multipurpose tools used to complete many tasks in a variety of ways, but still have difficulty understanding how to integrate technology into their instructional framework. Teachers often cite a number of barriers they believe limit their use of computer-related technologies. It is important to understand the barriers teachers encounter and begin to formalize approaches to alleviate them for the integration of computer-related technologies into classrooms.

**Barriers in using computer-related technologies**

Teachers often have found themselves confronted by barriers that limited their use of computer-related technologies in schools. Potential barriers may be defined as those situations identified by teachers that make it difficult for them to integrate technology into the classroom. Although experienced computer-using teachers indicated that progress has been made in reducing these barriers over the last few years, significant barriers still remain that limit the integration of technology into the curriculum (Sheingold & Hadley, 1990).

Sheingold and Hadley (1990) asked computer-using teachers to rate 35 barriers as to how problematic each barrier had been in the past and would be in the future for the integration of computers into their teaching. It was found that some of the barriers considered to be very important in the past were no longer perceived by teachers as significant. Significant barriers cited in the past by teachers such as the lack of interest in and the lack of knowledge of computers were hardly mentioned as a present concern. These computer-using teachers identified the lack of time to develop lessons that use computers as the
most significant barrier they encountered. Computer hardware continued to be a barrier for teachers, as they believed there still are not enough computers and other peripherals available in schools. Other barriers mentioned by teachers included problems in scheduling enough computer time for teachers' classes and not enough room in the school curriculum for more computer-based instruction. Two administrative barriers mentioned by teachers were inadequate financial support for computer purchases and not enough support for the supervision of student computer use.

In other surveys, teachers have listed similar barriers in the use of computer-related technology to those reported in the Sheingold and Hadley survey. Teachers cited the lack of training and knowledge about the computer, not enough computer hardware and the problem of financing the purchase of equipment as barriers for technology use (Gleason & Reed, 1982; Morgan, 1983). Financing the purchase of additional computer-related technologies continues to be a significant barrier for teachers in using computer-related technologies. The Office of Technology Assessment (1988) stated that sixty-six percent of the states reported the lack of funding as a serious barrier that needed to be overcome before an increase in the use of technology to its potential could be realized. Additional barriers cited in this report included lack of equipment, inadequate or inappropriate training and for some teachers anxiety about new technology. Similar to the most significant barrier cited by Sheingold and Hadley, Becker (1991) reported "teachers saying that the biggest impediment to better computer use is the lack of time required to figure out how to use the computers well" (p. 9).

Beaver (1987) asked elementary teachers to name the past, present and future most critical contributors and barriers to successful instructional
computing program development. Teachers cited adequate hardware, adequate software, administrative support, the willingness for teachers to change and staff inservice programs as the most vital contributors to instructional computing program development. Although teachers believed that adequate hardware was the most significant contributor in both the past and the present to computing program development, they believed that adequate software would be the most significant contributor to program development in the future. Inadequate staff training, lack of quality software, insufficient hardware, and lack of staff development were listed by teachers as the most significant barriers in the past. The most significant barrier teachers believed would exist in the present and future was teachers resistance to change.

Teachers have identified potential barriers that they believe have made it difficult for them to utilize computer-related technologies in schools. Some of the barriers cited most often by teachers included the lack of time required to develop lessons that used computer-related technologies, the lack of training to use computer-related technologies, not enough computer-related technologies in schools, and inadequate financial support for additional computer-related technologies.

Becker (1990) stated that "current utilization patterns are likely to change in the near future, reflecting new opportunities and greater understanding of computer applications in education" (p. 9). Before utilization of computer-related technologies can change dramatically, teachers must acquire the knowledge to understand the capabilities of computer-related technology. In order for this to happen, teachers need to gain experience working with and applying these technologies to instructional opportunities in schools. Providing in-service training for teachers in the effective use of computers may be one of
the most critical factors necessary for successfully infusing computer-related technologies in schools (Gleason, 1982).

Computer Inservice Education and Staff Development

In a relatively short period of time, teachers have been overwhelmed with a number of major computer technological changes (Kinnaman, 1990). Most of the computer-related hardware and software that is accessible to teachers today did not even exist ten years ago. Therefore, it has been difficult for teachers to become comfortable with a computer application before a new computer technology is announced. Because of the continued evolution in computer-related technological developments, some believe that these technologies have not made an impact on education (Brunner, 1990; Ray, 1991). Perhaps the most significant factor affecting the impact of computer-related technologies in schools lies in the fact that the majority of teachers have had little or no training in the use of the new technologies (Scrogan, 1989). Kuskie suggested,

Teachers and schools must be given the time to learn how to best use existing equipment. Only with a broad knowledge of various technologies can teachers be expected to move on to new and more powerful applications. As teachers become comfortable with them, technologies will become more readily accepted into the classrooms (Bruder, 1989, p. 26).

Many educators have chosen not to utilize the computer as an instructional tool in classrooms because they simply do not know how to use one. This slow acceptance of computer-related technology in education may be due to the fact that teachers have not been given opportunities to develop
personal computer skills and to design specific classroom applications using the technology. If computer-related technologies are to have an impact on teaching and learning in the future, teachers must become comfortable with these technologies as tools that enhance instruction (Office of Technology Assessment, 1988). It takes a great deal of time to learn how to use computer-related technologies, and teachers have both to master the technology and figure out how to teach with it (Brady, 1991).

There are not enough teachers in the schools who have acquired the necessary computer skills to utilize the technology for classroom instruction (Scrogan, 1989). Some of the reasons for the shortage of teachers capable of using computer-related technologies include the lack of computer-related courses offered in teacher training institutions, the inability of economically pressed school districts to hire new teachers with computer experience, and inadequate computer-related staff development programs (Office of Technology Assessment, 1988). According to McCune (1983) "states can play a key role by providing inservice training, technical assistance, and other incentives for increasing educational staff capability" (p. 4).

National and state requirements for teacher preservice and inservice computer education

A section in each of Electronic Learning's annual surveys included information on teacher certification and inservice education in computer use. Results from the initial survey, "1981 Survey of the States," suggested that state agency officials were aware that educators needed help with computer inservicing, but were waiting to see if teachers would find local solutions to their own problems (Christen & Gladstone, 1983). In 1981, only thirteen of the
state departments of education were involved in training teachers in computer use. As of 1981, most state educational agencies reported that their plans to assist educators in instructional computing were just being conceptualized and in the early stages of development. A major concern cited by teachers was the difficulty they had developing computer classroom applications without first proper inservice training in the use of computers. As more departments of education realized what impact computer technologies could have on education, more states began to require or recommend preservice and inservice computer education programs through the years.

Because of the teachers' computer inservice concerns cited in the "1981 Survey of the States," teacher inservicing in computer use was found to be a priority of many state educational agencies the next few years. In 1983, Electronic Learning's "Third Annual Survey of the States" reported that forty state educational agencies were actively involved in computer inservice programs for teachers (Christen & Gladstone, 1983). State education agencies were concerned that preservice and inservice teachers had not acquired necessary computer skills for the classroom. As a result, some state educational agencies recommended or required preservice teachers to learn computer skills before they entered the classroom and experienced teachers to learn computer skills through computer inservice opportunities. By 1983, departments of education from sixteen states and the District of Columbia either recommended or required teacher preservice or inservice computer training. Over time, these requirements have continued to change as more states recommended or required that preservice and inservice teachers acquire necessary computer skills for the classroom.
In 1989, teacher training was still listed as the most important issue to the advancement of educational technology by ten state departments of education and the District of Columbia in Electronic Learning's "Ninth Annual Survey of the States" (Bruder, 1989). By 1989, twenty-three states and the District of Columbia required all or some preservice teachers, depending on their major, to take computer courses for teacher certification. The number of hours required in computer education for preservice teachers varied greatly between respondents, from one hour in Vermont to fifty hours in Washington D.C. According to the "Ninth Annual Survey of the States," ninety-four percent of the state departments of education reported that computer or technology inservice training was not required for teachers to maintain certification in their respective states. Of the states that required no computer inservice training for teachers, 93% provided training to certified teachers who requested it. In states where computer inservice training was provided, training programs were organized by various groups. Sixty-seven percent of the respondents reported their state had computer inservice programs organized by state departments, ninety percent had inservice programs organized by district departments and thirty-one percent had inservice programs organized by the teachers.

Even though the number of states that provided computer inservice training for teachers has continually increased, it is not clear that teachers have received the necessary inservice training to effectively use computer-related technologies in schools. Various national and state surveys have assessed if computer-related inservices have been provided for teachers, what type of inservice was provided, who conducted the inservice and if follow-up support was provided for teachers.
National surveys have been conducted to determine if computer inservice education and staff development programs were available for teachers. In 1988, data from the report "Power On! New Tools for Teaching and Learning" indicated that only one-third of all K-12 teachers had more than 10 hours of computer inservice training (Office of Technology Assessment, 1988). Respondents noted that most of the computer inservice training sessions that were provided focused on learning about computers, not learning how to teach with computers.

In the survey of accomplished computer-using teachers by Sheingold and Hadley (1990), results showed teachers had taken advantage of a variety of opportunities to learn how to use computers in their classrooms. When asked how or where they were trained in computer use, eighty-seven percent of these accomplished computer-using teachers indicated they were self-taught. Other computer inservice training opportunities these teachers reported were: conferences and workshops on their own time (76%), courses at local colleges (65%), inservice courses offered by their district (56%), inservice courses offered at their school (50%), courses in graduate or undergraduate training (44%), instruction from other teachers (40%), and instruction on site by consultants (38%).

Another factor that contributed to the achievement of the accomplished computer-using teachers surveyed was the support they received in the use of computers from their schools and districts. Seventy-seven percent of the teachers reported they had access to on-site computer use support and advice. This support came from various sources: other teachers (69%), school computer
coordinator or aide (60%), district computer coordinator (53%), and consultants (20%). These teachers worked in an environment where others were interested in using computers for instruction and they were supported in that use.

Computer staff development opportunities and support available to teachers were issues examined in "The Survey of Incentives for Staff Development of Computer-Based Instruction," a national telephone survey of 155 school administrators and teachers in K-12 public schools (Winkler & Stasz, 1985). Eighty percent of the districts surveyed provided inservice training to teachers and indicated the median amount of time available was 25 hours. Ninety-five percent of the school districts indicated teachers were provided with technical assistance with hardware problems, eighty percent with locating and evaluating courseware, and sixty-five percent with integrating computers into the curriculum. A computer resource person was available to assist teachers in 66% of the school districts. Advanced computer courses for teachers were available in fifty-six percent of the districts and computer inservices were held in the teachers' schools in seventy-three percent of the districts. Larger proportions of teachers participated in computer inservice training programs in districts with more computers available in districts when a computer resource person was available to assist them, and in districts when the inservice programs were held in the teacher's school.

Results reported by state surveys have yielded additional information about computer-related technology inservice opportunities for teachers. One topic included in the "Survey of Educational Technology in Ohio School Districts" specifically addressed staff training in the use of technology and the sources of the training (Morgan, 1983). Data were analyzed by the type of district (city, village, local), by the size of the district, and by the average daily
enrollment. Collectively, fifty percent of the school districts in Ohio indicated that they had a formal computer inservice training program for teachers. Larger school districts in Ohio were more apt to have computer inservice training programs for teachers than smaller school districts. Sixty-five percent of the city districts reported having inservice training available to teachers while fifty percent of the village districts and forty one percent of the local districts had computer inservice opportunities available to teachers. Over 65% of the districts that had higher average daily enrollment indicated they had inservice programs available to teachers, compared to 54% of the districts with lower average daily enrollment.

Also, Ohio teachers were asked who conducted the computer inservice programs available to them. Respondents indicated the person who provided the computer inservice instruction was either a local college or university faculty member, an outside consultant, or an expert on their own staff. Expert teachers identified by staff members as technology users conducted computer inservices in 51% of the schools. Forty percent of the schools used outside consultants for inservice programs and thirty-six percent of the schools had inservice programs offered by local colleges or universities.

Other researchers were interested in who instructed the training programs, how many teachers received the training, and the topics addressed in the training programs. A state survey conducted in the spring of 1983 by researchers at the University of Texas in collaboration with the Texas Education Agency investigated these three aspects of teacher training in the use of computers (Anderson & Smith, 1984). Out of 205 teachers who responded to the survey, 85% of them believed teachers in their school had received computer inservice training. When asked who the instructor was for the computer
inservice programs, teachers responses varied for each level (elementary, middle/junior high, high school). Forty three percent of the elementary teachers reported that consultants from Education Service Centers provided the computer inservice instruction, fifty percent of the middle/junior high teachers reported that vendors provided the instruction and fifty three percent of the high school teachers reported that an interested teacher provided the instruction. Also, teachers indicated they had received computer inservice instruction on a variety of computer topics. The percentage of teachers who received inservice instruction on the following topics included: computer literacy (90%), educational applications (80%), courseware use (78%), programming (70%), courseware selection (64%), and hardware selection (47%).

One objective of the "Instructional Computing: A Needs Assessment of Iowa K-12 Teachers" survey was to determine the inservice needs of elementary and secondary teachers in Iowa (Jarchow & Hunter, 1983). Teachers responded to seven specific inservice questions on how beneficial inservice sessions on specific computer-related topics would be for them. Teachers strongly agreed or agreed that the most beneficial inservice sessions would be on integrating computer-related activities into the classroom (79%), programming (71%), choosing appropriate software (70%), using computer managed instructional programs (68%), and learning word processing (62%). Teachers perceived inservice sessions on evaluating student computing efforts (51%) and authoring computer programs (41%) would be less beneficial to them. Some of the additional inservice topics suggested by elementary and secondary respondents included: using computers in various subject areas, using drill and practice programs, developing networks to obtain information, and writing computer programs.
In the spring of 1988, the "Survey of Computer Usage in Louisiana Schools" described the state of computer usage in 179 randomly selected elementary and secondary public schools in Louisiana (Kirby, Wilson & Smith-Gratto, 1989). Each school principal and a key computer-using teacher were asked to estimate the percentage of teachers in their schools who received computer training in college courses or inservice workshops. In three-quarters of all the schools surveyed, less than ten percent of the teachers at both elementary and secondary levels had received any type of inservice instruction in the use of computers. At the elementary level, eighteen percent of the schools reported having no inservice instruction on the use of computers, but four of the elementary schools noted that all teachers had received computer inservice instruction. Fifteen percent of the secondary schools reported that their teachers had no computer inservice training, while nine of the schools reported computer inservice training had been available for the entire faculty.

The Minnesota "Computer Usage Building Survey" included questions about teacher training and support in the area of how to use productivity software (Minnesota Department of Education, 1989). Seventy-eight percent of the schools that returned the survey provided teacher computer training in the use of computer productivity software. In 91% of the schools, there was a staff member within the building to assist teachers who might have questions or problems with the technology. Of those computer support positions, 41% were paid positions with assigned time, 30% were paid positions without assigned times, and 29% were voluntary positions. Teachers mentioned that inservice opportunities needed to be conveniently scheduled and the times most frequently mentioned by teachers for inservices were during teacher workshop days and during the summer. Teachers commented that inservices needed to
focus on their specific needs and abilities and follow-up support was very important.

Summary

Teacher inservice training in the use of computer-related technology continues to be a major problem discouraging the acceptance of these technologies as instructional tools in schools. Training teachers to successfully use computers in the classroom is a tremendous task (Office of Technology Assessment, 1988). Successful implementation of computer-related technologies in schools has depended upon colleges of education, state departments of education and school districts working together to provide adequate computer inservice training to meet the needs of the classroom teacher (Anderson & Smith, 1984). Findings from the national and state surveys indicated that computer inservice training for teachers was provided in some states because computer skills were either required or recommended, or teachers participated because they were interested in learning about how to use computer-related technologies. As indicated from survey results, the majority of teachers, however, still have had little or no computer training. Also, there is very little support given to teachers who use computer-related technologies. On the other hand, Sheingold and Hadley (1990) reported that experienced computer-using teachers learned how to use computer-related technologies on their own, but also had support services available.

Programs that exist may not be meeting teachers' needs. Specifically, many computer training programs provided for teachers have created an awareness of the computer, but have failed to introduce possible integrated uses in education (Hannifan, Dalton & Hooper, 1987). Teachers indicated that
computer inservices should be more specialized, based upon their own needs and abilities. Training with computers should be an ongoing process that takes place at varying levels, depending upon the teachers' responsibilities and the way the technology is to be used (Office of Technology Assessment, 1988). As more effective uses of computer-related technologies are developed, teachers will need continuing computer inservice programs that assist them in infusing these technologies into the curriculum.

Teacher Attitudes Toward Computers and Computer-Related Technologies

Although many computer enthusiasts have endorsed computers and their potential uses in education (Galanter, 1984; Hasset, 1985; Rhodes, 1986), it can not be assumed that teachers have readily accepted computers in schools (Dickerson & Pritchard, 1981; Scheffler, 1986; Trotter, 1990; Tucker, 1985). During the past decade computers have become more available for teachers to use (Becker, 1990), but many teachers remain reluctant to use the technology (Cox, Rhodes, and Hall, 1988). This teacher reluctance may be due to teachers' attitudes and confidence toward computer-related technologies.

Cox, Rhodes and Hall (1988) stated that "the successful implementation of computers and computer-related technologies in schools is dependent on gaining the acceptance of teachers and on teachers being motivated and committed as to the value of computers in schools" (p. 175). If teachers do not value the computer as an instructional device, they will not utilize computers to their potential (Reed, 1986). It is important that teacher attitudes toward computer-related technologies be examined to determine if those attitudes have affected teacher use of computer-related technologies.
Researchers have used various approaches to determine teachers' attitudes toward computer-related technologies. These approaches have included surveys, interviews, and observations. The following section describes surveys that have examined teachers' attitudes toward computer-related technology in education and teachers' confidence in their ability to use computer-related technology.

**Surveys on teacher attitudes toward computers and computer-related technologies**

Teacher attitudes toward computers and computer-related technologies have been examined in a number of surveys. One area of focus for researchers was to determine how teachers perceived the value of computer-related technologies in education (Bitter & Davis, 1985; Lillard, 1985; McCoy & Haggard, 1989). McCoy and Haggard (1989) reported that teachers' perceived value of computers in education influenced their computer use. In 1981, a national survey, "Microcomputers in American Public Schools," was conducted to assess current computer accessibility and usage patterns in schools and teacher attitudes toward computers (Ingersoll, Smith & Elliot, 1983). This survey was sent to a cross section of 4,200 elementary through secondary schools. Although a few teachers reported apprehension about the role of computers in teaching, the majority of teachers had positive attitudes toward computers in classrooms. Over 74% of the teachers agreed with the statement, "I am happy to see new technologies enter the classroom." This positive attitude was evident at all grade levels. Respondents believed computers were motivational to students and were useful instructional tools in the classroom.
The "School Utilization Survey" was conducted not only to assess how teachers used computers, but how teachers perceived the effectiveness of computers in education (Center for Educational Statistics, 1986). Results from the "School Utilization Survey" indicated that eighty-two percent of the teachers believed that computers could help teachers teach more effectively. These findings also indicated that sixty-three percent of the teachers did not find computers to be disruptive to classroom activities. Approximately one-third of the teachers believed that integrating the computer into the curriculum was simple; while the other two-thirds of the teachers either disagreed or abstained from answering the question.

In 1989, International Business Machines Corporation (IBM) commissioned a market research firm to conduct a nationwide poll of K-12 teachers about their attitudes toward computers in the classroom ("The Computer Report," 1989). Telephone interviews were conducted with 1,100 K-12 teachers and examined teachers' perceptions about the role of computers in classrooms and how that role affected teachers' use. Eighty-five percent of the teachers believed the use of computers in the classroom had a positive impact on education. Fifty-nine percent of the respondents believed computers were used effectively in education, while thirty-one percent believed they were not used effectively. Teachers supported the widespread use of computers in education and believed computers could be used in the future to address a variety of educational goals.

State surveys have also included information about teacher attitudes toward computer-related technologies. In 1982, a "Computers in Education Survey" was given to 238 Nebraska K-12 teachers that focused on educators' perceptions and expectations of the role of computers in education (Stevens,
Respondents perceived that computers would have a strong influence on classroom instruction in the future, but teachers were less positive about the use of computers in their own classrooms. Over 75% of the teachers surveyed, viewed their teaching style as not being conducive to computers and 43% indicated they were not willing to change their instructional techniques in order to use computers. Therefore, these teachers believed computers would be an influential instructional tool in the future, but probably not in their own classrooms.

A survey conducted by Southern Illinois University in 1983 asked sixty-one teachers to respond to a 78 item survey about their opinions on a number of computer-related topics that included the extent they believed teaching and schools would be influenced by computer use and the extent they believed their teaching careers would be influenced by computers (Killian, 1984). Respondents had significant positive attitudes toward all items dealing with the growing importance of computers in education and the impact of computers on professional challenge, teaching effectiveness, and job satisfaction.

Teachers with more computer experience using computers have more confidence in their abilities and tend to have more positive attitudes toward the use of computers (Koohang, 1987; Loyd & Gressard, 1984). Some teachers have indicated that they became discouraged when they attempted to use computers. Teachers become discouraged because they lacked confidence in their ability to operate a computer (Cox, Rhodes & Hall, 1988).

Items on surveys have addressed this issue of teacher confidence toward computer-related technologies. Teachers' perceptions, opinions, and attitudes about instructional computing were examined during the 1984-1985 school year in Wisconsin public schools (Knupfer, 1987). Surveys containing both closed
and open ended questions were mailed to all 510 sixth-grade teachers in K-6 schools. Several questions on this survey were intended to measure positive attitudes, negative attitudes, discriminatory attitudes, and attitudes about the teachers' own competence to use computers for instruction. Statistical analysis were conducted on these four attitudinal categories between teachers who had used and had not used computers in their teaching. Those teachers who used computers had more positive attitudes toward instructional computing and stronger feelings of competence. Those teachers who had not used computers were found to have more negative and discriminatory attitudes toward instructional computing. It was concluded that nonusers were not convinced that computer education was worth the effort to adjust their current teaching practices, but teachers who were computer users at least continued to make an effort to use computers in their classrooms. Other researchers have found that negative teacher attitudes can seriously constrain the extent of computer use in schools (Bliss, Chandra, & Cox, 1986; Brown, 1981).

Over an eight semester period, a total of two hundred forty teachers who had been enrolled in a graduate level computers in education course at Arizona State University were given the "Minnesota Computer Literacy and Awareness Assessment" (Bitter & Davis, 1985). This assessment consisted of questions on teacher attitudes and knowledge about computers. Teachers confidence in their ability to use computers decreased slightly during each year of the study. In 1980, sixty-five percent of the teachers were confident about their ability to use computers. The percentage dropped to fifty-six percent in 1981 and to forty-nine percent in 1982. Although teachers level of confidence in their abilities decreased, their desire to learn more about computers increased each year.
Not all the survey results reported that teacher confidence had an affect on their use of computers in the classroom. A survey of eighty-one teachers in 26 schools in six districts was conducted to examine the use of computers by teachers (McCoy & Haggard, 1989). The instrument included items on current use of computers in the classroom, confidence in personal ability to use computers, and perception of the value of computers in education. Seventy percent of the respondents indicated they were confident in their ability to use a computer. However, results from this survey indicated that teachers' confidence in their personal ability had no effect on whether or not they used computers in teaching.

Trollip and Alessi (1988) suggested that a major reason that teachers do not use computers was that they were not comfortable with the computers because of inadequate training. Computer inservices provide time for teachers to develop their computer skills. Lillard (1985) concluded that by providing programs to increase the teachers' knowledge about computers, teachers' attitudes toward the instructional use of computers will become increasingly positive.

Wright and Stone (1983) conducted a survey that involved teachers and staff from two public schools. The questionnaire used in the study was designed to gather information on demographics, teacher attitudes, and teacher feelings about computers. Nearly all of the 154 teachers in this study were inexperienced with computers. Findings indicated that sixty-six percent of the teachers felt unprepared about computers and nearly half of them felt frustrated and insecure. Data suggested any exposure to computers through inservice training helped to relieve teachers' uncomfortable feelings and increased their interest to learn more about computers. According to Kelly (Davis & Davis, 1983) teachers
who waited the longest time to begin computer inservice training had the most
difficulty in getting motivated to learn about the computer.

Findings from surveys to assess teachers' attitudes toward computers and
computer-related technologies indicated that the majority of teachers perceived
computers as a useful instructional tools in schools. Teachers indicated that
computers would have an impact on education in the future, but teachers' limited use of computers in classrooms was not indicative of that finding. The
teachers that had confidence in their abilities to use computers, were more likely to use the computer in their classrooms.
CHAPTER III. METHODOLOGY

After a review of the literature on national and state surveys on computer-related technology use, no information was found about the current state of computer-related technology use in Iowa. Thus, this descriptive research study was designed as a cooperative effort by the Iowa Department of Education and Iowa State University, College of Education to assess the current state of computer-related technology use in schools by K-12 teachers. Information gathered from this study will provide a basis to develop and plan future uses of these technologies in schools throughout Iowa. This chapter describes the methodology used to conduct this research study. The summary of the research methodology includes sections on a description of the sample, the development of the instrument, the research procedure, the limitations, and the data analysis.

Sample

A complex random sample was constructed by the Iowa State Statistical Laboratory staff (Norusis, 1986). The Iowa Department of Education furnished a computer tape that contained demographic information on all Iowa's K-12 public school teachers. A representative sample of 3,001 Iowa teachers was drawn from the population of approximately 30,000 teachers. This sample was designed so that the researcher would be able to make comparisons within Area Educational Agency districts, grade level (elementary, middle/junior high, high school) and school enrollment size. Table 1 shows the crosstabulation of the sample according to Area Educational Agency and teachers' grade level.
Table 1. Crosstabulation of area education agency by grade level

<table>
<thead>
<tr>
<th>AEA</th>
<th>Elementary</th>
<th>Jr. High/Middle</th>
<th>High School</th>
<th>Special Education</th>
<th>Other</th>
<th>Total</th>
<th>Column Total</th>
<th>Column Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEA 01</td>
<td>98</td>
<td>28</td>
<td>75</td>
<td>0</td>
<td>2</td>
<td>203</td>
<td>(6.8%)</td>
<td></td>
</tr>
<tr>
<td>AEA 02</td>
<td>79</td>
<td>35</td>
<td>63</td>
<td>0</td>
<td>3</td>
<td>180</td>
<td>(6.0%)</td>
<td></td>
</tr>
<tr>
<td>AEA 03</td>
<td>66</td>
<td>32</td>
<td>58</td>
<td>0</td>
<td>2</td>
<td>158</td>
<td>(5.3%)</td>
<td></td>
</tr>
<tr>
<td>AEA 04</td>
<td>69</td>
<td>25</td>
<td>54</td>
<td>0</td>
<td>2</td>
<td>150</td>
<td>(5.0%)</td>
<td></td>
</tr>
<tr>
<td>AEA 05</td>
<td>81</td>
<td>33</td>
<td>70</td>
<td>0</td>
<td>7</td>
<td>191</td>
<td>(6.4%)</td>
<td></td>
</tr>
<tr>
<td>AEA 06</td>
<td>69</td>
<td>33</td>
<td>57</td>
<td>0</td>
<td>5</td>
<td>164</td>
<td>(5.5%)</td>
<td></td>
</tr>
<tr>
<td>AEA 07</td>
<td>95</td>
<td>30</td>
<td>69</td>
<td>0</td>
<td>1</td>
<td>195</td>
<td>(6.5%)</td>
<td></td>
</tr>
<tr>
<td>AEA 09</td>
<td>117</td>
<td>47</td>
<td>69</td>
<td>4</td>
<td>4</td>
<td>241</td>
<td>(8.0%)</td>
<td></td>
</tr>
<tr>
<td>AEA 10</td>
<td>127</td>
<td>42</td>
<td>81</td>
<td>0</td>
<td>6</td>
<td>256</td>
<td>(8.5%)</td>
<td></td>
</tr>
<tr>
<td>AEA 11</td>
<td>176</td>
<td>65</td>
<td>111</td>
<td>7</td>
<td>3</td>
<td>362</td>
<td>(12.1%)</td>
<td></td>
</tr>
<tr>
<td>AEA 12</td>
<td>85</td>
<td>38</td>
<td>67</td>
<td>2</td>
<td>5</td>
<td>197</td>
<td>(6.6%)</td>
<td></td>
</tr>
<tr>
<td>AEA 13</td>
<td>96</td>
<td>27</td>
<td>75</td>
<td>1</td>
<td>1</td>
<td>200</td>
<td>(6.7%)</td>
<td></td>
</tr>
<tr>
<td>AEA 14</td>
<td>77</td>
<td>12</td>
<td>65</td>
<td>2</td>
<td>0</td>
<td>156</td>
<td>(5.2%)</td>
<td></td>
</tr>
<tr>
<td>AEA 15</td>
<td>86</td>
<td>26</td>
<td>68</td>
<td>1</td>
<td>1</td>
<td>182</td>
<td>(6.1%)</td>
<td></td>
</tr>
<tr>
<td>AEA 16</td>
<td>82</td>
<td>28</td>
<td>53</td>
<td>2</td>
<td>1</td>
<td>166</td>
<td>(5.5%)</td>
<td></td>
</tr>
</tbody>
</table>

Column Total: 1,403
Column Percent: 46.8%
Development of the Instrument

A cooperative research study was conducted by the Iowa Department of Education and the College of Education at Iowa State University to determine the state of technology use by Iowa K-12 teachers. Personnel from the Iowa Department of Education involved in the development of this study included the administrator of the division of planning and accountability, the state technology coordinator, the consultant of instructional improvement, the consultant of educational media, and two members of the state technology committee. Those involved on this committee from Iowa State University were a professor from curriculum and instructional technology in the College of Education and a graduate student in curriculum and instructional technology. Four meetings were scheduled during February and March of 1991.

Prior to the first meeting of this committee, it was proposed that survey instruments of previous national and state surveys be reviewed and possible research questions written. Numerous national and state survey examples were examined and common computer-related technology themes in these surveys were identified and used to create a framework for possible research questions by the researcher. These computer-related technology themes addressed accessibility, instructional uses, inservice education and staff development, and teacher attitudes. Research questions were written that pertained to these specific computer-related technology themes.

At the first meeting, representatives from both the Department of Education and Iowa State University shared their goals and objectives for the research study. Also, the research study approach and the development procedures for the instrument were discussed. The committee decided to construct a survey instrument and to send the instrument to K-12 teachers.
throughout Iowa. Next, the list of the research questions were distributed to each of the committee members. The committee suggested other research questions be added to the list and recommended that a major section of the instrument focus on the instructional uses of computer-related technology by teachers.

Using the suggestions and recommendations offered by committee members, an instrument was designed to assess the accessibility, instructional uses, computer inservice opportunities, and teacher attitudes toward computer-related technologies. Most of the items used to construct the instrument were adapted from other national and state surveys found in a review of related literature. Prior to the second meeting, a draft of the instrument was distributed to each committee member; the draft listed each research question and the items that were intended to measure each research question were listed underneath. Committee members were asked to indicate whether they believed the items on the survey measured what the research question had asked and to mention other revisions for the survey.

The second meeting was spent revising the survey instrument. Each item was discussed and revised according to the suggestions offered by committee members. Some revisions suggested by members included: omitting some of the items; adding responses for some of the items; changing the wording of various items; redefining some of the response categories; and designing some of the questions for continuous variable responses. Revisions and additions to the instrument were made according to the comments received by those on the committee.

After these revisions were made to the instrument, the survey was given to six Department of Education representatives, two Iowa State University
professors, and six Iowa State University graduate students. They were asked to write comments, and to comment on the appropriateness of the items for measuring each of the research questions for the four computer-related technology topics and to make any additional comments about the survey. The majority of comments from these people related to the classifications given for the instructional uses of computer-related technology, the wording of some of the items, the order of items in various sections, and the general format of the instrument. Two additional meetings were held for committee members from the Department of Education and Iowa State University to discuss the final revisions of the instrument, the content of the cover letter, the sample selection, and the distribution of the survey.

After these modifications to the instrument were completed, a pilot test was conducted with eleven graduate students enrolled in an educational technology classroom applications course. The students were asked to complete the questionnaire and to make comments about any questionable items. Also, the time each student needed to complete the instrument was documented. Final revisions made to the instrument based on the comments made by the graduate students were rewording various items and directions, highlighting the directions to each section, and deleting five repeated items on the questionnaire.

The Iowa State University Committee on the use of Human Subjects in Research reviewed and approved this research study. A copy of the approved human subjects form can be found in Appendix D.

The final sixteen page questionnaire, "Iowa Survey of Computer-Related Technology Use by K-12 Teachers", contained 172 items that were organized into five sections: (a) teacher background information, p. 2; (b) accessibility of
Design of section one: Teacher background information

The purpose of section one was to obtain descriptive background information about the K-12 teachers in the sample. Ten items were included in this section and requested information about:

1. education,
2. gender,
3. age,
4. grade level teaching,
5. years of teaching experience,
6. computer experience,
7. use of computers in teaching.

Design of section two: Accessibility of computer-related technologies

Section two included seventeen items that addressed the access teachers had to computer-related technologies in their schools. Fifteen of the items were multiple choice and two were completion items. Respondents were asked to circle all of the responses that applied to their situation for five of the multiple choice questions. Also, teachers were allowed to write their own responses for seven of the multiple choice questions. Items in this section requested information about the following areas and were obtained from the national and state surveys cited:
design of section three: instructional uses of computer-related technologies

section three addressed the instructional uses of computer-related technologies. this section contained 109 items and was organized into the following five parts:

- part i: teachers' proficiency in using computer-related technologies,
- part ii: teachers' interest in using computer-related technologies,
- part iii: teachers' use of computer-related technologies,
- part iv: teachers' frequency of use of computer-related technologies,
- part v: teachers' barriers in use of computer-related technologies.
Parts I & II  

Items for parts I and II were adapted from the "Computer Usage Teacher Survey" (Minnesota Department of Education, 1989). Teachers were asked to rate their proficiency and their interest in using computer based instructional applications, computer tool software and other computer-related technology applications. Teachers used the following likert-type scale to answer the sixteen items on their proficiency in use of computer-related technologies:

1. Unfamiliar - do not know what this item is
2. Low - little or no skill
3. Medium - some proficiency, could use some advanced training
4. High - very proficient, use regularly

Teachers responded to the 16 items about their interest in using various computer-related technologies based on a likert-type scale with the following values:

1. Unfamiliar - I do not know what this is
2. Low - I have no interest in using this in my classroom or computer lab
3. Medium - I have some interest in using this in my classroom or computer lab
4. High - I am very interested in using this in my classroom or computer lab

Part III  

In part III, teachers described their uses of computer based instructional applications, computer tools, telecommunication and distance learning applications, programming and multimedia. These 34 items were adapted from the "National Survey on the Integration of Computers into Schools: Teachers' Current Practices and Experiences" (Sheingold & Hadley,
Teachers reported their responses for these items using the following likert-type scale:

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

Part IV Teacher were asked to indicate how often they used various computer-related technologies in their classrooms or computer labs during the 1990-1991 school year. Twenty items were adapted from a previous survey conducted by researchers at Iowa State University (Thompson et al., 1990); however, this topic is supported by other surveys found in the literature (Beal et al., 1883; Becker, 1985, 1986, 1990; Bychowski & Dusseldorp, 1984; Parr & Miles, 1985). The teachers responses involved a likert-type scale with the following values:

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 ten times a year)

A rotated varimax factor analysis was conducted and from the nineteen frequency of use items, three factors emerged. A rotated varimax factor analysis is a statistical technique used to compute all of the correlations among all combinations of variables, and presents them as one correlation matrix (Bailey, 1987). From this correlation matrix, factor loadings are used to identify similar concepts that are characterized by the responses to the related groups of
variables. A factor loading with an absolute value of .4 or more was considered enough to include an item as a part of each factor (Bailey, 1987). All of the items listed for factor 1 related to the frequency of use of computer tool applications, all items listed for factor 2 related to the frequency of use of newer computer-related technologies (e.g. telecommunications, interactive videodisc systems, CD ROM applications, and hypermedia applications), and all items listed for factor 3 related to the frequency of use for computers in instruction. A descriptive list of the items included in each of the three identified frequency of use factors can be found in Appendix A. The items and their loadings included in each of the three factors were as follows:

**Factor 1**: frequency of use of computer tool applications - item 69, (.56); item 70, (.59); item 71, (.81); item 72, (.80); item 73, (.58); item 74, (.53); item 75, (.43); item 80, (.50).

**Factor 2**: frequency of use of newer computer-related technologies - item 78, (.67); item 79, (.80); item 82, (.71); item 84, (.78); item 85, (.76).

**Factor 3**: frequency of use of computers in instruction - item 67, (.84); item 68, (.75); item 69, (.41); item 73, (.42); item 76, (.64); item 77, (.82).

**Part V** In the last part of section three, teachers rated a list of twenty-two potential barriers that might have effected their use of computer-related technologies in their school. These barriers were associated with computer hardware and software, teacher instructional experiences, organizational problems and administrative support. Part V was adapted from items on the "National Survey on the Integration of Computers into Schools: Teachers' Current Practices and Experiences" (Sheingold & Hadley, 1990). A likert-type agreement scale was used with the following responses:
Again, a rotated varimax factor analysis was conducted to measure the unifying concepts that characterized the responses of the twenty-three items about the barriers in use of computer-related technologies and six factors emerged. Factor 1 items described barriers in use due to computer software issues; factor 2 items described barriers in use due to the amount of district level support; factor 3 items described barriers in use due to the limited access of computer-related technologies; factor 4 items described barriers in use due to the difficulty in using computer-related technologies; factor 5 items described barriers in use due to maintenance of computer-related technologies; and factor 6 items described barriers in use due to teacher attitudes toward computer-related technologies. Appendix B provides a descriptive list of the items included in the six identified barriers in use factors. The items and their loadings included in each of the three factors were as follows:

**Factor 1:** barriers in use; computer software - item 91, (.64); item 92, (.57); item 93, (.57); item 94, (.67); item 95, (.70); item 96, (.68); item 97, (.67).

**Factor 2:** barriers in use; district level support - item 106, (.72); item 107, (.66); item 108, (.85); item 109, (.80).

**Factor 3:** barriers in use; limited access to computer-related technologies - item 87, (.78); item 88, (.76); item 90, (.44); item 91, (.48); item 92, (.57).
Factor 4: barriers in use; difficulty in using computer-related technologies - item 98, (.75); item 99, (.66); item 100, (.51); item 105, (.54).
Factor 5: barriers in use; maintenance of computer-related technologies - item 89, (.58); item 103, (.69); item 104, (.72).
Factor 6: barriers in use; teacher attitudes toward computer-related technologies - item 101, (.80); item 102, (.77).

Design of section four: Computer inservice education and staff development

The purpose of section four was to gather information on the computer-related technology inservice opportunities that have been offered to teachers and the support they have been given for the continued use of these technologies. This section included thirteen multiple choice questions that requested information about the following areas and adapted from the national and state surveys cited:

1. availability of computer inservices (Bychowski & VanDusseldorp, 1984; Minnesota Department of Education, 1989; Morgan, 1983; Parr & Miles, 1985; Schimizzi, 1983; Winkler & Stasz, 1985),
2. teacher participation in computer inservices offered (Parr & Miles, 1985; Winkler & Stasz, 1985),
3. type of computer inservices offered (Morgan, 1983; Sheingold & Hadley, 1990),
4. existence of a district technology plan (Parr & Miles, 1985; Schimizzi, 1983),
Design of section five: Teacher attitudes toward computers and computer-related technologies

Teachers' attitudes toward computers and computer-related technologies were determined in section five. Sixteen of the twenty-three items for this section were taken from a previous survey prepared by researchers at Iowa State University (Thompson et al., 1990). The other seven items were adapted from the questionnaire "Microcomputers in Education: A Scholastic Program In-Service Training" (Poirot & Heidt, 1982). Respondents indicated to what extent they agreed or disagreed with each item using the following five-point agreement scale described by Henerson, Morris and Fitz-Simmons (1978, p. 86-88):

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

A rotated varimax factor analysis was conducted to measure the unifying concepts that characterized the responses of the twenty-three attitude items, and three factors emerged. All of the items listed for factor 1 related to teacher general attitude toward computer-related technologies, all items listed for factor 2 related to teacher confidence toward using computer-related technologies, and all items listed for factor 3 related to teacher attitude toward the necessity of computer-related technologies in education. A descriptive list of the items included in each of the three identified attitude factors can be found in...
Appendix C. The items numbers and their loadings included in each of the three factors were as follows:

Factor 1: teacher general attitude toward computer-related technologies - items 3, (.46); item 6, (.61); item 8, (.55); item 12, (.73); item 13, (.80); item 14, (.74); item 15, (.79); item 16, (.62); item 21, (.64); item 23, (.69).

Factor 2: teacher confidence toward using computer-related technologies - item 1, (.44); item 2, (.76); item 3, (.56); item 4, (.77); item 7, (.84); item 9, (.66); item 16, (.44); item 17, (.72).

Factor 3: teacher attitude toward the necessity of computer-related technologies in education - item 5, (.49); item 10, (.43); item 11, (.48); item 18, (.75); item 19, (.74); item 22, (.53).

**Reliability and validity of the questionnaire**

Attention must be given to measure the validity of the instrument used for a research study (Ary, Jacobs & Razavieh, 1985). One way to assess the content validity of an instrument is to have experts or professionals familiar with the purpose of the survey examine the items to determine whether they measure what they are supposed to measure. As indicated earlier, to determine the content validity of the instrument used for this research study, six department of education personnel, two university professors, and six graduate students were asked to comment on the appropriateness of the survey for measuring the research questions.

A Cronbach alpha reliability coefficient was obtained for each of the three frequency of use factors, each of the six barriers in use factors and each of the three attitude factors measured in order to test the internal consistency of these
items on the instrument. The reliability coefficients for the three frequency of use factors were as follows:

(1) frequency of use of computer tool applications, \( r = .82 \)
(2) frequency of use of newer computer-related technologies, \( r = .83 \)
(3) frequency of use of computers in instruction, \( r = .82 \)

The reliability coefficients for the six barriers in use factors were as follows:

(1) barriers in use; computer software, \( r = .80 \)
(2) barriers in use; district level support, \( r = .82 \)
(3) barriers in use; limited access to computer-related technologies, \( r = .77 \)
(4) barriers in use; difficulty in using computer-related technologies, \( r = .60 \)
(5) barriers in use; maintenance of computer-related technologies, \( r = .60 \)
(6) barriers in use; teacher attitudes toward computer-related technologies, \( r = .67 \)

The reliability coefficients for the three attitude factors were as follows:

(1) general teacher attitude toward computer-related technologies, \( r = .90 \)
(2) teacher confidence toward using computer-related technologies, \( r = .87 \)
(3) necessity of computer-related technologies in education, \( r = .77 \)
Research Procedure

In April of 1991, 3,001 K-12 teachers throughout Iowa were sent the questionnaire along with a cover letter and a postage-paid, return envelope (Appendix E). The cover letter described the purpose of the research study and the participants were told they were voluntary representatives of teachers in their specialty area. Each questionnaire was assigned a number for the purpose of monitoring the rate of return. A postcard reminder was mailed to approximately 1,300 of the non-respondents two weeks after the initial mailing of the survey. A follow-up mailing of the questionnaire was omitted due to the costs involved in mailing another survey.

Approximately, 1,771 teachers returned the survey after the first mailing. After a postcard reminder was sent to non-respondents, an additional 163 surveys were returned. A total of 1,934 participants responded to the survey. The final response rate was 64%. Nine surveys were returned by respondents who chose not to fill it out. Some of the surveys were returned only partially completed by respondents; data from these surveys were included in the results.

Limitations

One limitation of this study is the responses were from a sample of K-12 teachers in Iowa. If this instrument were administered in any other state or combination of state, the results might be different than the ones reported in this research study.
Analysis of the Data

Personnel from Iowa Department of Education Bureau of Data and Word Processing entered the data collected from the survey instruments that were returned. Data were analyzed for all the variables using the appropriate SPSSX procedure to determine the following descriptive statistics: the frequency of response, the percentage of each response, the number of responses for each item, the means scores and the standard deviation of scores (SPSS Reference Guide, 1990). The chi-square statistic was used to test whether selected variables were independent of the grade level (elementary, middle/junior high, high school, K-12) variable. A one-way analysis of variance was used to identify possible significant differences in the dependent variable means among grade levels (elementary, middle/junior high, high school, K-12). A Scheffe' test was used to determine which grade levels differed significantly. The alpha level was set at .05.

Summary

In summary, this chapter included sections on a description of the sample, the development of the instrument, the research procedure, the limitations, and the data analysis.

A sixteen page questionnaire was constructed that contained 172 items on teacher background information, accessibility of computer-related technologies, instructional uses of computer-related technologies, computer inservice education and staff development and teacher attitudes toward computers and computer-related technologies. In April of 1991, three thousand one K-12 teachers were sent the Iowa Survey of Computer-Related Technology Use by K-12 Teachers. Sixty-four percent of the surveys were returned by teachers.
CHAPTER IV. RESULTS AND FINDINGS

Teacher responses from the questionnaire, "Iowa Survey of Computer-Related Technology Use by K-12 Teachers," were used to compute descriptive information about: (1) teacher background, (2) accessibility of computer-related technologies in schools, (3) instructional uses of computer-related technologies, (4) teacher computer inservice and staff development opportunities, and (5) teacher attitudes toward computer-related technologies. In this chapter, an analysis of the data gathered from the survey is presented. The data summarized in this chapter include a description of the respondents and the findings addressing the research questions presented in Chapter 1. (Detailed one-way ANOVA tests results appear in Appendix F.)

Description of the Respondents

The purpose of section one of the survey was to obtain descriptive background information about the 1,934 respondents. Information was gathered about the respondents on demographic characteristics. Of the 1,934 teachers who responded to the survey, 69.3% were female and 30.7% were male. Most of the respondents (37.8%) were between the ages of 38-47 years. Less than ten percent (9.1%) of the respondents were under the age of 27 years and only six percent (6.9%) were over 58 years old. Forty-nine percent (49.0%) of the respondents were elementary teachers, twenty-one percent (21.7%) were middle or junior high teachers, twenty-seven percent (27.4%) were high school teachers, and two percent (1.9%) were K-12 teachers (Figure 1). It should be noted that the group of teachers in the K-12 category is significantly smaller than each of the other three groups of teachers. Some of the respondents in this group included physical
education teachers, music teachers, art teachers, counselors, media specialists and computer coordinators. The reader should be careful about the interpretation of the results for this group of respondents.

Respondents were also asked to indicate years of education and years of teaching experience. Overall, the greatest number of respondents (47.5%) had earned an undergraduate degree and fifteen or more additional credits at the graduate level. Almost twenty percent (19.9%) had earned an undergraduate degree and slightly less than sixteen percent (15.6%) had earned a master’s degree. Over one third of the respondents (38.0%) had 11 to 20 years of teaching experience. Less than one third of the respondents (30.7%) had less than 10 years of teaching experience. A small percentage (6.9%) of the respondents had over 31 years of teaching experience.
Only six percent (6.6%) of the respondents reported they had no experience using a computer. When asked if they used a computer in their teaching, seventy-seven percent (77.2%) of the respondents said they used the computer in their teaching, whereas twenty-two percent (22.8%) did not use the computer in their teaching (Figure 2).

Figure 2. Percentage of respondents who use computers in their teaching

Teachers, who indicated that they used computers in their teaching, were asked to estimate how many years, including the 1990-1991 school year, they had used computers in their teaching. Twenty-two percent (22.0%) of the teachers had used the computer in their teaching for 2 years or less, twenty-eight percent (28.8%) for 3 or 4 years, twenty-five percent (25.3%) for 5 or 6 years, twelve percent (12.3%) for 7 or 8 years, eight percent (8.0%) for 9 or 10 years, and three percent (3.6%) for more than 10 years (Figure 3).
In summary, the participants in this research study were predominantly female K-12 teachers with computer experience. Over two-thirds of the sample had more than ten years of teaching experience. More than half of the respondents had used computers for more than two years in their teaching.

Accessibility of Computer-Related Technologies

The purpose of the second section of the survey was to determine the accessibility of computer-related technologies for teachers at home and in schools. There were nine research questions related to the accessibility issue.
Accessibility of computer-related technologies: Research question 1

The first research question was stated as follows: Do teachers have a computer at home to use?

Slightly more than one third (36.3%) of the respondents had a computer at home to use. Teachers also indicated what type of computer they had in their home and could choose more than one response. The most common type of computer that teachers (35.7%) had in their home was an Apple II+, Apple IIe, or Apple IIc. The second most common computer type that teachers (23.0%) had at home was an Apple IIgs. Twenty percent (20.1%) of the teachers had IBM or IBM compatible computers and thirteen percent (13.2%) had Macintosh computers.

Accessibility of computer-related technologies: Research question 2

The second research question was stated as follows: Are teachers allowed to check out a computer from school to use at home?

Fifty nine percent (59.1%) of the respondents indicated that their school districts allowed them to check out school computers for home use. Twenty-four percent (24.8%) of the respondents reported they could not check out school computers to use at home and sixteen percent (16.1%) said they did not know if their school districts allowed teachers to checkout computers. Of the fifty-nine percent (59.1%) of the respondents who indicated they could take a school computer home to use for teaching-related tasks, fifty-six (56.4%) of them had used this option.
Accessibility of computer-related technologies: Research question 3

The third research question was stated as follows: Are computers available for instructional use at each level (elementary, middle/junior high, high school)?

A large majority of respondents (97.6%) at all three levels indicated that computers were available for instructional uses. Ninety-seven percent of the elementary teachers (97.8%), middle/junior high teachers (97.3%), and high school teachers (97.5%), reported computers were available for instructional use in their building.

Accessibility of computer-related technologies: Research question 4

The fourth research question was stated as follows: What types of computers are available to teachers at each level (elementary, middle/junior high, high school) for instructional uses?

The respondents were asked to select the type of computer that was most available for instructional use in their building. A majority of all respondents (72.7%) indicated the most available computer in their building was either an Apple II+, IIe or IIc. Eighteen percent (18.2%) of the teachers reported the second most available computer was an Apple IIGS. Types of computers least available for instructional purposes in schools were an IBM or IBM compatible (4.2%) and a Macintosh (4.1%).

Over eighty percent of the computers available to respondents at all levels were Apple II+, IIe, IIc or IIGS computers. Ninety-six percent (96.5%) of the computers in elementary schools were Apple II family computers. In middle/junior high schools, 92.4% of the computers were Apple II family computers and 80.4% of the computers at high schools were Apple II family
computers. Figure 4 shows the percentages for the types of computers in schools as reported by respondents.

High schools reported having more powerful computers available to teachers for instructional uses. As stated earlier, only 4.2% of the computers available for instructional uses were IBM or IBM compatible computers and 4.1% were Macintosh computers. Seventy-six percent (76.3%) of the Macintosh computers and almost fifty percent (49.4%) of the IBM or IBM compatible computers available in schools were in high schools.

Accessibility of computer-related technologies: Research question 5

The fifth research question was stated as follows: Where are computers for instructional use located in elementary, middle/junior high, and high schools?

The most common locations for computers in schools cited by respondents were in computer labs (66.3%), in classrooms (65.5%), in the school media center or library (48.5%), and on a portable cart (40.9%) (Figure 5). When the survey was administered, almost sixty percent (59.7%) of the respondents reported they had a computer in their classroom.

Accessibility of computer-related technologies: Research question 6

The sixth research question was stated as follows: Are computers designated for teacher use only available in the schools?

The majority of the respondents (70.9%) indicated they did not have any computers designated for teacher use only in their building. Only twenty-nine percent (29.1%) of the respondents reported there was a computer in their building designated for teacher use only (Figure 6).
Figure 4. Types of computers in schools
Figure 5. Locations for computers in schools

Figure 6. Computers available for teacher use only in schools
The respondents who indicated they had a computer(s) available also reported the location of the teacher use only computers in their schools. Respondents were able to choose one or more of the listed locations. The most frequent location for teacher use only computers reported by respondents (58.8%) was in a teacher work area. Other locations cited by respondents was in the media center or library (33.9%) and on a portable cart (23.4%).

Accessibility of computer-related technologies: Research question 7

The seventh research question was stated as follows: What other types of computer-related technologies are accessible to teachers in their school?

A list of other computer-related technologies were given to respondents so they could indicate what other technologies were available in their school. Teachers indicated that video cassette recorders were accessible in 91.1% of the schools, dot matrix printers were in 90.3% of the schools, video cameras in 83.0% of the schools, and hard disk drives in 58.5% of the schools.

Newer computer-related technologies were not as readily available in schools as other technologies. Laser printers were reported in 23.1% of the schools, modems in 15.9% of the schools, CD ROMs in 10.7% of the schools, liquid crystal diode/display in 9.1% of the schools, videodisc players in 7.4% of the schools, and scanners were in 4.9% of the schools. Table 2 presents the frequencies of the computer-related technologies that respondents reported were in their schools.
Table 2. Percent of schools having each computer-related technology

<table>
<thead>
<tr>
<th>Type of Computer-Related Technology</th>
<th>Number of Respondents</th>
<th>Adjusted Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD ROM</td>
<td>207</td>
<td>10.7</td>
</tr>
<tr>
<td>Graphics pad or tablet</td>
<td>310</td>
<td>16.0</td>
</tr>
<tr>
<td>Hard disk drive</td>
<td>1131</td>
<td>58.5</td>
</tr>
<tr>
<td>Dot matrix printer</td>
<td>1755</td>
<td>90.7</td>
</tr>
<tr>
<td>Laser printer</td>
<td>447</td>
<td>23.1</td>
</tr>
<tr>
<td>Liquid crystal diode/display</td>
<td>176</td>
<td>9.1</td>
</tr>
<tr>
<td>Modem</td>
<td>307</td>
<td>15.9</td>
</tr>
<tr>
<td>Scanner</td>
<td>95</td>
<td>4.9</td>
</tr>
<tr>
<td>Videodisc player/station</td>
<td>144</td>
<td>7.4</td>
</tr>
<tr>
<td>Voice synthesizer</td>
<td>130</td>
<td>6.7</td>
</tr>
<tr>
<td>Video camera</td>
<td>1605</td>
<td>83.0</td>
</tr>
<tr>
<td>Video cassette recorder</td>
<td>1762</td>
<td>91.1</td>
</tr>
<tr>
<td>Still video camera</td>
<td>141</td>
<td>7.3</td>
</tr>
<tr>
<td>Satellite communications</td>
<td>280</td>
<td>14.5</td>
</tr>
<tr>
<td>Mainframe computers</td>
<td>53</td>
<td>2.7</td>
</tr>
<tr>
<td>Local area network</td>
<td>189</td>
<td>9.8</td>
</tr>
<tr>
<td>Long distance computer network</td>
<td>97</td>
<td>5.0</td>
</tr>
</tbody>
</table>

(n=1934)
Accessibility of computer-related technologies: Research question 8

The eighth research question was stated as follows: Is computer software available in schools for teachers to use?

The majority of respondents (97.6%) said computer software was available in their school to use. This number is identical to the number of teachers who reported that computers were available for instructional use (97.6%).

Accessibility of computer-related technologies: Research question 9

The ninth research question was stated as follows: How is computer software for instructional uses made available to teachers?

Respondents were requested to indicate how computer software programs were made available to teachers in their building. Again, teachers were allowed to choose more than one of the listed responses. Most of the teachers (56.8%) obtained computer software by checking it out from a central location in their building. Also, over half of the teachers (54.2%) obtained some computer software from their Area Education Agency. Thirty-nine percent (39.0%) of the respondents have individual copies of computer software assigned to their classroom and almost twenty percent (19.8%) have copies available at a networked computer work station. Only seven percent (7.0%) of the respondents checked out computer software from a district central office and six percent of the respondents (6.7%) checked out computer software from another school in the district.
Instructional Uses of Computer-Related Technologies

The purpose of the third section of the survey was to assess teachers' instructional uses of computer-related technologies. There were five research questions that addressed the following themes: (1) teachers' proficiency in using computer-related technologies; (2) teachers' interest in using computer-related technologies; (3) teachers' use of computer-related technologies; (4) teachers' frequency of use of computer-related technologies; and (5) teachers' identified barriers in the use of computer-related technologies.

**Instructional uses of computer-related technologies: Research question 10**

The tenth research question was stated as follows: How do teachers rate their proficiency in using various computer-related technology applications?

There were sixteen items on the survey measuring teachers' proficiency in using computer-related technology applications. The likert scale was as follows: 1 = Unfamiliar; 2 = Low - little or not skill; 3 = Medium - some proficiency; 4 = High - very proficient. These sixteen items were then grouped into three factors: computer based instruction (e.g. drill and practice, tutorials, educational games, simulations); computer tool software (e.g. word processing, databases, spreadsheets); and other computer-related technology applications (e.g. telecommunications, programming, hypermedia).

The mean response for the computer based instruction factor was 2.57; this mean indicated that teachers rated their proficiency in using computer based instructional applications between having little or no skill and having some proficiency. The higher responses for the individual items for the computer based instruction factor was 2.96 for educational games and 2.94 for drill and practice; over seventy percent of the teachers indicated having some proficiency
or being very proficient in using these two applications (Figure 7). The lowest response for proficiency in using computer based instructional applications was 2.20 for simulations. Elementary teachers average response to the computer based instruction factor was 2.67, middle/junior high school teachers average response was 2.46, high school teachers average response was 2.48, and K-12 teachers average response was 2.47. The one-way analysis of variance indicated there was a significant difference among the grade level (elementary, middle/junior high, high school, K-12) groups (Table 3). The Scheffe' test showed the mean for elementary teachers was significantly higher than middle/junior high teachers and high school teachers.

Table 3. Means, standard deviations and F-tests for ratings of respondents by grade level for proficiency in using computer based instructional applications

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>913</td>
<td>2.67</td>
<td>.76</td>
<td>10.04</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>408</td>
<td>2.46</td>
<td>.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>503</td>
<td>2.48</td>
<td>.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>33</td>
<td>2.47</td>
<td>.97</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Scheffe' test indicates significant difference between groups 1 & 2 and 1 & 3 at .05.

The average response for the proficiency in using computer tool software factor was 2.19. The highest average response for the computer tool software items was 3.01 for word processing; seventy-two percent of the respondents indicated they had some proficiency or were very proficient in using word
Figure 7. Mean responses of respondents for proficiency in using computer based instructional applications

1 = Unfamiliar - do not know what item is
2 = Low - little or no skill
3 = Medium - some proficiency
4 = High - very proficient
processors. Teachers rated their proficiency in using other individual computer tool software items lower: databases (2.24), graphics/drawing programs (2.12), spreadsheets (2.13), and desktop publishing (2.03) (Figure 8). The mean score for elementary teachers for their proficiency in using computer tool software was 2.09, the mean score for middle/junior high teachers was 2.24, the mean score for high school teachers was 2.34, and the mean score for K-12 teachers was 2.36 (Table 4). The one-way ANOVA procedure indicated there was a significant difference reported among grade levels. The Scheffe' test with the alpha level of .05 indicated that the mean for the elementary teachers was significantly less than the mean for high school teachers and the mean for middle/junior high teachers.

Table 4. Means, standard deviations and F-tests for ratings of respondents by grade level for proficiency in using computer tool applications

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>909</td>
<td>2.09</td>
<td>.69</td>
<td>14.02</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>409</td>
<td>2.24</td>
<td>.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>510</td>
<td>2.34</td>
<td>.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>34</td>
<td>2.36</td>
<td>.68</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05. Scheffe' test indicates significant difference between groups 2 & 1 and 3 & 1 at .05.

Teachers' average response for the factor of other computer-related technology applications was 1.55; over seventy percent of the respondents reported they had little or no skill or were unfamiliar with using all of the items.
Figure 8. Mean responses of respondents for proficiency in using computer tool applications.
included in this factor. Seventy-five percent of the respondents indicated they were unfamiliar with the term hypermedia and seventy-one percent were unfamiliar with the term CD ROM. Figure 9 shows the mean responses for each individual item included as part of the other computer-related technology applications variable. The mean for middle/junior high school teachers was significantly higher than elementary teachers, the mean for high school teachers was significantly higher than elementary teachers, and the mean for K-12 teachers was significantly higher than the elementary teachers mean and the middle/junior high school teachers mean (Table 5).

Table 5. Means, standard deviations and F-tests for ratings of respondents by grade level for proficiency in using other computer-related technology applications

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>906</td>
<td>1.46</td>
<td>.49</td>
<td>19.60</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>404</td>
<td>1.57</td>
<td>.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>510</td>
<td>1.67</td>
<td>.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>34</td>
<td>1.85</td>
<td>.71</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* $p < .05$.
Scheffe' test indicates significant difference between groups 2 & 1, 3 & 1, 4 & 1 and 4 & 2 at .05.

Instructional uses of computer-related technologies: Research question 11

The eleventh research question was stated as follows: How do teachers at each level (elementary, middle/junior high, high school) rate their interest in using various computer-related technology applications?
Figure 9. Mean responses of respondents for proficiency in using other computer-related technologies

1 = Unfamiliar - do not know what this item is
2 = Low - little or no skill
3 = Medium - some proficiency
4 = High - very proficient

Teacher Utilities: 1.97
Telecom.: 1.43
Programming: 1.71
Hypermedia: 1.32
CD ROM: 1.36
The sixteen items from the survey that measured teachers' interest in using computer-related technology applications in their classroom or computer lab had the following likert scale: 1 = Unfamiliar; 2 = Low - no interest; 3 = Medium - some interest; 4 = High - very interested. From these sixteen items the following three categories emerged: computer based instructional applications (e.g. drill and practice, tutorials, educational games, simulations); computer tool applications (e.g. word processing, databases, spreadsheets); and other computer-related technology applications (e.g. telecommunications, programming, hypermedia).

The mean response for the interest in using computer based instructional applications was 3.09; this indicated teachers had some interest in using these applications in their classroom or computer laboratory. Over seventy percent of the respondents reported they had some interest or were very interested in using computer based instructional applications. The highest individual computer based instructional application mean was 3.27 for problem solving; fifty-five percent of the respondents were highly interested in using problem solving in their classroom or computer laboratory. Figure 10 shows the mean responses for each individual item included in the computer based instructional application variable. The mean response for interest in using computer based instructional applications for elementary teachers was 3.21, the mean for middle/junior high teachers was 3.02, the mean for high school teachers was 2.95, and the mean for K-12 teachers was 2.99. The Scheffe' test reported the mean for elementary teachers was significantly higher than the mean for middle/junior high teachers and the mean for high school teachers. Elementary teachers were significantly more interested in using computer based instructional applications in their
Figure 10. Mean responses of respondents for interest in using computer based instructional applications

1 = Unfamiliar - do not know what this is
2 = Low - no interest in using
3 = Medium - some interest in using
4 = High - very interested in using

Ratings of Teacher Interest in use
classroom or computer labs than middle/junior high school teachers or high school teachers (Table 6).

Table 6. Means, standard deviations and F-tests for ratings of respondents by grade level for interest in using computer based instructional applications

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>919</td>
<td>3.21</td>
<td>.71</td>
<td>15.14</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>409</td>
<td>3.02</td>
<td>.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>506</td>
<td>2.95</td>
<td>.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>2.99</td>
<td>.92</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*  
Scheffe' test indicates significant difference between groups 1 & 2 and 1 & 3 at .05.

Teachers' average response for the interest in using computer tool applications (2.68) was somewhat less than the mean for the interest in using computer based instructional applications (3.09). For the computer tool applications category, teachers' average response ranked closer to having some interest in using these computer tool applications in their classrooms or computer labs than having no interest in using these applications. Over eighty percent (81.5%) of the respondents had some interest or were very interested in using word processing; the mean for interest in using word processing was 3.31. Over half of the respondents reported they were unfamiliar with the term or had no interest in using graphing utilities (51.6%) or spreadsheets (51.3%). In Figure 11, the mean responses for the individual items included in the computer tool application category are presented. The means for high school teachers and K-12
Figure 11. Mean responses of respondents for interest in using computer tool applications

1 = Unfamiliar - do not know what this is
2 = Low - no interest in using
3 = Medium - some interest in using
4 = High - very interested in using
teachers were significantly higher than the mean for elementary teachers. This indicated that high school teachers and K-12 teachers were significantly more interested in using computer tool applications than elementary teachers. Table 7 shows the means of the grade level groups for their interest in using computer tool applications.

Table 7. Means, standard deviations and F-tests for ratings of respondents by grade level for interest in using computer tool applications

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>915</td>
<td>2.56</td>
<td>.82</td>
<td>14.47</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>408</td>
<td>2.72</td>
<td>.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>512</td>
<td>2.83</td>
<td>.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>3.05</td>
<td>.86</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05.
Scheffe' test indicates significant difference between groups 2 & 1, 3 & 1 and 4 & 1 at .05.

The lowest teachers' average response was for interest in using other computer-related technologies in their classrooms or computer labs; the mean reported for this factor was 2.06. The higher responses for the individual items for the interest in using other computer-related technology applications factor were teacher utilities (2.56), programming (2.16), telecommunications (2.08), CD ROM (1.83), and hypermedia (1.81). Hypermedia and CD ROM applications were unfamiliar to fifty-five percent of the respondents (Figure 12). The reported mean for elementary teachers (1.91) was significantly lower than the reported means for middle/junior high teachers (2.14), high school teachers (2.24), and
Figure 12. Mean responses of respondents for interest in using other computer-related technology applications

1 = Unfamiliar - do not know what this is
2 = Low - no interest in using
3 = Medium - some interest in using
4 = High - very interested in using
K-12 teachers (2.59). This indicated that all of the other grade level groups had significantly more interest in using other computer-related technology applications than elementary teachers (Table 8).

Table 8. Means, standard deviations and F-tests for ratings of respondents by grade level for interest in using other computer-related technology applications

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>911</td>
<td>1.91</td>
<td>.78</td>
<td>23.64</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>406</td>
<td>2.14</td>
<td>.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>508</td>
<td>2.24</td>
<td>.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>2.59</td>
<td>.92</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Scheffer test indicates significant difference between groups 2 & 1, 3 & 1, 4 &1 and 4 & 2 at .05.

Instructional uses of computer-related technologies: Research question 12

The twelfth research question was stated as follows: Do teachers at each level (elementary, middle/junior high, high school) use or desire to use computer-related technology applications in their classroom or computer lab?

Teachers described their use of the following computer-related technology applications: computer based instructional applications, computer tool applications, telecommunications and distance learning applications, programming, and multimedia. Teachers reported their responses to the thirty-four items using the following likert scale: 1 = Do not use at all/No desire to use; 2 = Would like to use; 3 = Currently use.
The teachers' average response to the use of computer based instructional applications was 2.12; this indicated that teachers would like to use computer based instructional applications in their classrooms or computer labs. Fifty-five percent of the respondents indicated they were currently using educational games (55.9%) and drill and practice programs (55.3%). Almost half of the respondents indicated they would like to use simulations (48.3%), problem solving (47.6%), and teacher utilities (45.4%). Figure 13 shows the mean responses for each individual item included in the computer based instructional factor. Examining the means for the computer based instructional items by grade level revealed that the mean of the elementary teachers was significantly greater than the middle/junior high teachers and the high school teachers. Elementary teachers used computer based instructional applications significantly more than middle/junior high teachers or high school teachers (Table 9).

Table 9. Means, standard deviations and F-tests for respondents' use of computer based instructional applications

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>916</td>
<td>2.22</td>
<td>.51</td>
<td>22.33</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>406</td>
<td>1.99</td>
<td>.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>508</td>
<td>2.02</td>
<td>.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>2.11</td>
<td>.66</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.  
Scheffe' test indicates significant difference between groups 1 & 2 and 1 & 3 at .05.
Figure 13. Mean responses of respondents for the use of computer based instructional applications.

1 = Do not use at all/No desire to use
2 = Would like to use
3 = Currently use
The average teacher response for the use of computer tool applications was 1.70 which indicated the teachers' responses were between do not use at all/no desire to use and would like to use. Three categories of computer tools were identified on the survey and the average response for these categories were text processing tools (2.10), analytic and information tools (1.72), and graphics and creative arts tools (1.48).

Results from the text processing tools category indicated that fifty-six percent (56.8%) of the respondents were currently using word processors. Fifty-four percent (54.5%) of the respondents expressed they would like to use desktop publishing programs and forty-eight percent (48.4%) would like to use writing tools. The mean responses for individual items are presented in Figure 14. The mean reported for high school teachers (2.17) was significantly greater than the means for middle/junior high teachers (2.05) and elementary teachers (2.06). Also, the means for K-12 teachers (2.42) was significantly greater than middle/junior high teachers and elementary teachers (Table 10). Thus, high school teachers and K-12 teachers were using text processing tools significantly more than middle/junior high schools teachers or elementary teachers.

The highest average response for the analytic and information tools was 1.72 for charting/graphing applications; over fifty percent (52.1%) of the respondents indicated they would like to use charting/graphing applications in their classrooms or computer labs. Forty-four percent (44.7%) of the respondents do not use or had no desire to use spreadsheets and forty-one percent (41.6%) do not use or had no desire to use databases. Figure 15 presents the mean responses for the individual analytic and informational tool items. The mean reported for elementary teachers (1.56) was significantly lower than the means for the middle/junior high teachers (1.75), the high school teachers (1.94) and the K-12
Figure 14. Mean response of respondents for the use of text processing tools
Figure 15. Mean responses of respondents for the use of analytic and information tools
Table 10. Means, standard deviations and F-tests for respondents' use of text processing tools

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>911</td>
<td>2.06</td>
<td>.58</td>
<td>8.20</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>405</td>
<td>2.05</td>
<td>.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>512</td>
<td>2.17</td>
<td>.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>2.42</td>
<td>.57</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Scheffe' test indicates significant difference between groups 3 & 1, 3 & 2, 4 & 1 and 4 & 2 at .05.

teachers (2.01) (Table 11). This indicated that elementary teachers were using analytical and informational tools significantly less than all other grade levels. Also, the means for the middle/junior high teachers was significantly lower than the means for the high school teachers. Therefore, middle/junior high teachers were using analytical and informational tool significantly less than high school teachers.

Teachers' average response for the use of telecommunication/distance learning was 1.49; this indicated teachers' average responses were between do not use at all/no desire to use and would like to use. The higher average responses for individual items were for the use of teacher bulletin boards (1.65), the use of student bulletin boards (1.61), and the use of curriculum based bulletin boards (1.60). Over fifty-five percent of the respondents indicated the do not use or have no desire to use telecommunications within the school, telecommunication within the school district, telecommunications within the state, and telecommunication out of the state. Only one significant difference
Table 11. Means, standard deviations and F-tests for respondents' use of analytic and information tools

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>902</td>
<td>1.56</td>
<td>.55</td>
<td>45.78</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>404</td>
<td>1.75</td>
<td>.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>507</td>
<td>1.94</td>
<td>.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>2.01</td>
<td>.62</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Scheffe' test indicates significant difference between groups 2 & 1, 3 & 1, 3 & 2 and 4 & 1 at .05.

between grade level groups was found; the mean for high school teachers in using telecommunication/distance learning applications was significantly greater than the mean for elementary teachers. Thus, high school teachers were using telecommunication/distance learning applications significantly more than elementary teachers. Table 12 presents the means of the grade level groups for respondents' use of telecommunication/distance learning applications.

Table 12. Means, standard deviations and F-tests for respondents' use of telecommunication/distance learning applications

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>896</td>
<td>1.46</td>
<td>.43</td>
<td>4.56</td>
<td>.0034*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>400</td>
<td>1.53</td>
<td>.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>505</td>
<td>1.53</td>
<td>.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>35</td>
<td>1.62</td>
<td>.51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Scheffe' test indicates significant difference between groups 3 & 1 at .05.
As indicated earlier, the teachers' average response to graphics and creative arts tools was 1.48 which would be between do not use at all/no desire to use and would like to use. The highest average response was 1.82 for ready made graphics. The Scheffe' test indicated that the mean for the K-12 teachers (1.86) was significantly greater than the means for elementary teachers (1.47), the middle/junior high teachers (1.45), and the high school teachers (1.51) (Table 13).

Table 13. Means, standard deviations and F-tests for respondents' use of graphics and creative arts tools

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>907</td>
<td>1.47</td>
<td>.43</td>
<td>9.44</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>403</td>
<td>1.45</td>
<td>.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>505</td>
<td>1.51</td>
<td>.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>1.86</td>
<td>.46</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Scheffe' test indicates significant difference between groups 4 & 1, 4 & 2, and 4 & 3 at .05.

Teachers' average response for the use of multimedia in their classroom or computer labs was 1.38. Teachers' average responses ranked closer to not knowing what multimedia applications were than to having no interest in using these applications in their classrooms or computer labs. Average responses for individual multimedia items were videodisc (1.48), video overlay (1.41), CD ROM (1.37), and robotics (1.32) (Figure 16). The means for multimedia use for the elementary teachers (1.31) was significantly lower than the means for the middle/junior high teachers (1.40), the high school teachers (1.47), and the K-12
Figure 16. Mean responses of respondents for the use of multimedia applications.
117

teachers (1.78) (Table 14). This indicates that elementary teachers use multimedia applications significantly less than teachers at all other grade levels. Also, the mean for the K-12 teachers was significantly higher than the means for the middle/junior high teachers and the high school teachers.

Table 14. Means, standard deviations and F-tests for respondents' use of multimedia applications

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>869</td>
<td>1.31</td>
<td>.44</td>
<td>22.01</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>399</td>
<td>1.40</td>
<td>.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>502</td>
<td>1.47</td>
<td>.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>35</td>
<td>1.78</td>
<td>.55</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Scheffe' test indicates significant difference between groups 2 & 1, 3 & 1, 4 & 1, 4 & 2, and 4 & 3 at .05.

The lowest teachers' average response for the use of computer-related technology applications was 1.30 for programming. The highest average response was 1.67 for BASIC. Over seventy-percent of the respondents indicated that they do not use or have no desire to use Logo, Pascal, Fortran or Hypertalk. The reported mean for K-12 teachers was significantly greater than the means for elementary teachers and middle/junior high teachers. Table 15 shows the means of the grade level groups for the use of programming applications.
Table 15. Means, standard deviations and F-tests for respondents' use of programming

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>882</td>
<td>1.28</td>
<td>.40</td>
<td>6.10</td>
<td>.0004*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>400</td>
<td>1.28</td>
<td>.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>502</td>
<td>1.34</td>
<td>.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>35</td>
<td>1.54</td>
<td>.46</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05.
Scheffe' test indicates significant difference between groups 4 & 1 and 4 & 2 at .05.

**Instructional uses of computer-related technologies: Research question 13**

The thirteenth research question was stated as follows: How frequently do teachers use computer-related technologies for instruction?

Twenty items on the survey asked teachers to indicate how frequently they used computer-related technology applications in their classroom or computer laboratory. The likert scale for these twenty items was as follows: 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 ten times a year). Three frequency in use factors were identified from these twenty items using a rotated varimax factor analysis. These three factors were the frequency of use for computers for instruction (e.g. drill and practice, tutorials, whole class demonstration), the frequency of use of computer tool applications (e.g. word processors, databases, spreadsheets), and the frequency of use of newer computer-related technologies (e.g. telecommunications, interactive video, CD ROM).
The highest teachers' average response for the frequency in use factors was for using computers for instruction; the mean for this factor was 3.03. According to the likert scale used for these items, teachers' average response ranked closest to using computers for instruction sometimes (1-4 times a year) during the school year. The individual approaches that teachers indicated they used computers for were drill and practice (3.58), students to work in groups on the computer (3.32), tutorials (3.07), and word processing (3.05). Teachers used the computer for instruction less frequently for whole class instruction (2.56) and problem solving skills (2.67). The Scheffe' test indicated that the mean for the frequency of use for computers in instruction for elementary teachers was significantly greater than the means for the middle/junior high teachers and the high school teachers (Table 16). Thus, elementary teachers use the computer for instruction significantly more frequently than teachers at the other grade levels.

Table 16. Means, standard deviations and F-tests for the frequency for using computers for instruction

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>920</td>
<td>3.21</td>
<td>.81</td>
<td>28.79</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>409</td>
<td>2.82</td>
<td>.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>514</td>
<td>2.87</td>
<td>.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>2.98</td>
<td>1.07</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Scheffe' test indicates significant difference between groups 1 & 2 and 1 & 3 at .05.
Teachers' average response for the frequency of use of computer tool applications factor was 2.75; this average response indicated that teachers used computer tool applications between never and sometimes (1-4 times a year) in their classrooms or computer labs. Examining the responses to individual items for this factor revealed that the most frequently used computer tool applications were word processing (3.05) and managing student information (2.73). Spreadsheets (2.04), databases (2.09), and desktop publishing (2.16) were the computer tool applications that the respondents indicated they used less frequently. The mean response for the frequency of use of computer tool application factor for elementary teachers was 2.62, for middle/junior high teachers was 2.76, for high school teachers was 2.94, and for K-12 teachers was 3.09. Examining the means for this factor by grade level revealed that the means of the middle/junior high teachers, the high school teachers, and the K-12 teachers were significantly greater than the elementary teachers (Table 17). Thus, high school teachers, middle/junior high teachers, and K-12 teachers used computer tool applications significantly more frequently than elementary teachers.

The lowest teachers' average response for the frequency of use factors was for use of newer computer-related technologies; the average response for this frequency in use factor was 1.75. Over ninety-five percent of the respondents were not familiar with the terminology or had never used hypermedia applications, interactive videodisc systems, and telecommunications. The mean response for the frequency of use of newer computer-related technologies factor for elementary teachers was 1.66, the mean for middle/junior high teachers was 1.78, the mean for high school teachers was 1.88, and the mean for K-12 teachers was 1.99 (Table 18). The reported means for the middle/junior high teachers, the
Table 17. Means, standard deviations and F-tests for the frequency in using computer tool applications

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>919</td>
<td>2.62</td>
<td>.64</td>
<td>24.12</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>410</td>
<td>2.76</td>
<td>.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>514</td>
<td>2.94</td>
<td>.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>3.09</td>
<td>1.03</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Scheffe' test indicates significant difference between groups 2 & 1, 3 & 1, 3 & 2, and 4 & 1 at .05.

Table 18. Means, standard deviations and F-tests for the frequency in using newer computer-related technologies

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>914</td>
<td>1.66</td>
<td>.46</td>
<td>28.38</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>408</td>
<td>1.78</td>
<td>.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>509</td>
<td>1.88</td>
<td>.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>35</td>
<td>1.99</td>
<td>.69</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Scheffe' test indicates significant difference between groups 2 & 1, 3 & 1, 3 & 2, and 4 & 1 at .05.

high school teachers and the K-12 teachers were all significantly greater than the mean for the elementary teachers. Middle/junior high teachers, high school teachers, and K-12 teachers use newer computer-related technologies significantly more frequently in their classrooms or computer labs than elementary teachers. Also, the mean for the high school teachers was
significantly greater than the mean for the middle/junior high school teachers for this factor.

**Instructional uses of computer-related technologies: Research question 14**

The fourteenth research question was stated as follows: What barriers do teachers encounter when using computer-related technologies?

Teachers indicated the extent to which they believed twenty-three potential barriers affected their use of computer-related technologies in their building. All of the twenty-three barrier items were negatively stated. The likert scale for these twenty-three items was as follows: 1 = Strongly Disagree; 2 = Disagree; 3 = Undecided; 4 = Agree; 5 = Strongly Agree. Thus, a high average response indicated that a barrier existed for the respondents. Using a rotated varimax factor analysis, six barriers in the use of computer-related technology factors emerged from these twenty-three items: computer software, district level support, limited access to computer-related technologies, difficulty in using computer-related technologies, maintenance of computer-related technologies, teacher attitudes toward computer-related technologies.

The highest rated barrier in use factor, difficulty in using computer-related technologies, had an average response of 3.34. Thus, the teachers' average response was between undecided and agree. Also, this factor contained the highest rated individual response item (3.99), "I lack enough time to develop lessons that use computer-related technologies;" seventy-eight percent (78.1%) of the respondents agreed or strongly agreed with this statement. Fifty-nine percent (59.1%) of the teachers agreed or strongly agreed that they had difficulty scheduling computer time for their class. A one-way analysis of the grade level
means indicated there were no significant differences between the grade level groups (elementary, middle/junior high, high school, K-12) (Table 19).

Table 19. Means, standard deviations and F-tests for barrier in use due to difficulty in using computer-related technologies

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>915</td>
<td>3.36</td>
<td>.76</td>
<td>1.62</td>
<td>.1834</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>408</td>
<td>3.37</td>
<td>.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>512</td>
<td>3.32</td>
<td>.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>3.12</td>
<td>.82</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05. Scheffe' test indicates no significant difference between groups.

The average response for the limited access to computer-related technologies factor was 3.2; this indicated that the average responses were between undecided and agree. Sixty-eight percent (68.3%) of the respondents agreed or strongly agreed with the statement, "There are too few printers or other peripherals." Also, sixty-three percent (63.3%) of the respondents agreed or strongly agreed with the statement, "There are too few computers for the number of teachers needing access to them." Over fifty percent (51.5%) of the respondents disagreed or strongly disagreed that the computers they had access to have limited capabilities such as not enough memory or incompatible software. Table 20 shows there were no significant differences in the means between the grade level groups (elementary, middle/junior high, high school, K-12).
Table 20. Means, standard deviations and F-tests for barrier in use due to limited access to computer-related technologies

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>914</td>
<td>3.18</td>
<td>.91</td>
<td>2.59</td>
<td>.0513</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>409</td>
<td>3.31</td>
<td>.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>513</td>
<td>3.22</td>
<td>.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>3.08</td>
<td>.84</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* $p < .05$.
Scheffe' test indicates no significant difference between groups.

Teachers' average response for the district level support barrier was 2.90 which indicated teachers average response was close to undecided. More than sixty-five percent (65.6%) of the respondents disagreed or strongly disagreed with this statement, "There is poor administrative support or initiative from my school district." Table 21 shows there were no significant differences between the grade level groups (elementary, middle/junior high, high school, K-12).

Table 21. Means, standard deviations and F-tests for barrier in use due to inadequate district level support

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>912</td>
<td>2.86</td>
<td>.96</td>
<td>1.75</td>
<td>.1538</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>408</td>
<td>2.93</td>
<td>.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>511</td>
<td>2.94</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* $p < .05$.
Scheffe' test indicates no significant difference between groups.
The average teacher response for the computer software barrier was 2.68; this indicated that teachers' average response was between disagree and undecided. Sixty-four percent (64.0%) of the respondents disagreed or strongly disagreed that instructional computer software programs are too complicated for them to use. Slightly more than fifty-seven percent (57.3%) of the respondents disagreed or strongly disagreed with this statement, "The computer software available for me to use is of poor instructional quality." Forty percent (40.9%) of the respondents disagreed with the statement, "Most computer software programs are not adaptable for my particular classes or curriculum." The mean for the computer software barrier in use factor for elementary teachers (2.61) was significantly lower than the means for the middle/junior high teachers (2.75) and high school teachers (2.75) (Table 22). Thus, elementary teachers considered computer software less of a barrier in using computer-related technologies than middle/junior high teachers or high school teachers.

Table 22. Means, standard deviations and F-tests for barrier in use due to computer software

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>913</td>
<td>2.62</td>
<td>.73</td>
<td>6.10</td>
<td>.0004*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>409</td>
<td>2.75</td>
<td>.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>513</td>
<td>2.75</td>
<td>.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>2.73</td>
<td>.72</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05. Scheffe' test indicates significant difference between groups 3 & 1 and 2 & 1 at .05.
The average teacher response for the maintenance of computer-related technologies barrier factor was 2.67; this indicated that teachers' average response was between disagree and undecided. The average responses for individual items for this factor were 2.46 for not enough space in their building for computers, 2.61 for difficult to keep the hardware working, and 3.01 for not enough help for operating and maintaining computers. Table 23 presents the means of the grade level groups for the maintenance of computer-related technologies barrier factor. The mean for the computer maintenance barrier factor for elementary teachers (2.74) was significantly higher than the mean for the high school teachers (2.57). This indicated that elementary teachers believed that computer maintenance was less of a barrier in use of computer-related technologies than high school teachers.

Table 23. Means, standard deviations and F-tests for barrier in use due to the maintenance of computer-related technologies

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>915</td>
<td>2.74</td>
<td>.89</td>
<td>4.51</td>
<td>0.0037*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>409</td>
<td>2.68</td>
<td>.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>514</td>
<td>2.57</td>
<td>.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>2.70</td>
<td>.90</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Scheffe' test indicates significant difference between groups 1 & 3 at .05.

The lowest average response for a barrier factor was 2.20 for teacher attitudes toward computer-related technologies. Teachers' average responses were between undecided and disagree. Eighty percent (80.6%) of the teachers
disagreed or strongly disagreed with the statement, "I am not interested in using computer-related technologies." Only two percent (2.3%) of the respondents indicated that they had no doubts as to whether students were learning more or differently when computer-related technologies are used in instruction. Table 24 shows there was no significant difference between the grade level groups (elementary, middle/junior high, high school, K-12).

Table 24. Means, standard deviations and F-tests for barrier in use due to teacher attitude

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>911</td>
<td>2.20</td>
<td>.80</td>
<td>.87</td>
<td>.4562</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>408</td>
<td>2.20</td>
<td>.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>512</td>
<td>2.21</td>
<td>.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>35</td>
<td>1.99</td>
<td>.97</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Scheffe' test indicates no significant difference between groups.

Computer Inservice Education and Staff Development

The purpose of the fourth section of the survey was to ascertain if computer inservice opportunities were available for teachers, who provided the instruction for the inservice, what type of computer-related technology inservice would teachers like offered, if school districts' had technology plans, and if teachers had access to support for using computer-related technologies. Five research questions addressed this computer-related technology theme.
Computer inservice education and staff development: Research question 15

The fifteenth research question was stated as follows: Are computer inservices, workshops and/or courses available for teachers?

The majority of respondents (86.6%) reported that computer inservices, workshops and/or courses were available to teachers in their district and eighty percent (80.9%) had participated in a computer inservice, workshop and/or course. Although over half of the respondents (52.9%) believed the computer inservices offered were appropriate for their needs, fifty-five percent (55.0%) of the respondents believed there were not an adequate number of computer inservice opportunities available to teachers.

Computer inservice education and staff development: Research question 16

The sixteenth research question was stated as follows: How have computer inservices, workshops and/or courses been offered to teachers?

Respondents were requested to indicate how computer inservice programs had been offered, such as at their school on school time or by colleges and universities. The respondents were allowed to choose more than one of the listed responses or to write their own response. Computer courses or workshops offered through the Area Education Agency was the most frequently cited response (52.7%). Less than half of the respondents (48.1%) indicated that computer courses or workshops were offered by their school or district on teachers' own time. Thirty percent (30.7%) of the respondents reported that courses or workshops had been offered by colleges and universities and twenty-three percent (23.9%) reported that courses or workshops were offered at their school on school time. Only sixteen percent (16.1%) of the respondents had taken a course offered in their undergraduate
or graduate program. Figure 17 shows how computer inservice programs have been offered to teachers.

Computer inservice education and staff development: Research question 17

The seventeenth research question was stated as follows: Who provided the instruction for the computer inservices, workshops and/or courses available to teachers?

Over half of the respondents (58.5%) indicated the computer inservice programs were instructed by a teacher or a person within their district and forty-six percent (46.3%) of the respondents reported AEA consultants provided the instruction for the computer inservice programs. Thirty percent (30.1%) of the teachers responded that teachers or consultants outside of their school district provided the instruction for the computer inservice programs. Finally, twenty-five percent (25.7%) indicated that college or university personnel were the instructors responsible for the computer inservice programs. Figure 18 shows who provided the instruction for computer inservice programs offered teachers.

Computer inservice education and staff development: Research question 18

The eighteenth research question was stated as follows: What types of computer-related technology inservices would teachers like offered?

Computer based instruction (e.g. drill and practice, tutorials, simulations) was the type of inservice most frequently cited by sixty percent (60.3%) of the respondents. Fifty-nine percent (59.7%) of the respondents cited interest in an inservice on computer tools (e.g. word processor, database, spreadsheet). Slightly less than half of the respondents (49.5%) indicated an
Figure 17. How computer inservice programs have been offered to teachers

A = offered at school on school time
B = offered by district on school time
C = offered by school/district on own time
D = offered through AEA
E = offered by colleges or universities
F = offered in undergraduate/graduate program
G = conferences available
Figure 18. Personnel who provided the instruction for the computer inservice programs

A = teachers/personnel within district
B = teacher/consultant outside of district
C = AEA consultants
D = college or university personnel

58.5% 46.3% 30.1% 25.7%
interest in inservice instruction on the integration of computer-related
technologies into specific curriculum areas. One-third of the respondents
(33.6%) indicated they would like inservice instruction on
telecommunications/distance learning and twenty-three percent (23.6%) were
interested in an inservice on hypermedia (Figure 19).

The most preferred time for an inservice on computer-related
technologies, cited by forty percent (40.8%) of the respondents, was during an
inservice day. Twenty-four percent (24.2%) of the respondents indicated they
would prefer inservices during the school day and seventeen percent (17.0%)
preferred after school.

Computer inservice education and staff development: Research question 19

The nineteenth research question was stated as follows: Are teachers
aware if their district has a technology plan?

A total of sixty-one percent (61.0%) of the respondents indicated their
school district did not have a technology plan or they were not aware if a
technology plan existed for their district. Only thirty-nine percent (39%) of the
respondents reported they were aware of a technology plan for their school
district (Figure 20). Of the respondents who were aware that a technology plan
existed for their school district, twenty-one percent (21.0%) were involved in
the development of their district's technology plan and less than forty percent
(39.6%) of the respondents were aware of the content of the technology plan
for the curriculum they teach.
Figure 19. Type of computer-related technology inservice teachers would like offered

<table>
<thead>
<tr>
<th></th>
<th>A: computer based instruction</th>
<th>B: computer tools</th>
<th>C: telecommunications/distance learning</th>
<th>D: programming</th>
<th>E: hypermedia</th>
<th>F: computer hardware (troubleshooting)</th>
<th>G: integration into curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>60.3%</td>
<td>59.7%</td>
<td>33.6%</td>
<td>26.1%</td>
<td>23.6%</td>
<td>24.3%</td>
<td>49.5%</td>
</tr>
</tbody>
</table>
Computer inservice education and staff development: Research question 20

The twentieth research question was stated as follows: Do teachers have access to on-site support when using computer-related technologies?

Over half (55.1%) of the respondents indicated they had access to on-site support for the use and integration of computer-related technologies into the curriculum. The source of computer-related technology support most often cited by respondents (42.0%) was another teacher. Also, twenty-five percent (25.0%) of the respondents indicated they obtained support from school computer coordinators, twenty percent (20.8%) from Area Education Agency consultants, and ten percent (10.6%) from district computer coordinators. Less than ten percent (9.1%) of the respondents reported they received computer-related
technology support from an organized group of teachers within their school or district.

Teacher Attitudes Toward Computers and Computer-Related Technologies

The purpose of the final section of the survey was to assess teacher attitudes toward computers and computer-related technologies. There were twenty items on the survey that measured teachers' attitudes toward computers and computer-related technologies. The likert scale for these items was as follows: 1 = Strongly Disagree; 2 = Disagree; 3 = Undecided; 4 = Agree; 5 = Strongly Agree. Before the data were analyzed, the nine attitude items that were negatively worded were reversed scored (i.e. 1=5, 2=4, 4=2, and 5=1). The item numbers of the nine attitude items that were reversed scored were 1, 4, 5, 7, 11, 17, 18, 19, and 22. Three factors emerged from these twenty-three items: (1) teacher general attitude toward computer-related technologies; (2) teacher confidence toward using computer-related technologies; (3) and teacher attitude toward the necessity of computer-related technologies in education. The first attitude research question addressed teacher attitudes toward computers and computer-related technologies using the general attitude factor and the necessity of computer-related technologies in education factor. The second research question addressed teacher confidence toward using computers and computer-related technologies.

Teacher attitudes toward computers and computer-related technologies: Research question 21

The twenty-first research question was stated as follows: What are teachers' attitudes toward computers and computer-related technologies?
The average response for the general attitudes of teachers toward computers and computer-related technologies factor was 4.05, slightly higher than agree. The most positive response were for the statements, "Computer-related technologies are an important part of the future for improving the quality of education" and "I would like to improve my skills in the use of computer-related technologies;" the mean score for these two items were 4.30 and 4.29 respectively. Ninety percent (90.0%) of the respondents agreed or strongly agreed that computers were valuable tools that can be used to improve the quality of education. Over eighty-six percent (86.2%) of the respondents agreed or strongly agreed that they would like to use computer-related technologies more in their teaching. The lowest mean of an individual item for this factor was 3.70 for the statement, "My teaching is positively affected when using computer-related technologies." Table 25 shows that no significant difference between the grade level groups (elementary, middle/junior high, high school, K-12) was found.

Table 25. Means, standard deviations and F-tests for respondents' general attitudes toward computer-related technologies

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>919</td>
<td>4.04</td>
<td>.62</td>
<td>1.16</td>
<td>.3228</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>409</td>
<td>4.05</td>
<td>.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>515</td>
<td>4.04</td>
<td>.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>4.23</td>
<td>.62</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05.
Scheffe' test indicates no significant difference between groups.
The attitude factor, teacher attitude toward the necessity of computer-related technologies in education, had an average response of 4.24. Thus, the teachers' average response was between agree and strongly agree. The highest average response was 4.4 for the item, "Teachers need to know how to use the computer successfully;" ninety-one percent (91.0%) of the respondents agreed or strongly agreed with this statement. The average response of other individual items for this factor were 4.32 for computers are valuable in education because they can be used to teach more than one or two subjects, 4.25 for computers are useful for accessing and organizing information, and 4.24 for computer-related technologies are necessary luxuries in most school settings. Elementary teachers average response to the third attitude factor was 4.20, middle/junior high school teachers average response was 4.25, high school teachers average response was 4.29 and K-12 teachers average response was 4.38 (Table 26). The mean for elementary teachers was significantly lower than high school teachers.

Table 26. Means, standard deviations and F-tests for respondents' attitude toward the necessity of computer-related technologies in education

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>916</td>
<td>4.20</td>
<td>.56</td>
<td>3.57</td>
<td>.0136*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>409</td>
<td>4.25</td>
<td>.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>515</td>
<td>4.29</td>
<td>.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>4.38</td>
<td>.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* \( p < .05 \).
Scheffe' test indicates significant difference between groups 3 & 1 at .05.
Teacher attitudes toward computers and computer-related technologies: 
Research question 22

The twenty-second research question was stated as follows: Do teachers have confidence in their personal ability to use computers and computer-related technologies?

The average response for the teacher confidence toward using computer-related technologies factor was 3.6; this mean indicated that teachers rated their confidence in using computer-related technologies between undecided and agree. The highest average response was 4.00 for the item, "I think that computers make my professional work easier"; seventy-six percent (76.6%) of the respondents agreed or strongly agreed with this statement. The two least positive single responses were on the items, "I have confidence in using a computer to complete my work" and "It wasn't a struggle for me to learn how to use a computer successfully"; the average response for these two items were 3.06 and 3.14 respectively. Elementary teachers' average response to the confidence factor was 3.56, middle/junior high school teachers' average response was 3.66, high school teachers' average response was 3.68 and K-12 teachers average response was 3.92 (Table 27). The means reported for the high school teachers and K-12 teachers were significantly greater than the mean reported for the elementary teachers.

Summary

A large majority of Iowa teachers (97.6%) at all grade levels indicated that computers were available for instructional uses. Predominantly, Apple II family computers were the most available types of computers in schools; over eighty percent of the computers at all grade levels were Apple II family
Table 27. Means, standard deviations and F-tests for respondents' confidence toward using computer-related technologies

<table>
<thead>
<tr>
<th>Grade Level Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Elementary</td>
<td>919</td>
<td>3.56</td>
<td>.74</td>
<td>5.82</td>
<td>.0006*</td>
</tr>
<tr>
<td>2. Middle/Junior High</td>
<td>409</td>
<td>3.66</td>
<td>.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. High School</td>
<td>515</td>
<td>3.68</td>
<td>.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. K-12</td>
<td>36</td>
<td>3.92</td>
<td>.67</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Scheffe' test indicates significant difference between groups 3 & 1 and 4 & 1 at .05.

Results indicated that Iowa teachers were interested in using computer-related technology applications such as word processing and problem solving, however, Iowa teachers' proficiency in using and actual use of computer-related technology applications was not as high as their interest. Elementary teachers indicated they were more proficient and more interested in using computer based instructional applications (e.g. drill and practice, educational games, tutorials) than middle/junior high and high school teachers. Yet, middle/junior high and high school teachers indicated they were more proficient and more interested in using computer tool applications (e.g. word processing, databases, spreadsheets) than elementary teachers. Also, over half of the Iowa teachers indicated they were unfamiliar with newer computer-related technologies.

Overall, Iowa teachers had positive attitudes toward computers and computer-related technologies, but were less confident in their own ability to use computer-related technologies. The respondents indicated they were interested
in improving their skills in the use of computer-related technologies and thought that computer-related technologies were an important part of the future of education.
CHAPTER V. SUMMARY, DISCUSSION, AND RECOMMENDATIONS

This chapter begins with a brief summary of the entire study. The summary is followed a discussion of the results and recommendations to help plan for the use of computer-related technologies in Iowa schools.

Summary of the Results

Numerous designs and approaches for survey research have been used by researchers to assess the use of computer-related technologies by teachers (Becker, 1985, 1986, 1990; Kirby, Wilson & Smith-Gratto, 1988; Morgan, 1983; Riccobono, 1985; Schimizzi, 1983; Sheingold & Hadley, 1990). National and state surveys have described the accessibility of computer-related technologies, the instructional uses of computer-related technologies, teacher computer inservice opportunities and access to on-site support, and teacher attitudes toward computers and computer-related technologies.

Since 1981, there has been an increase in the number of computers in schools (Becker, 1985, 1986, 1990). By 1985, over ninety-four percent of the schools had computers available for instructional purposes (Hood et al., 1985). The type of computers most accessible in elementary and secondary schools were Apple II family computers. Becker (1990) reported that high schools were more likely to have powerful computers such as MS-DOS and Macintosh computers available for instructional use than elementary schools.

Although computers have become more accessible to teachers during the last decade, the number of other computer-related technologies have not increased as quickly. Less than ten percent of the K-12 schools across the nation
reported having newer computer-related technologies such as CD ROMs, modems, videodisc players, and optical scanners.

Instructional uses of computer-related technologies have steadily evolved over the last decade. During the first part of the 1980's, the instructional uses of computer-related technologies focused primarily on computer literacy, programming, and computer assisted instruction. As the decade progressed, different computer-related technology applications like word processing, databases and spreadsheets emerged and focused on the development of problem solving and information handling skills. These computer applications enabled teachers to employ the computer as a multipurpose tool used for a variety of classroom activities.

In 1988, there were still some K-12 teachers who had little or no computer inservice training (Office of Technology Assessment, 1988). By 1989, twenty-three states had required or recommended that preservice and inservice teachers acquire the necessary computer skills for the classroom (Bruder, 1989). In the past, teachers have often become discouraged and frustrated in using computer-related technologies because of the lack of computer inservice opportunities based on their needs and abilities and the lack of support given to teachers who use computer-related technologies in schools.

Overall, teachers' attitudes have remained positive toward the role of computers and computer-related technologies in education (Koohang, 1987; McCoy & Haggard, 1989; Stevens, 1983-84; "The Computer Report," 1989). Although teachers perceived computers as valuable instructional tools in schools in the future, teachers' confidence in their own abilities to use computer-related technologies is less positive (Bitter & Davis, 1985; Cox, Rhodes & Hall, 1988; Wright & Stone, 1983). Teachers who were more
confident in using computer-related technologies were more likely to use these technologies for instruction than teachers who were less confident (Koohang, 1987).

The purpose of this study was to assess the current state of computer-related technology use by K-12 teachers throughout Iowa. Data were collected from 1,934 K-12 Iowa teachers that described their responses to four major areas of computer-related technologies: (1) accessibility of computer-related technologies; (2) instructional uses of computer-related technologies; (3) computer inservice education and staff development; and (4) teacher attitudes toward computer-related technologies.

The "Iowa Survey of Computer-Related Technology Use by K-12 Teachers" was developed to assess the four major areas of computer-related technology identified by the researcher. Section one of the survey was designed to obtain descriptive background information about the respondents. The purpose of section two was to gather information about teachers' accessibility to computer-related technologies in schools and at home. Section three was organized into five parts; each of these five parts obtained specific information about teachers' instructional uses of computer-related technologies in schools. The purpose of section four was to gather information about the computer-related technology inservice opportunities and support provided for teachers. Teachers' attitudes toward and confidence in using computer-related technologies were assessed in section five of the survey. The survey contained 172 items that were directly related to one of the twenty-two research questions. A copy of the "Iowa Survey of Computer-Related Technology Use by K-12 Teachers" and a cover letter were sent to 3,001 K-12 teachers in April of 1991. Sixty-four percent of the respondents returned the survey. Results were
analyzed using the SPSSX procedures for descriptive statistics, chi-square, one-way analysis of variance, and scheffe' test.

Accessibility of computer-related technologies

A majority of the respondents (97.0%) at all levels (elementary, middle/junior high, high school) indicated that computers were accessible to them for instructional uses in their building. Less than thirty percent (29.1%) of the respondents, however, indicated that computers designated specifically for teacher use were available in their schools. Over eighty percent of the respondents at all levels reported that the type of computer most available for instruction in their building was an Apple II family computer. Results indicated that Macintosh and MS-DOS computers were more accessible to high school teachers. The two computer locations most often cited by respondents were computer laboratories (66.3%) and classrooms (65.5%). Elementary schools were more likely to place computers in classrooms, but the computers in middle/junior high and high schools were more likely to be in computer laboratories.

Almost sixty percent (59.1%) of the respondents indicated that their district allowed them to check out a computer from school to use at home. Of the respondents who indicated they were allowed to check out a school computer, more than half (56.4%) had taken a computer home from school. Thirty-five percent (35.7%) of the total sample already had a computer at home to use.

Computer-related technologies that were most accessible to teachers were video cassette recorders (91.1%), dot matrix printers (90.3%), and video cameras
Teachers reported they had little access to newer technologies such as modems, CD ROMs, LCDs, videodisc players and scanners.

**Instructional uses of computer-related technologies**

Iowa teachers' were asked to rate their proficiency in using computer-related technology applications using the following likert scale: 1 = Unfamiliar - do not know what item is, 2 = Low - little or no skill, 3 = Medium - some proficiency, 4 = High - very proficient. Teachers' average response for their proficiency in using computer based instructional applications (e.g. drill and practice, tutorials, educational games, simulation) was 2.57, their proficiency in using computer tool software applications (e.g. word processing, databases, spreadsheets) was 2.19, and their proficiency in using other computer-related technology applications (e.g. telecommunications, programming, hypermedia) was 1.55. According to the likert scale used, teachers rated their proficiency in using computer-based instructional applications and computer tool software applications between little or no skill and some proficiency in using the applications. Teachers' rated their proficiency in using other computer-related applications between unfamiliar with the applications and little or no skill using the applications. The highest rated individual items for these three categories were word processing programs (3.04), educational games (2.96), and drill and practice programs (2.94). The lowest rated individual items for the proficiency in use section were hypermedia (1.32), CD ROM (1.36), and telecommunications (1.43). Elementary teachers' mean was significantly higher than middle/junior high and high school teachers for proficiency in using computer based instructional applications, but significantly lower than those
two groups of teachers for proficiency in using computer tool software applications and other computer-related technology applications.

Overall, respondents indicated they were interested in using the majority of computer-related technology applications listed on the survey in their classrooms and computer laboratories. Respondents rated their interest in using computer-related technology applications using the following likert scale: 1 = Unfamiliar - do not know what item is, 2 = Low - no interest, 3 = Medium - some interest, and 4 = High - very interested. Teachers expressed the highest interest in using word processing (3.31), problem solving (3.27), and drill and practice (3.15). These mean responses indicated that teachers were between having some interest in using these applications and being very interested in using these applications in their classrooms or computer laboratories. The individual applications teachers expressed the least interest in using were hypermedia (1.81), CD ROM (1.83), and telecommunications (2.08). Teachers mean responses might have been low because between forty and fifty-five percent of them were unfamiliar with those particular applications. The teachers' average response for their interest in using computer based instructional applications was 3.09, their interest in using computer tool applications was 2.68, and their interest in using other computer-related technology applications was 2.06.

Respondents were asked to describe their use of computer-related technology applications using the following likert-type scale: 1 = Do not use at all/No desire to use, 2 = Would like to use, and 3 = Currently use. Teachers' average response to their use of computer based instructional applications was 2.12, computer tool applications was 1.70, telecommunication/distance learning applications was 1.49, multimedia was 1.38, and programming was 1.30. Only
the computer based instructional applications were rated between would like to use and currently use; all of the other categories of applications were rated between do not use at all/no desire to use and would like to use. The individual applications that Iowa teachers rated the highest were word processing programs 2.42, educational games 2.38, and drill and practice programs 2.34. The individual applications rated the lowest by teachers were programming and hypermedia.

The following likert scale was used to assess how frequently teachers used computer-related technologies: 1 = Not familiar with the terminology, 2 = Never, 3 = Sometimes (1-4 times a year), 4 = Often (5-10 times a year), and 5 = Very often (more than ten times a year). The average responses for the most frequently used computer-related technology applications were drill and practice programs 3.58, tutorials 3.07, and word processing programs 3.05. Teachers' average responses for these computer-related technology applications indicated teachers were using them between sometimes (1-4 times a year) and often (5-10 times a year). Also, teachers indicated that they provided opportunities for their students to work on the computer in groups in the classroom or computer laboratory; the average response for this individual item was 3.32. Teachers' average responses for the frequency in using hypermedia (1.64), CD ROM applications (1.68), and interactive videodisc systems (1.74) were between not familiar with this terminology and never. Examining the means by grade level for these categories revealed that high school teachers and middle/junior high teachers used computer tool applications (e.g. word processing, databases, spreadsheets) and newer technologies (e.g. hypermedia, telecommunications) significantly more than elementary teachers. However, elementary teachers
used computer based instructional applications significantly more than middle/junior high or high school teachers.

Teachers expressed that the most significant barrier in using computer-related technologies was their lack of time to develop lessons that use these technologies. Also, they thought there were too few peripherals accessible in their schools. Respondents indicated that administrative support in using computer-related technologies and the accessibility of computer software were not barriers to their use of computer-related technologies.

Computer inservice education and staff development

Eighty-six percent (86.6%) of the respondents indicated that computer inservices, workshops and/or courses were available to teachers in their district. Slightly more than eighty percent (80.9%) of the respondents had participated in a computer inservice opportunity. Fifty-five percent (55.0%) of the respondents thought there were not an adequate number of computer inservices while fifty-two percent (52.9%) of the respondents believed that the computer inservices offered were appropriate for their specific needs.

Over half (52.7%) of the respondents indicated that computer courses or workshops available to teachers in their district were offered through the Area Education Agency. Other computer inservice opportunities offered for teachers included computer courses or workshops offered by their school or district on the teachers' own time (48.1%), courses or workshops offered by colleges and universities (30.7%), and courses offered in their undergraduate or graduate program (16.1%). Almost sixty percent (58.5%) of the respondents indicated the computer inservice programs were instructed by a person within their own
district and forty-six percent (46.3%) reported that AEA consultants provided the instruction.

Sixty percent (60.3%) of the respondents indicated they would like inservices offered on computer based instructional applications (e.g. drill and practice, tutorials, simulations). Slightly less than sixty percent (59.7%) of the respondents expressed interest in computer inservices on computer tool applications (e.g. word processor, database, spreadsheet). Almost half of the respondents (49.5%) indicated an interest in learning how to integrate computer-related technologies into specific curriculum areas. Fewer respondents expressed interest in computer inservices on telecommunications/distance learning (33.6%) and hypermedia (23.6%).

Fifty-five percent (55.1%) of the respondents indicated they had access to on-site support for the use of computer-related technologies in their classroom or computer laboratory. The most frequent source of computer-related technology support, cited by forty-two percent (42.0%) of the respondents, was support from another teacher.

The majority of respondents (81.8%) indicated that their school district did not have a technology plan or they were not aware if a technology plan existed for their district. Of the eighteen percent (18.2%) of the respondents who indicated they were aware of a district technology plan, twenty-four percent (24.9%) of them were involved in the development of the technology plan and less than half (46.1%) were aware of the content of the technology plan for the curriculum they teach.
Teacher attitudes toward computers and computer-related technologies

Respondents indicated their attitude and confidence toward computers and computer-related technologies using the following likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, and 5 = Strongly Agree. Three attitude factors emerged from the twenty-three attitude items using a rotated varimax factor analysis. Teachers' average responses for the three attitude factors were: teacher attitude toward the necessity of computer-related technologies in education (4.24), general attitude of teachers toward computers and computer-related technologies (4.05), and teacher confidence toward using computer-related technologies (3.6). The highest rated teacher response was 4.4 for the item, "Teachers need to know how to use the computer successfully"; over ninety percent (91.0%) of the respondents agreed or strongly agreed with this statement. The lowest rated teacher response was 3.06 for the item, "I have confidence in my ability to use a computer to complete my work."

On the necessity of computer-related technologies in education factor, the mean response for high school teachers (4.29) was significantly higher than elementary teachers (4.20). The means reported for high school (3.92) and K-12 teachers (3.68) for the teacher confidence toward using computer-related technologies factor were significantly greater than the mean reported for elementary teachers (3.56). There were no significant difference reported by the grade level groups (elementary, middle/junior high, high school, K-12) for the general attitudes of teachers toward computers and computer-related technologies factor.
Discussion of the Results

The results of the four major computer-related themes will be covered in the survey will be discussed below. The discussion will include the following four sections: (1) accessibility to computer-related technologies, (2) instructional uses of computer-related technologies, (3) computer inservice education and staff development, and (4) teacher attitudes toward computer-related technologies.

Accessibility of computer-related technologies

Results from this research study indicated that 97.6% of the teachers surveyed at all levels had computers available for instructional use in their buildings. In 1983, eighty nine percent of Iowa schools had computers (Jarchow & Hunter, 1983), by 1991 that figure increased to ninety-seven percent. It seems Iowa schools have acquired computers at a rate in line with schools across the nation. National assessments reported that 95% of the schools nationwide had computers available for instruction by 1987.

The type of computers most accessible for instructional purposes in Iowa schools were Apple II+, IIe, IIc or II GS computers; over eighty percent of the teachers at all levels (elementary, middle/junior high, high school) indicated Apple II family computers were in their buildings. Although a small percentage of MS-DOS and Macintosh computers were reported in the schools, the majority of the MS-DOS and Macintosh computers were in the high schools. Becker (1990) stated that "the Apple II computer continues to dominate the installed base of school computers, particularly in the elementary schools" (p. 7). Results from Becker's 1989 Computers in Education Survey indicated that more than 80% of the elementary schools and the high schools had at least one Apple II
computer. A result similar to the findings reported in this study. Also, Becker noted that Apple II computers constituted 75% of all the computers in K-6 schools. Based on Becker's national findings, elementary teachers in Iowa have more (96.5%) Apple II family computers in their buildings than what has been reported by other schools across the nation. A majority of high school teachers (80.4%) also reported that the type of computer most accessible to them for instruction was an Apple II type. Less than ten percent of the computers accessible to high school teachers were MS-DOS or Macintosh computers; Becker (1990) reported that 30% of all computers in high schools were MS-DOS computers. Clearly, the installed base of computers in Iowa schools are Apple II family computers. Thus, it appears Iowa teachers are subjected to using older generation computers that may have limited capabilities that may impede future uses of advanced technological applications.

Computers within Iowa schools are housed in a variety of locations. Those locations cited most often by respondents were in computer laboratories (66.3%), in classrooms (65.5%) in the school media centers (48.5%), and on a portable carts (40.9%). Of the respondents who indicated computers were located in laboratories in their buildings, 35.4% were elementary teachers and 35.2% were high school teachers. Becker (1990) stated that 40% of K-6 elementary schools' computers were in computer laboratories compared to 56% of high school computers. In Iowa, computers in classrooms were more likely to be located in elementary schools than in classrooms at any other level; fifty-two percent (52.9%) of the respondents who indicated computers were located in classrooms were elementary teachers. The location of computers cited most often by middle/junior high school and high school teachers was in a computer laboratories.
The majority of Iowa teachers indicated that newer computer-related technologies such as modems, CD ROMs, and videodisc players were not accessible to them in their buildings. Although fifteen percent (15.9%) of the Iowa teachers reported that modems were in their schools, approximately ninety percent indicated additional computer-related technologies were not accessible in their buildings. Ten percent or less of the respondents had access to CD ROMs (10.7%), telecommunications (9.8), liquid crystal diodes (9.1%), videodisc players (7.4%), and still video cameras (7.3%). One factor limiting the use of newer computer-related technologies may be the preponderance of Apple II family computers in Iowa schools. Apple II family computers have limited capabilities and may be inefficient to accommodate the needs of the teachers; the more powerful computers, such as MS-DOS and Macintosh, may be required to utilize the capabilities of these newer computer-related technologies.

Iowa teachers reported a smaller number of computers designated specifically for teacher use were available in schools than the Minnesota teachers who responded to the Minnesota Computer Usage Survey. Only twenty-nine percent (29.1%) of Iowa teachers indicated they had computers designated solely for teacher use in their building, whereas forty-seven percent (47.4%) of the Minnesota teachers had access to computers for teacher use only. In most classroom environments, teachers are expected to use computers, yet these findings indicate that most teachers throughout Iowa have not been provided with the necessary tools for this to occur.

Some Iowa schools have programs that allow teachers to check out a computer from school to use at home. Almost sixty percent (59.1%) of the teachers indicated that their schools allowed them to check out computers to use at home, however, slightly more than one half (56.4%) of the respondents
indicated they had taken a computer home. School districts have attempted to increase the accessibility of computers for teachers by implementing school computer check out programs. It appears that Iowa teachers have taken some advantage of the opportunity these programs have offered.

Most Iowa teachers do not have computers at home. Over one-third (36.3%) of the respondents indicated they had a computer at home. In 1983, Jarchow reported that 13% of Iowa teachers had computers at home. Thus, comparisons between these findings indicated that twenty percent more Iowa teachers have computers at home in 1991 than in 1983.

Respondents indicated that the most common computer type in their homes was an Apple II family computer. Also, the majority of Minnesota teachers indicated they owned an Apple II type computer (Minnesota Department of Education, 1989). The type of computer respondents had in their homes reflected the computer type most commonly found in schools. It appears that teachers are choosing to buy home computers similar to those computers found in schools.

**Instructional uses of computer-related technologies**

In the "Iowa Survey of Computer-Related Technology Use by K-12 Teachers," respondents were asked to rate their proficiency in using, their interest in using, and their current use of computer-related technology applications. The computer-related technology application teachers considered themselves most proficient in using was word processing (3.01). Using a five point scale, teachers rated their proficiency in using word processing almost one point higher than in using databases, spreadsheets, or desktop publishing. With the exception of word processing, educational games, drill and practice
programs, and tutorials, most teachers rated their proficiency in using other
computer-related applications as low. Respondents indicated they were
unfamiliar with the newer computer-related technology applications
(hypermedia, telecommunications, CD ROM). Elementary teachers rated their
proficiency skills in using computer tool applications (e.g. word processing,
database, spreadsheets) significantly lower than high school or middle/school
teachers; however, they rated their proficiency in using computer based
instructional applications (e.g. educational games, drill and practice programs,
simulations) significantly higher than high school or middle/junior high
school teachers. These findings reflect national grade level usage patterns
(Becker, 1990); elementary teachers use computer based instructional
applications more than secondary teachers and elementary teachers use
computer tool applications less than secondary teachers.

Overall, respondents expressed at least some interest in using most of the
computer-related technology applications listed on the survey in their
classrooms or computer laboratories. Except for spreadsheets, graphing utilities,
telecommunications/distance learning, hypermedia and CD ROM applications,
the majority of teachers expressed that they had some interest or were very
interested in using computer-related technology applications in their
classrooms or computer laboratories. Teachers expressed the most interest in
using word processing programs (3.30), problem solving applications (3.27), and
educational games (3.21). By examining the means of the interest in using
computer based instructional applications and teachers' proficiency in using
these applications, teachers have more interest than proficiency in using
computer based instructional applications. It is important to note that the two
computer-related technology applications that teachers' rated themselves as
most proficient in using, word processing programs and educational games, were also the applications respondents were most interested in using in their classrooms or computer labs. It appears that teachers are most interested in using computer-related technology applications that they have some proficiency in using already. Elementary teachers were significantly more interested in using computer based instructional applications than all other grade level groups, but they were significantly less interested in using other computer-related technology applications (e.g. telecommunications, hypermedia and CD ROM) than secondary teachers. High school and K-12 teachers were significantly more interested in using computer tool applications than elementary teachers.

In general, Iowa teachers do not have a varied repertoire for current computer use in their classrooms or computer labs. Word processing is currently being used by 56.8% of the respondents, educational games by 55.9% of the respondents, and drill and practice programs by 55.3% of the respondents. Except for tutorials (37.9%), less than one-third of the respondents reported they were currently using any of the other computer-related technology applications that were listed on the survey. Again, examining the means of the interest in using computer-related technology applications and the use of these applications, teachers indicated they are more interested in using these applications than actually using the applications in their classrooms. Unlike the typical Iowa teacher, accomplished computer-using teachers across the nation used a number of computer applications in their classrooms (Sheingold & Hadley, 1990). These experienced computer-using teachers average between 14 and 15 different instructional uses for computer-related technology applications.
Respondents indicated they would like to use other computer based instructional applications that they were not currently using such as problem solving programs and simulations and computer tool applications such as desktop publishing, writing tools, databases and spreadsheets. It appears that Iowa teachers are aware of the importance of teaching problem solving and information handling skills in their classrooms, but continue to use rote drill and practice computer programs. Results suggested that teachers need the opportunity to learn how to use problem solving and information handling computer applications.

Although the average response for the use of telecommunications or distance learning was 1.49, over fifty percent of the respondents indicated they would like to use teacher bulletin boards, student bulletin boards, and curriculum based bulletin boards. Over fifty-five percent of teachers indicated they did not use or had no desire to use the other telecommunication applications listed on the survey (e.g. online databases, telecommunication within the school, telecommunication out of state). Necessary computer-related technologies to support telecommunication applications were not accessible to teachers in schools. As stated earlier, only 15% of the respondents indicated they had access modems in their building.

Results from the proficiency in use of computer-related technologies and interest in use of computer-related technologies sections indicated that respondents were unfamiliar with the newer computer-related technologies such as interactive video and CD ROM applications. Respondents average response concerning the use of multimedia was 1.38. Conclusions drawn from these findings indicate that teachers are not using these newer computer-related technologies because they are not familiar with their capabilities and they do not
have access to these technologies in their schools. Iowa teachers' interest in using newer computer-related technologies was quite different from that expressed by the accomplished computer-using teachers. According to Sheingold and Hadley (1990), accomplished computer-using teachers were aware of newer computer-related technologies and were interested in using these technologies even though the technologies may not be accessible in their schools.

It should be noted that the majority of teachers indicated they did not use or desire to use any of the programming applications listed on the survey (e.g. Logo, BASIC, Fortran). Becker (1990) indicated that computer programming had reached a plateau in use and that computer coordinators had reported a decline in the use of programming in schools between 1987 and 1989. It appears that Iowa teachers have followed that trend.

Results from this research study indicated that Iowa teachers have made infrequent use of computer-related technologies in their classrooms or computer laboratories. All the average responses for the three frequency use factors were between never and sometimes (1-4 times a year). Examining the responses to individual items revealed that the respondents indicated they most frequently used drill and practice programs (3.58), computers for student group work (3.32), tutorials (3.07), and word processing (3.05). Even though a greater percentage of the respondents indicated they used word processing in their classrooms, results show teachers continued to use drill and practice programs more frequently than word processing programs. A different profile for frequency of use emerged from the survey by Sheingold and Hadley (1990). Although the three most frequently used computer applications mentioned by the accomplished computer-using teachers were similar to the applications cited
by Iowa teachers, word processing emerged as the most frequently used application followed by drill and practice and tutorial programs.

Iowa teachers stated that the most significant barrier in using computer-related technologies was their lack of time to develop lessons that used these technologies. Time to use computer-related technologies has been the highest rated barrier cited by respondents in other surveys (Beaver, 1987; Becker, 1990; Sheingold & Hadley, 1990). Other frequently mentioned barriers by Iowa respondents included too few peripherals, too few computers and problems scheduling computer time for their class. Poor administrative support and teachers' interest in using computer-related technologies were not perceived has potential barriers by the respondents in their use of these technologies.

The barrier section of the Iowa survey was adapted from "A National Survey on the Integration of Computers into Schools: Teachers' Current Practices and Experiences" (Sheingold & Hadley, 1990). A rotated varimax factor analysis was run on the barrier items of the Iowa survey. The six barrier factors that emerged from this factor analysis were: computer software, district level support, limited access to computer-related technologies, difficulty in using computer-related technologies, maintenance of computer-related technologies, and teacher attitudes toward computer-related technologies. Sheingold and Hadley (1990) had identified the following four barrier categories on their national survey: hardware, software, instruction and teacher experience, and organization or administration. Results for the Iowa survey were analyzed using the aforementioned six barrier categories. The two barrier factors with the highest mean were difficulty in using computer-related technologies (3.34) and limited access to computer-related technologies (3.2). The respondents indicated
that these two factors had the most potential to limit their use of computer-related technologies.

**Computer inservice education and staff development**

The majority of respondents (86.6%) indicated that computer inservices, workshops and/or courses were available to teachers in their district. Most of the national and state surveys reported that computer inservice opportunities were available to fifty-five percent to eighty-five percent of the teachers (Anderson & Smith, 1984; Minnesota Department of Education, 1989; Morgan, 1983; Schimizzi, 1983; Winkler & Stasz, 1985). Even though eighty percent (80.9%) of the respondents indicated they had participated in a computer inservice workshop or course, only fifty-two percent (52.9%) of the respondents thought the computer inservices offered were appropriate for their specific needs. Thus, the computer inservice workshops and/or courses that have been offered may not have met enough teachers' expectations and needs.

Respondents expressed interest in participating in computer inservices offered on various computer-related technology topics. The respondents were most interested that inservices be offered on computer based instructional applications and computer tool applications; yet, teachers had previously indicated they were the most proficient with computer based and computer tool applications and were using these applications most frequently in their classrooms or computer laboratories. It appears that teachers would like inservices for more advanced training in the use of these applications because they have become comfortable in using these computer applications. Almost half of the respondents (49.5%) indicated they were interested in learning how to integrate computer-related technologies into specific curriculum areas. Thus,
some teachers may be interested in using the computer as a multipurpose tool throughout the curriculum, rather than an isolated tool serving a single need. Even though respondents indicated they were unfamiliar with many of the newer computer-related technologies, they expressed some interest in computer inservices on the newer technologies such as telecommunications/distance learning (33.6%) and hypermedia (23.6%).

In 1983, 901 Iowa teachers were asked to rate how beneficial inservice sessions on computer-related topics would be for them using a 5 point likert scale (Jarchow & Hunter, 1983). Teachers reported that the most beneficial inservice sessions would be on integrating computer activities into the classroom, programming, choosing appropriate software, using computer managed instructional programs and learning word processing. Although some of the suggested inservice topics were different in the 1983 Iowa study and this one, trends have emerged that described what inservice topics teachers think should be covered for computer inservices. Teachers continued to express interest in learning how to integrate the computer throughout the curriculum. Possibly, this continued interest implies that computer inservices that have been offered have not effectively modeled how computer-related technologies can be infused into the curriculum by teachers. Since 1983, computer tool applications have emerged as inservice topics that teachers have become more interested in learning how to use. Teachers' interest in learning programming appears to have declined over the years.

Over half (52.7%) of the respondents indicated that Area Education Agencies have offered computer inservice programs for teachers and almost fifty percent (48.1%) indicated computer courses or workshops had been offered by their school or district. In Iowa, Area Education Agencies and schools have
been actively involved in providing computer workshops or courses for teachers. This involvement of Area Education Agencies and schools was also disclosed in items addressing who provided the computer inservice instruction. Almost sixty percent (58.5%) of the respondents indicated the computer inservice programs were instructed by a person within their own district and forty-six percent (46.3%) reported that AEA consultants provided the instruction.

Fifty-five percent (55.1%) of the respondents reported they had access to on-site support for the use of computer-related technologies. According to findings from other national and state surveys, Iowa teachers have less support available to them for the use of computer-related technologies. The Minnesota Department of Education (1989) reported that ninety-one percent of the teachers had access to on-site support; Sheingold and Hadley (1990) reported that seventy-seven percent of the teachers had access to on-site support, and Winkler and Stasz (1985) reported sixty-six percent of the teachers had access to on-site support. Another teacher was cited most often by Iowa respondents as the source of the computer-related technology support.

Findings from this study indicated that the majority of respondents (81.8%) believed that their school district did not have a technology plan or were not aware that a plan existed for their district. The Iowa Department of Education mandated that all Iowa school districts were to have a technology plan by July of 1989. Thus, individuals in each school district involved in the development of the district technology plan have yet to fully implement this plan in their districts because so few teachers are aware of its existence.
Teacher attitude toward computers and computer-related technologies

Overall, the attitude of Iowa teachers toward computers and computer-related technologies is positive. Teachers consider computer-related technologies as an important part of the future for improving the quality of education. The respondents think that computer-related technologies could be used across the curriculum, used for accessing and organizing information, and were necessities in most school settings. Over ninety percent (91.0%) of the respondents indicated that teachers need to know how to use a computer successfully. Teachers' attitudes were positive toward improving their own skills in using computer-related technologies and would like to use computer-related technologies more in their teaching. Although there were no significant differences between grade level groups on their general attitude toward computers and computer-related technologies, the mean for teacher attitude toward the necessity of computer-related technologies in education for high school teachers was significantly higher than elementary teachers.

Teachers were, however, less confident about their own ability to use computer-related technologies than their general attitude toward computer-related technologies. The lowest single response of the twenty-three attitude questions was 3.06 for the item "I have confidence in using a computer to complete my work." High school and K-12 teachers were significantly more confident in their own abilities to use computer-related technologies than elementary teachers.
Recommendations

The purpose of this research study was to assess the use of computer-related technologies by K-12 teachers in Iowa. Through the analysis of the data from this study, new directions and plans for the future use of computer-related technologies in Iowa schools may be defined. Several recommendations emerge that should help to plan for the effective and efficient use of computer-related technologies in Iowa schools.

The first recommendation is to make strong efforts to insure that teachers have access to newer computer-related technologies such as more powerful computers, modems, videodisc players, and CD ROMs. Access should include stations specifically designed for teacher use. Results from the Iowa survey indicated that a large majority of school computers, over eighty percent, were Apple II family computers. Also, less than 15% of the teachers reported they had access to the newer computer-related technologies. It is possible that by providing newer computer-related technologies for teachers to use, schools and districts may ensure that teachers will have the adequate tools necessary to create active learning environments that promote the ability to think critically, communicate effectively, and solve problems efficiently.

The second recommendation is to create an awareness among teachers of what types of newer computer-related technologies and applications are available and how they might be applied throughout the curriculum. In general, Iowa teachers expressed interest in learning about the newer computer-related technologies and applications, therefore opportunities must be provided for teachers to learn how to use these technologies. Staff development programs must be developed that provide teachers with hands-on experience using the newer computer-related technologies and applications.
A third recommendation is to provide advanced training in computer-related technology applications that teachers already have some proficiency in using. Elementary teachers indicated they were most interested in learning about computer based instructional applications and those were also the applications that they reported they were most proficient in using. Although high school and middle/junior high school teachers had reported they had some proficiency in using computer tool applications, they also indicated they were interested in learning more about computer tool applications. Since teachers already have proficiency in using some of the computer-related technology applications, advanced computer inservices should demonstrate how to integrate computer-related technology applications throughout the curriculum. Almost fifty percent (49.5%) of the Iowa teachers indicated they were interested in attending a computer-related technology inservice on the integration of computer-related technologies into specific curriculum areas.

A fourth recommendation is to provide computer inservice training on computer-related technology applications that Iowa teachers indicated they were interested in learning to use, but were less proficient in using. Iowa teachers' attitudes are positive toward using computer-related technologies and those positive attitudes may foster added interest in learning how to use these technologies. Iowa teachers reported they were most interested in learning to use word processing, problem solving, simulations, and tutorials. By learning to use these computer-related technology applications in their classrooms, teachers may provide opportunities that promote the development of higher level cognitive skills that are becoming increasingly important to learners in the information age.
A fifth recommendation is to provide multiple levels of computer-related technology teacher training to enhance instruction and professional productivity. Multiple level computer-related technology inservices would allow beginning computer-using teachers to become comfortable in using computer-related technologies and experienced computer-using teachers opportunities to develop advanced computer-related technology skills. Even though Iowa teachers reported they had less confidence in their own ability to use computer-related technologies, they indicated they had positive attitudes toward using computer-related technologies. Also, teachers indicated they had difficulty in using computer-related technologies because they lacked the time necessary to improve their skills and to develop uses for computer-related technologies in their classrooms. A priority of these staff development programs should be to provide time and opportunities for teachers to gain confidence and become comfortable in using computer-related technologies. Due to teachers' lack of time to improve their computer skills and confidence in using computer-related technologies, staff development programs need to be long-term and stress the integration of computer-related technology applications into the curriculum.

A sixth recommendation is to provide ample support and time for teachers to learn how to use computer-related technologies and to plan for its use in schools. Iowa teachers indicated their lack of time to develop lessons that use computer-related technologies as the number one barrier that affects their use of computer-related technologies. Finding enough time for teachers to learn how to use and to use computer-related technologies is a difficult task. School districts will need to assess their particular situation and develop creative and flexible solutions that will provide teachers with the necessary time
they need to effectively use computer-related technologies. A supportive school environment is necessary where teachers are encouraged and expected to use computer-related technologies in their teaching. Iowa teachers must be supported by peers, administrators, Area Education Agency personnel, university and college personnel, and department of education personnel in their use of computer-related technologies. The continued support from these sources will be vital to the successful implementation of computer-related technologies in Iowa schools.

One final recommendation is to make district technology plans available for teachers to examine. Sixty-one percent (61.0%) of the Iowa teachers indicated their school district did not have a technology plan or they were not aware if one existed. The Iowa Department of Education mandated that by July 1, 1989 all school districts in Iowa were to have developed a technology plan. Therefore, it is important that teachers become aware of the content of the technology plan for the successful implementation of the plan. District technology plans must be continually reviewed and updated as new computer-related technologies and applications are designed. The goals and objectives of the technology plan should focus on the educational needs of the students and how teachers can meet those needs rather than on the technology.

In conclusion, this assessment of computer-related technology use by K-12 teachers provides a basis for the future development of plans that promote computer-related technology use in Iowa schools. The profile of the status of computer-related technology use in Iowa's schools is similar to others at the state and national level. Due to limited computer hardware, inservice training, and time Iowa teachers have made only modest attempts to use computer-related technologies as intellect-enhancement tools. Hence, future plans must
include opportunities for teachers to become aware of the educational implications that newer computer-related technologies offer the educational environment. Efforts to expand the use of computer-related technologies should take advantage of Iowa's teachers' positive attitudes toward computer-related technologies and offer opportunities that promote and encourage teachers to use computer-related technologies in their classrooms. Follow-up assessments are recommended to determine patterns of change in teachers' uses of computer-related technologies in schools over time. These assessments may determine if Iowa teachers possess a commitment to transparently use computer-related technology as a part of their daily instructional routine and continually use computer-related technology to its fullest potential for preparing Iowa students for life in the Information Age.
REFERENCES


ACKNOWLEDGEMENTS

There are many people who I owe my deepest gratitude and appreciation for their assistance throughout the development and completion of this research study. First, I would like to express my sincere thanks to Dr. Ann Thompson for her expert advice and guidance. She made the seemingly impossible become reality because of her enthusiasm, encouragement and support during this study. Also, I greatly appreciated the suggestions and support from my other committee members, Dr. Michael Simonson and Dr. Rex Thomas.

Next, I wish to thank all of the Iowa Department of Education personnel who participated and contributed to this research project. My special thanks to Mr. Lee Tack for his time, assistance and support throughout the study and to Ms. Becky Timmerman for sharing her materials and her 'vision' of the future role of computer-related technologies in Iowa schools.

I would especially like to thank the graduate and undergraduate students who were always there when I needed them most. They were a very special group of people who supported me throughout my degree program and never hesitated to help me when I needed assistance. In particular, I wish to thank Julie, Connie, Karen, MiOk, Gayle, Doug, Dennis, Matt, Terry, Christine and Diane.

There were two special friends who always lifted me up when things seemed the lowest. Thank you, Julie and Dale, for the many walks and talks that brightened my long days of summer past. Most people are fortunate to have one good friend who will listen, give advice and offer support. I was very lucky to have two!
All of my life, my family has been my support. During the past two years, my success to a large extent has been due to the fact that all of my family encouraged me to strive for lofty goals. I would like to thank my mother and grandmother for their constant support and words of encouragement when they must of intuitively known that I needed them most. I am also extremely grateful to my two brothers, Brian and Craig, for their confidence in their 'little sister's' abilities.

And finally, I would like to thank my father, who always supported and encouraged me to do my best in whatever I attempted. The memory of his courage and determination has been an inspiration for me throughout these past two years.
APPENDIX A: SURVEY ITEMS INCLUDED IN EACH FREQUENCY OF USE FACTOR AND FACTOR LOADING
APPENDIX A: SURVEY ITEMS INCLUDED IN EACH FREQUENCY OF USE FACTOR AND FACTOR LOADING

Factor 1: Frequency of Use of Computer Tool Applications

item 69 - I provide opportunities for my students to use a word processing program as a writing tool. (.56)

item 70 - I provide opportunities for my students to take tests or quizzes on the computer. (.59)

item 71 - I provide opportunities for my students to use spreadsheet programs. (.81)

item 72 - I provide opportunities for my students to use database management programs to store, access and manipulate information. (.80)

item 73 - I use a computer to explain or demonstrate an idea or skill to the entire class. (.58)

item 74 - I provide opportunities for my students to use simulation programs. (.53)

item 75 - I provide opportunities for my students to use desktop publishing programs. (.43)

item 80 - I use the computer to help manage student information. (.50)

Factor 2: Frequency of Use of Newer Technologies

item 78 - I use on-line databases and/or bulletin board systems. (.67)

item 79 - I provide opportunities for my students to use interactive videodisc systems. (.80)
item 82 - I provide opportunities for my students to use art/graphic programs. (.71)

item 84 - I provide opportunities for my students to use any type of CD ROM application. (.78)

item 85 - I provide opportunities for my students to use hypermedia applications (e.g., Hypercard, Hyperstudio, Linkway). (.76)

Factor 3: Frequency of Use of Computers in Instruction

item 67 - I provide opportunities for my students to use drill and practice programs. (.84)

item 68 - I provide opportunities for my students to use tutorial programs. (.75)

item 69 - I provide opportunities for my students to use a word processing program as a writing tool. (.41)

item 73 - I use a computer to explain or demonstrate an idea or skill to the entire class. (.42)

item 76 - I use the computer to teach problem solving skills. (.64)

item 77 - I provide opportunities for my students to work on the computer in groups. (.82)
APPENDIX B: SURVEY ITEMS INCLUDED IN EACH BARRIER IN USE FACTOR AND FACTOR LOADING
APPENDIX B: SURVEY ITEMS INCLUDED IN EACH BARRIER IN USE FACTOR AND FACTOR LOADING

Factor 1: Barriers in Use: Computer Software

item 91 - There are not enough instructional computer software programs available for me to use. (.64)

item 92 - There are not enough copies of computer software programs available for me to use. (.57)

item 93 - Most instructional computer software programs are too complicated for me to use. (.57)

item 94 - Most computer software programs are not adaptable for my particular classes or curriculum. (.67)

item 95 - The instructional software available for me to use is of poor instructional quality. (.70)

item 96 - The manuals and support materials that accompany the computer software programs are not useful. (.68)

item 97 - There is not enough information available about how to use the instructional software in my classroom. (.67)

Factor 2: Barriers in Use: District Level Support

item 106 - There is poor administrative support or initiative from my school district. (.72)

item 107 - There is inadequate district level financial support for computer-related technology use from my school and/or district. (.66)

item 108 - There is inadequate district level development of goals or plans for computer-related technology use. (.85)
item 109 - There is inadequate communication throughout my school system about computer-related technology information and experiences. (.80)

Factor 3: Barriers in Use; Limited Access to Computer-Related Technologies

item 87 - There are too few computers for the number of teachers needing access to them. (.78)

item 88 - There are too few printers or other peripherals (e.g., videodisc player, CD ROM, VCR). (.76)

item 90 - The computers I have access to have limited capabilities (out of date, not enough memory, incompatible with software, etc.). (.44)

item 91 - There are not enough instructional computer software programs available for me to use. (.48)

item 92 - There are not enough copies of computer software programs available for me to use. (.57)

Factor 4: Barriers in Use; Difficulty in Using of Computer-Related Technologies

item 98 - I lack enough time to develop lessons that use computer-related technologies. (.75)

item 99 - I find it too difficult to fit activities that use computer-related technologies into the prescribed curriculum. (.66)

item 100 - There is not enough freedom for me to use computer-related technologies the way I want. (.51)

item 105 - There are problems scheduling enough computer time for my class. (.54)
Factor 5: Barriers in Use; Maintenance of Computer-Related Technologies

item 89 - It is difficult to keep the hardware in working order. (.58)
item 103 - There is not enough space in my building for computers. (.69)
item 104 - There is not enough help for operating and maintaining computers. (.72)

Factor 6: Barriers in Use; Teacher Attitudes Toward Computer-Related Technologies

item 101 - I am not interested in using computer-related technologies. (.80)
item 102 - I have doubts as to whether students are learning more or differently when computer-related technologies are used in instruction. (.77)
APPENDIX C: SURVEY ITEMS INCLUDED IN EACH ATTITUDE FACTOR AND FACTOR LOADING
APPENDIX C: SURVEY ITEMS INCLUDED IN EACH ATTITUDE FACTOR AND FACTOR LOADING

Factor 1: Teacher General Attitude Toward Computer-Related Technologies

item 3 - I think computers make work more enjoyable. (.46)

item 6 - Computer-related technologies are an important part of the future for improving the quality of education. (.61)

item 8 - I would like to improve my skills in the use of computer-related technologies. (.55)

item 12 - Computers are valuable tools that can be used to improve the quality of education. (.73)

item 13 - Computer-related technologies should be used to improve learning throughout the curriculum. (.80)

item 14 - Computers are useful for teaching thinking and problem solving skills. (.74)

item 15 - Computer-related technologies should be used by teachers more than they are now. (.79)

item 16 - My teaching is positively affected when using computer-related technologies. (.62)

item 21 - Overall, I think the computer is a very important tool for instruction in my classroom. (.64)

item 23 - I would like to use computer-related technologies more in my teaching. (.69)
Factor 2: Teacher Confidence Toward Using Computer-Related Technologies

item 1 - I think that computers make my professional work more difficult. (.44)

item 2 - I am comfortable using computer-related technologies for my own work. (.76)

item 3 - I think computers make work more enjoyable. (.56)

item 4 - It has been a struggle for me to learn how to use a computer successfully. (.77)

item 7 - I lack confidence in using a computer to complete my work. (.84)

item 9 - I don’t feel threatened by computers. (.66)

item 16 - My teaching is positively affected when using computer-related technologies. (.46)

item 17 - I do not feel comfortable using computer-related technologies in my teaching. (.72)

Factor 3: Teacher Attitude Toward the Necessity of Computer-Related Technologies in Education

item 5 - Teachers do not need to know how to use a computer. (.49)

item 10 - The computer is useful for accessing and organizing information. (.43)

item 11 - Word processing makes writing more difficult. (.48)

item 18 - Computer-related technologies are unnecessary luxuries in most school settings. (.75)

item 19 - Computers are of little value in education because they can be used to teach only one or two subjects. (.74)
item 22 - Computer-related technologies are of little value in the classroom because they are too difficult to use. (.53)
APPENDIX D: DOCUMENTATION OF HUMAN SUBJECTS APPROVAL
Checklist for Attachments and Time Schedule

The following are attached (please check):

12. [x] Letter or written statement to subjects indicating clearly:
   a) purpose of the research
   b) use of any identifier codes (names, #'s), how they will be used, and when they will be removed (see Item 17)
   c) an estimate of time needed for participation in the research and the place
   d) if applicable, location of the research activity
   e) how you will ensure confidentiality
   f) in a longitudinal study, note when and how you will contact subjects later
   g) participation is voluntary; nonparticipation will not affect evaluations of the subject

13. [ ] Consent form (if applicable)

14. [ ] Letter of approval for research from cooperating organizations or institutions (if applicable)

15. [x] Data-gathering instruments

16. Anticipated dates for contact with subjects:

   First Contact: April 1, 1991
   Last Contact: April 15, 1991

17. If applicable: anticipated date that identifiers will be removed from completed survey instruments and/or audio or visual tapes will be erased:

   June 1, 1991

18. Signature of Departmental Executive Officer

   Signature redacted for privacy

   Date: 2/24/91

   Department or Administrative Unit

   Signature redacted for privacy

19. Decision of the University Human Subjects Review Committee:

   [x] Project Approved
   [ ] Project Not Approved
   [ ] No Action Required

   Patricia M. Keith
   Name of Committee Chairperson

   Date: 3/19/91

   Signature of Committee Chairperson

   Signature redacted for privacy

GC: 1/90
APPENDIX E: COVER LETTER AND SAMPLE QUESTIONNAIRE
April 22, 1991

Dear Classroom Teacher:

Computer-related technologies have become an integral part of our educational environment. As the technical capabilities of these technologies continue to evolve rapidly, so do their possible uses in education. Because of the need to plan future directions in the use of computer-related technologies in schools throughout Iowa, it is important to assess how such technologies are currently being used by K-12 teachers. There is no current information available regarding teachers' use of computer-related technologies in Iowa schools.

The Iowa Department of Education and the College of Education at Iowa State University are combining in a cooperative effort to survey K-12 teachers regarding their uses of computer-related technologies throughout the state of Iowa. The length of this survey illustrates our attempt to collect a large amount of useful data. To reduce the burden of having all teachers in Iowa complete this survey, a stratified random sample of K-12 Iowa teachers has been drawn. You have been selected, as a result of this sampling procedure, to be a voluntary representative of teachers in your specialty area. To ensure that the information collected represents you and the thinking of teachers in your specialty area, it is important that you complete and return this survey. The completion of the survey will require approximately 30 minutes.

An identification number has been assigned to the survey sent to you. This number will allow us to check your name off the mailing list when the survey is returned. The completed survey will not be associated with your name.

Please return the survey in the enclosed postage paid envelope by May 6th. If you have any questions about the survey or for any reason are unable to complete the survey, please call Ann Thompson at (515) 294-5287. Thank you.

Sincerely,

Signature redacted for privacy

William L. Lepley
Director, Iowa Department of Education
Signature redacted for privacy

Ann Thompson
Associate Professor, Iowa State University
Iowa Survey of Computer-Related Technology Use by K-12 Teachers

A Statewide Survey

Study sponsored by:
Iowa Department of Education
Iowa State University, College of Education

Spring 1991

This survey is designed to be filled out by Iowa teachers (K-12). The survey items address the following themes of computer-related technology use: teacher background information, accessibility 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 technology.

All of the information that you supply will be kept strictly confidential. No school or person will ever be identified in our reports.

Thank You.
## Section One: Teacher Background Information

We need some information about you. Please circle the letter which best answers each question or fill in the blank.

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 (Go to question #6)
   b. Middle/Jr. High
   c. High School
   d. Complete School K-12

5. What is your primary teaching area? (Go to question #7 after answering)
   a. English/Language Arts
   b. Fine Arts
   c. Foreign Language
   d. Health
   e. Mathematics
   f. Physical Education
   g. Science
   h. Social Studies
   i. Special Education
   j. Vocational Education
   k. Other (specify) ________________

6. What grade level do you teach? _____

7. How many years have you taught? (include this year) _____

8. Do you have any experience using a computer?
   a. Yes
   b. No

9. Do you use a computer in your teaching?
   a. Yes
   b. No

10. For approximately how many years have you used the computer in any curriculum area in your classroom? (include this year) _____
Section Two: Accessibility of Computer-Related Technologies

This section includes questions about the accessibility of computer-related technologies for you. Please circle the letter(s) which best answers the question or fill in the blank.

1. Do you currently have a computer in your home which you use?
   a. Yes
   b. No → (Go to question #3)

2. What type of computer do you have at home? (Circle all that apply)
   a. Apple II+, IIe, or IIc
   b. Apple IIGS
   c. Macintosh
   d. IBM or IBM compatible
   e. Other brand: __________________

3. Are teachers in your district allowed to check out school computers to use at home?
   a. Yes
   b. No → (Go to question #5)
   c. Don’t know → (Go to question #5)

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

5. Are computers available for instructional use in your building?
   a. Yes
   b. No → (Go to question #7)
   c. Don’t know → (Go to question #7)

6. Which type of computer is most available for instructional use in your building? (Circle only one)
   a. Apple II+, IIe or IIc
   b. Apple IIGS
   c. Macintosh
   d. IBM or IBM compatible
   e. Other brand: __________________

7. Do you have any computers in your classroom now?
   a. Yes
   b. No → (Go to question #9)

8. How many computers do you have in your classroom? _________

9. Where are the computers designated for instructional uses located in your building? (Circle all that apply)
   a. No computers in building
   b. In computer lab(s)
   c. In classrooms
   d. In media center/library
   e. In a teacher work area
   f. On a portable cart
   g. Other (specify) ________________________________
10. 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.

11. Are there computer work stations in your building which are for teacher use only?
   a. Yes
   b. No ——> (Go to question #13)

12. Where are the computers designated for teacher use only located in your building?
   a. In a classroom
   b. In the media center/library
   c. In a computer lab
   d. In a teacher work area
   e. On a portable cart
   f. Other (specify) ______________________

13. What types of computer-related hardware are available at your school? Do not circle any items with which you are not familiar. (Circle all that apply)
   a. CD ROM
   b. Graphics pad/tablet
   c. Hard disk drive
   d. Printer (e.g., Epson, Imagewriter, Panasonic)
   e. Laser printer
   f. Liquid crystal diode/display (LCD)
   g. Modem
   h. Optical scanner
   i. Videodisc player/interactive video station
   j. Voice synthesizer
   k. Other (specify) ______________________
   l. None of the above

14. What other kinds of computer-related technologies do you have available at your school? Do not circle any items with which you are not familiar. (Circle all that apply)
   a. Television
   b. Video camera (camcorder)
   c. Video cassette recorder (VCR)
   d. Still video camera (e.g., XapShot)
   e. Satellite communications
   f. Mainframe computers for educational purpose (e.g., VAX)
   g. Local Area Network (LAN) (building and/or classroom computer networking)
   h. Long-distance computer networking (e.g., BITNET, Internet)
   i. Radio transmission equipment
   j. Other (specify) ______________________
   k. None of the above

15. Do you have computer software available in your building to use?
   a. Yes
   b. No
16. How is the computer software made available for instructional use in your building?
   (Circle all that apply)
   a. Teachers are assigned individual copies for each classroom.
   b. Copies are available at each networked computer work station.
   c. Copies are available for checkout at a central location in building.
   d. Copies are available for checkout from another school in the district.
   e. Copies are available for checkout from a district central office building.
   f. Copies are available for checkout from AEA.
   g. No computer software is available for me to use.
   h. Other (specify) ________________________________

17. Of all the computer software programs you have used, which programs do you find you have used and continue to use most frequently?
   Please list the three programs you use most often by name.

1) ____________________________

2) ____________________________

3) ____________________________
Section Three: Instructional Uses of Computer-Related Technologies

In the following section we will be looking at these five areas of uses of computer-related technologies: your proficiency in using these technologies, your interest in using these technologies, your use of these technologies in your classroom or computer lab, your frequency of using these technologies and your barriers in using these technologies.

Part I: Your proficiency
We would like you to rate your proficiency in using the following computer-related technologies. Please circle the number that best describes your proficiency in using each item.

1. Unfamiliar - do not know what this item is
2. Low - little or no skill
3. Medium - some proficiency, could use some advanced training
4. High - very proficient, use regularly

### Computer Based Instruction

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### Computer Tool Software

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<td>Telecommunications/Distance Learning</td>
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<td>Programming</td>
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<td>CD ROM</td>
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Part II: Your interest
Rate your interest in using the following computer-related technologies for instruction in your classroom or computer lab. Please circle the number which best describes your level of interest in using each item.

1. Unfamiliar - I do not know what this is.
2. Low - I have no interest in using this in my classroom or computer lab.
3. Medium - I have some interest in using this in my classroom or computer lab.
4. High - I am very interested in using this in my classroom or computer lab.

### Computer Based Instruction

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<td>21. Simulations</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

### Computer Tool Software

<p>| | | | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>22. Word processing</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>23. Databases</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>24. Spreadsheets</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>25. Desktop publishing</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>26. Graphics/drawing programs</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>27. Graphing utilities</td>
<td>1</td>
<td>2</td>
<td></td>
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</tbody>
</table>

### Other

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<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>28. Teacher utilities</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>29. Telecommunications</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>30. Programming</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>31. Hypermedia (e.g., Hypercard, Hyperstudio, Linkway, Amiga Vision).</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>32. CD ROM</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
### Part III: Your use

Please circle the number that best describes your use of the following computer-related technologies in your classroom or computer lab during the 1990-1991 school year. (Circle only one number)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Do not use at all/No desire to use</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Would like to use</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Currently use</td>
<td></td>
</tr>
</tbody>
</table>

#### Computer Based Instruction

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>33.</td>
<td>Drill and practice</td>
<td>1</td>
</tr>
<tr>
<td>34.</td>
<td>Tutorials</td>
<td>1</td>
</tr>
<tr>
<td>35.</td>
<td>Educational games</td>
<td>1</td>
</tr>
<tr>
<td>36.</td>
<td>Problem solving</td>
<td>1</td>
</tr>
<tr>
<td>37.</td>
<td>Simulations</td>
<td>1</td>
</tr>
<tr>
<td>38.</td>
<td>Teacher utilities</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Computer Tools

**Text Processing Tools**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>39.</td>
<td>Word processor</td>
<td>1</td>
</tr>
<tr>
<td>40.</td>
<td>Writing tools (e.g., spell-checker, thesaurus)</td>
<td>1</td>
</tr>
<tr>
<td>41.</td>
<td>Desktop publishing</td>
<td>1</td>
</tr>
</tbody>
</table>

**Analytic and Information Tools**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>42.</td>
<td>Databases</td>
<td>1</td>
</tr>
<tr>
<td>43.</td>
<td>Spreadsheets</td>
<td>1</td>
</tr>
<tr>
<td>44.</td>
<td>Charting/graphing</td>
<td>1</td>
</tr>
</tbody>
</table>

**Graphics and Creative Arts Tools**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>45.</td>
<td>Painting/drawing</td>
<td>1</td>
</tr>
<tr>
<td>46.</td>
<td>Drafting, computer-aided design</td>
<td>1</td>
</tr>
<tr>
<td>47.</td>
<td>Ready-made graphics (e.g., clip art)</td>
<td>1</td>
</tr>
<tr>
<td>48.</td>
<td>Music composition programs</td>
<td>1</td>
</tr>
<tr>
<td>49.</td>
<td>Optical scanning</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Telecommunication/Distance Learning

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>50.</td>
<td>On-line databases (e.g., Dialog)</td>
<td>1</td>
</tr>
<tr>
<td>51.</td>
<td>Telecommunication for instruction within the school</td>
<td>1</td>
</tr>
<tr>
<td>52.</td>
<td>Telecommunication for instruction within the school district</td>
<td>1</td>
</tr>
<tr>
<td>53.</td>
<td>Telecommunication for instruction within the state</td>
<td>1</td>
</tr>
<tr>
<td>54.</td>
<td>Telecommunication for instruction out of the state</td>
<td>1</td>
</tr>
<tr>
<td>55.</td>
<td>Teacher bulletin boards (e.g., communication between professionals, access to lesson plans, etc.)</td>
<td>1</td>
</tr>
<tr>
<td>56.</td>
<td>Student bulletin boards (e.g., communication between students, share information, word process letters etc.)</td>
<td>1</td>
</tr>
<tr>
<td>57.</td>
<td>Curriculum based bulletin boards (e.g., KidsNet, AT&amp;T Learning Link)</td>
<td>1</td>
</tr>
</tbody>
</table>
Part IV: Your frequency of use
We are trying to find out with what frequency these computer-related technologies are being used for instruction. Please circle the number that indicates the approximate number of times you have used these computer-related technologies in your classroom or computer lab during the 1990-1991 school year.

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)

<table>
<thead>
<tr>
<th>Technology</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>67. I provide opportunities for my students to use drill and practice programs.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>68. I provide opportunities for my students to use tutorial programs.</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>69. I provide opportunities for my students to use a word processing program as a writing tool.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>70. I provide opportunities for my students to take tests or quizzes on the computer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>71. I provide opportunities for my students to use spreadsheet programs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>72. I provide opportunities for my students to use data base management programs store, access and manipulate information.</td>
<td></td>
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</tr>
<tr>
<td>73. I use a computer to explain or demonstrate an idea or skill to the entire class.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>74. I provide opportunities for my students to use simulation programs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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)  

<p>| | | | | |</p>
<table>
<thead>
<tr>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>75.</td>
<td>I provide opportunities for my students to use desktop publishing programs.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>76.</td>
<td>I use the computer to teach problem solving skills.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>77.</td>
<td>I provide opportunities for my students to work on the computer in groups.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>78.</td>
<td>I use on-line databases and/or bulletin board systems.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>79.</td>
<td>I provide opportunities for my students to use interactive videodisc systems.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>80.</td>
<td>I use the computer to help manage student information.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>81.</td>
<td>I provide opportunities for my students to use art/graphic programs.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>82.</td>
<td>I provide opportunities for my students to use telecommunication devices to communicate with others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>83.</td>
<td>I use the computer to score tests.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>84.</td>
<td>I provide opportunities for my students to use any type of CD ROM application.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>85.</td>
<td>I provide opportunities for my students to use hypermedia applications (e.g., Hypercard, Hyperstudio, Linkway).</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

86. Approximately, how many minutes/hours per week does the average student in your classroom use computer-related technologies for educational purposes at school either during class or free time? ________
## Part V: Your barriers in use

In the last part of this section, we would like to know the extent to which you agree or disagree with the following statements about potential barriers in using computer-related technologies. Rate each potential barrier independently in terms of the extent to which you think it effects your use of computer-related technologies in your building. Using the categories below, please circle the corresponding number that best describes the degree to which you agree or disagree with each potential barrier.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Undecided</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>SD</td>
<td>D</td>
<td>U</td>
<td>A</td>
<td>SA</td>
</tr>
</tbody>
</table>

### Computer Hardware

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>87.</td>
<td>There are too few computers for the number of teachers needing access to them.</td>
<td></td>
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<tr>
<td></td>
<td>.................................................................................</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>88.</td>
<td>There are too few printers or other peripherals (e.g., videodisc player, CD ROM, VCR).</td>
<td></td>
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<tr>
<td></td>
<td>.................................................................................</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>89.</td>
<td>It is difficult to keep the hardware in working order.</td>
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<td></td>
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<td></td>
<td>.................................................................................</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>90.</td>
<td>The computers I have access to have limited capabilities (out of date, not enough memory, incompatible with software, etc.).</td>
<td></td>
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<tr>
<td></td>
<td>.................................................................................</td>
<td>1</td>
<td>2</td>
<td>3</td>
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</tbody>
</table>

### Computer Software

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</thead>
<tbody>
<tr>
<td>91.</td>
<td>There are not enough instructional computer software programs available for me to use.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.................................................................................</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>92.</td>
<td>There are not enough copies of computer software programs available for me to use.</td>
<td></td>
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<tr>
<td></td>
<td>.................................................................................</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>93.</td>
<td>Most instructional computer software programs are too complicated for me to use.</td>
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<td></td>
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<tr>
<td></td>
<td>.................................................................................</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>94.</td>
<td>Most computer software programs are not adaptable for my particular classes or curriculum.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.................................................................................</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>95.</td>
<td>The instructional software available for me to use is of poor instructional quality.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>.................................................................................</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>96.</td>
<td>The manuals and support materials that accompany the computer software programs are not useful.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>.................................................................................</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>97.</td>
<td>There is not enough information available about how to use the instructional software in my classroom.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.................................................................................</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>---</td>
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<td>---</td>
</tr>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Undecided</td>
<td>Agree</td>
</tr>
<tr>
<td>1</td>
<td>SD</td>
<td>D</td>
<td>U</td>
<td>A</td>
</tr>
</tbody>
</table>

**Instruction and Teacher Experience**

98. I lack enough time to develop lessons that use computer-related technologies. ............................................ 1 2 3 4 5
99. I find it too difficult to fit activities that use computer-related technologies into the prescribed curriculum. .......................... 1 2 3 4 5
100. There is not enough freedom for me to use computer-related technologies the way I want. ........................................ 1 2 3 4 5
101. I am not interested in using computer-related technologies. ............. 1 2 3 4 5
102. I have doubts as to whether students are learning more or differently when computer-related technologies are used in instruction. ........... 1 2 3 4 5

**Organization/Administration**

103. There is not enough space in my building for computers. ............. 1 2 3 4 5
104. There is not enough help for operating and maintaining computers. .... 1 2 3 4 5
105. There are problems scheduling enough computer time for my class. ...... 1 2 3 4 5
106. There is poor administrative support or initiative from my school district. ........................................ 1 2 3 4 5
107. There is inadequate financial support for computer-related technology use from my school and/or school district. .......................... 1 2 3 4 5
108. There is inadequate district level development of goals or plans for computer-related technology use. .................................... 1 2 3 4 5
109. There is inadequate communication throughout my school system about computer-related technology information and experiences. ............... 1 2 3 4 5
Section Four: Computer Inservice Education and Staff Development

This section includes questions about support given to teachers regarding the use of computer-related technologies and the availability of computer inservice programs for teachers. Please circle the appropriate response(s) to each question.

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 → (Go to question #7)

5. How have these computer inservice programs been offered? (Circle all that apply)
   a. Courses/workshops offered at my school on school time
   b. Courses/workshops offered by my district on school time
   c. Courses/workshops offered by my school or district on my own time
   d. Courses/workshops offered through AEA
   e. Courses/workshops offered by colleges and universities
   f. Courses offered in my undergraduate or graduate training
   g. Conferences available
   h. Other: ____________________________

6. Who provided the instruction for these inservice programs? (Circle all that apply)
   a. Teacher(s)/personnel within your school district
   b. Teacher(s)/consultant(s) outside of your school district
   c. AEA consultant(s)
   d. College or university personnel
   e. Other: ____________________________
7. In what computer-related technologies would you like inservice instruction?
   (Circle all that apply)
   a. Computer based instruction (e.g., drill and practice, tutorials, simulations)
   b. Computer tools (e.g., word processor, database, spreadsheet)
   c. Telecommunications/Distance Learning
   d. Programming
   e. Hypermedia
   f. Computer hardware (Troubleshooting)
   g. Examples of integration into specific curriculum areas
   h. Other (specify) ______________________
   i. None of the above

8. Which of the following would be your most preferred time for an inservice on computer-related technologies?
   a. Before school
   b. After school
   c. During school day
   d. Inservice day
   e. Weekend
   f. Summer
   g. None of the above

9. To your knowledge, does your district have a technology plan?
   a. Yes
   b. No ➔ (Go to question #12)
   c. Don't know ➔ (Go to question #12)

10. Were you involved in the development of your district's technology plan?
    a. Yes
    b. No

11. Are you aware of the content of the technology plan for the curriculum you teach?
    a. Yes
    b. No

12. Have teachers at your school had access to on-site support and advice for the use and integration of computers into the curriculum?
    a. Yes
    b. No ➔ (Go to question #1 in next section)

13. From which source(s) have you obtained the on-site support? (Circle all that apply)
    a. Another teacher
    b. An organized group of teachers
    c. School computer coordinator or aide
    d. District computer coordinator
    e. AEA consultant(s)
    f. Software company representatives
    g. Hardware company representatives
    h. Other: ________________________________
Section Five: Teacher Attitudes Toward Computers and Computer-Related Technologies

To what extent do each of the following statements characterize your attitudes toward computers and computer-related technologies. Using the categories below, indicate the extent to which you agree or disagree with each statement by circling your response.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Undecided (3)</th>
<th>Agree (4)</th>
<th>Strongly Agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I think that computers make my professional work more difficult.</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>2. I am comfortable in using computer-related technologies for my own work</td>
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<td></td>
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</tr>
<tr>
<td>3. I think computers make work more enjoyable.</td>
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<tr>
<td>4. It has been a struggle for me to learn how to use a computer successfully</td>
<td></td>
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<tr>
<td>5. Teachers do not need to know how to use a computer.</td>
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<tr>
<td>6. Computer-related technologies are an important part of the future for improving the quality of education.</td>
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<tr>
<td>7. I lack confidence in using a computer to complete my work.</td>
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<tr>
<td>8. I would like to improve my skills in the use of computer-related technologies.</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I don't feel threatened by computers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. The computer is useful for accessing and organizing information.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Word processing makes writing more difficult.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Computers are valuable tools that can be used to improve the quality of education.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Computer-related technologies should be used to improve learning throughout the curriculum.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Computers are useful for teaching thinking and problem solving skills.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Computer-related technologies should be used by teachers more than they are now.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. My teaching is positively affected when using computer-related technologies.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Undecided</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>---</td>
<td>------------------</td>
<td>----------</td>
<td>-----------</td>
<td>-------</td>
<td>----------------</td>
</tr>
<tr>
<td>18.</td>
<td>I do not feel comfortable using computer-related technologies in my teaching.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Computer-related technologies are unnecessary luxuries in most school settings.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Computers are of little value in education because they can be used to teach only one or two subjects.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>The computer helps me obtain individual diagnostic information from student test scores.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>Overall, I think the computer is a very important tool for instruction in my classroom.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>Computer-related technologies are of little value in the classroom because they are too difficult to use.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>I would like to use computer-related technologies more in my teaching.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX F: ONE-WAY ANOVA TABLES
Table 28. One-way ANOVA for the differences in grade level groups and proficiency in using computer based instructional applications

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>18.5781</td>
<td>6.1927</td>
<td>10.0397</td>
<td>&lt;.0001 *</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1853</td>
<td>1142.9703</td>
<td>.6168</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05.

Table 29. One-way ANOVA for the differences in grade level groups and proficiency in using computer tool applications

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>22.3028</td>
<td>7.4343</td>
<td>14.0174</td>
<td>&lt;.0001 *</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1858</td>
<td>985.4100</td>
<td>.5304</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05.

Table 30. One-way ANOVA for the differences in grade level groups and proficiency in using other computer-related technology applications

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>17.4817</td>
<td>5.8272</td>
<td>19.6012</td>
<td>&lt;.0001 *</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1842</td>
<td>547.6059</td>
<td>.2973</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05.
Table 31. One-way ANOVA for the differences in grade level groups and interest in using computer based instructional applications

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>25.5800</td>
<td>8.5267</td>
<td>15.1382</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1866</td>
<td>1051.0381</td>
<td>.5633</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.

Table 32. One-way ANOVA for the differences in grade level groups and interest in using computer tool applications

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>30.1927</td>
<td>10.0642</td>
<td>14.4666</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1867</td>
<td>1298.8503</td>
<td>.6957</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.

Table 33. One-way ANOVA for the differences in grade level groups and interest in using other computer-related technology applications

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>47.9950</td>
<td>15.9983</td>
<td>23.6414</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1861</td>
<td>1256.6438</td>
<td>.6767</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Table 34. One-way ANOVA for the differences in grade level groups and the use of computer based instructional applications

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>21.6079</td>
<td>7.2026</td>
<td>22.3285</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1862</td>
<td>600.6348</td>
<td>.3226</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* * p < .05.

Table 35. One-way ANOVA for the differences in grade level groups and the use of text processing tools

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>8.9511</td>
<td>2.9837</td>
<td>8.1996</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1860</td>
<td>676.8247</td>
<td>.3639</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* * p < .05.

Table 36. One-way ANOVA for the differences in grade level groups and the use of analytic and information tools

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>49.5588</td>
<td>16.5196</td>
<td>45.7830</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1845</td>
<td>665.7193</td>
<td>.3608</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* * p < .05.
Table 37. One-way ANOVA for the differences in grade level groups and the use of graphics and creative arts tools

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>5.8777</td>
<td>1.9592</td>
<td>9.4418</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1847</td>
<td>383.2638</td>
<td>.2075</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.

Table 38. One-way ANOVA for the differences in grade level groups and the use of telecommunication/distance learning applications

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>2.7888</td>
<td>.9296</td>
<td>4.5628</td>
<td>.0034</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1835</td>
<td>373.2409</td>
<td>.2037</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.

Table 39. One-way ANOVA for the differences in grade level groups and the use of programming applications

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>3.1825</td>
<td>1.0608</td>
<td>6.1021</td>
<td>.0004</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1819</td>
<td>315.5382</td>
<td>.1739</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Table 40. One-way ANOVA for the differences in grade level groups and the use of multimedia applications

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>13.5215</td>
<td>4.5072</td>
<td>22.0127</td>
<td>&lt;.0001 *</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1804</td>
<td>368.7595</td>
<td>.2048</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.

Table 41. One-way ANOVA for the differences in grade level groups and the frequency for using computers for instruction

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>62.5397</td>
<td>20.8466</td>
<td>28.7865</td>
<td>&lt;.0001 *</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1875</td>
<td>1357.8337</td>
<td>.7242</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.

Table 42. One-way ANOVA for the differences in grade level groups and the frequency for using computer tool applications

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>39.6142</td>
<td>13.2047</td>
<td>24.1233</td>
<td>&lt;.0001 *</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1875</td>
<td>1026.3478</td>
<td>.5474</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Table 43. One-way ANOVA for the differences in grade level groups and the frequency for using newer computer-related technologies

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>18.6194</td>
<td>6.2065</td>
<td>28.3762</td>
<td>&lt;.0001*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1862</td>
<td>407.2590</td>
<td>.2187</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.

Table 44. One-way ANOVA for the differences in grade level groups and barrier in use due to difficulty in using computer-related technologies

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>2.6748</td>
<td>.8916</td>
<td>1.6171</td>
<td>.1834</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1867</td>
<td>1029.4206</td>
<td>.5514</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.

Table 45. One-way ANOVA for the differences in grade level groups and barrier in use due to limited access to computer-related technology

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>5.8902</td>
<td>1.9634</td>
<td>2.5903</td>
<td>.0513</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1868</td>
<td>1415.9351</td>
<td>.7580</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Table 46. One-way ANOVA for the differences in grade level groups and barrier in use due to inadequate district level support

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>4.8681</td>
<td>1.6227</td>
<td>1.7549</td>
<td>.1538</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1863</td>
<td>1722.7011</td>
<td>.9247</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.

Table 47. One-way ANOVA for the differences in grade level groups and barrier in use due to computer software

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>8.8351</td>
<td>2.9450</td>
<td>6.1034</td>
<td>.0004 *</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1867</td>
<td>900.8717</td>
<td>.4825</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.

Table 48. One-way ANOVA for the differences in grade level groups and barrier in use due to the maintenance of computer-related technology

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>9.5902</td>
<td>3.1967</td>
<td>4.5097</td>
<td>.0037 *</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1870</td>
<td>1325.5720</td>
<td>.7089</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Table 49. One-way ANOVA for the differences in grade level groups and barrier in use due to teacher attitude

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>1.7278</td>
<td>.5759</td>
<td>.8695</td>
<td>.4562</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1867</td>
<td>1233.9998</td>
<td>.6624</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.

Table 50. One-way ANOVA for the differences in grade level groups and respondents' general attitude toward computer-related technology

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>1.3301</td>
<td>.4434</td>
<td>1.1623</td>
<td>.3228</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1875</td>
<td>715.2594</td>
<td>.3815</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.

Table 51. One-way ANOVA for the differences in grade level groups and respondents' attitude toward the necessity of computer-related technologies in education

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>3.4429</td>
<td>1.1476</td>
<td>3.5669</td>
<td>.0136 *</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1872</td>
<td>602.2980</td>
<td>.3217</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Table 52. One-way ANOVA for the differences in grade level groups and respondents' confidence toward using computer-related technologies

<table>
<thead>
<tr>
<th>Source</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3</td>
<td>9.4686</td>
<td>3.1562</td>
<td>5.8238</td>
<td>.0006 *</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1875</td>
<td>1016.1531</td>
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APPENDIX G: RESPONDENTS' WRITTEN SURVEY COMMENTS
RESPONDENTS' WRITTEN SURVEY COMMENTS

This survey was too long. I filled out a school smoking survey for the U. of Minn. recently and they sent $1.00 in cash in advance for doing the survey which took less time than this one. This one was too long.

My school won't buy a computer for my room alone. I want to use computer instruction for independent study in music theory and composition but can't afford equipment and I have no training.

I have an L.D. resource room. Therefore I have no time allotted for use. However they are widely used in our building for many things.

Not enough money in my budget to buy them. Need time to learn to use them. I fear they will become outdated too soon.

The biggest drawback with computers/software is not addressed in this survey in the lack of increased school budgeting for computers and software. This is expensive stuff and something else gets cut if I want to update the computer technology in my area. I don't think the technology should be expanded at the expense of the basic needs of the program. Applying for available grants is too time consuming for most classroom teachers. Technology money needs to be available to all schools, not just those proficient at applying for grants. Also, I think mandatory minimum hours in computer knowledge may be necessary for all teachers to become comfortable with computers in their classroom.

Time is my big problem. I just haven't had time to figure it out and use it. A computer class is assigned 15 min./week. Then optional use of computer for 10 or 15 min./wk. Also used during free time such as recess and before and after school.

No computer in my classroom other than my own. We have none in my classroom. Computers are in learning lab situation so that I cannot make them available to use for these purposes. (frequency of use section)

I want physical activity in my classroom. I do use computers a lot for record keeping, etc. (H.S. physical ed. teacher)

A few use the computer to write reports. I use it only a few (perhaps 3-5) times per year for the period of 45 min. Actually, I have used it more previously, but one computer per classroom doesn't work very well. I need a lot of time to preview software. Is this part of the time squeeze of a day? I have some Macintosh software - but no computer. I own some videodisc - but no player. If
you or the school expects us to use technology, then supply it. (on quest #2 computer inservice) - The number (of computer inservices) may be there, but I need individual help for my courses. (on quest #3 computer inservice) appropriate for your needs- The biggest problem. It (inservice) should be specifically related to my area. I've had enough general courses. After the course, I need direct application to a few good useable programs. 45 min. minimum to complete. Actual time spent = 1 hr. 30 min+.

I use the computer as a word processor, particularly with students who are learning disabled and who respond well to using the computer. I have used math programs but limited access to computers makes this inconvenient and impractical in a classroom with 20 students. Limited access has steered me away from ordering additional software. Just this morning, coincidentally, I "checked out" computer # 5 so that my 2 learning disabled students could do their reading questions on computer. The monitor had lines running through it, making the screen unreadable (just as it did last fall when I reported it). I checked out computer #1. When I started typing the questions, the alphabet was in a secret code! At recess, I typed the questions in the work room and went to the special reading room (she has 2 GS's). One teacher across the hall had just taken one of the computers. Jeremy got started . . . and then he had to go to his saxophone lesson. Gee, I'm glad I got this questionnaire today. I've requested 2 MACs for next year. I've been turned down. If you know of a benefactor, give them my number!

We used inservice time a number of years ago. Keyboarding, with instruction from H.S. teachers was begun at the 4th grade level. When we began our sharing program, "they" didn't - so we stopped.

My gifted class (grades 3-4-5) entered the knowledge MasterOpen in December and again in March. An across-the-curriculum academic contest, this competition is done, with instant scoring - and instant gratification, on the computer. With coded scoring, we're able to call in our scores and compete with schools all over the country. (We're #1 among schools our size - Both December and March)

I would really like to use a computer in my teaching - However our school system only has 1 Apple TIE which I need to teach graphics and clip art. We are not funded. The music teacher and the H.S. journalism teacher for our school newspaper would also benefit if we had one. We could even share! (teacher - social studies, fine arts)

Inservicing needs to be done at the level most relevant to the grade and curriculum we teach.
Currently forming a tech use plan - Should be interesting. Presently determining our priorities, district wide for next 5-10 years.

In my area they are useful for administrative type work (I'm a band director) if one types - but I don't. As far as their classroom use in band, there is little use for computers. Our students simply do not have time to use music related programs. They would be useful for Music Theory but here again the "hands-on" time is limited. Budget-wise we cannot afford to purchase computer-related materials with declining budgets and increasing costs of our basic needs. I'm afraid I'm not a very good person to ask about computer usage.

This is a good idea - Federal and State mandates are requiring schools to improve and use technology in the classroom. Where is the funding??

I teach K-5 Art and Physical Education so computers are not readily available for those classes - or are really necessary. But I do see the importance of computers in the classroom and hope that all students feel comfortable using the computer.

This survey would be better suited to a classroom teacher. I am a Music teacher.

Computers not in my classroom - must go to computer lab. Computers have been used for practice on states and capitals, countries and caps etc.

Send $. For those who took the computer (inservices) our inservices are split 5 or 6 ways and you take 1 thing each year.

Get me 30 computers and I'll use them every day - NO I have none in my room - computer lab has 20 which isn't enough for any of my classes - Also the school hasn't bought any departmental programs that I know of. The ones I use for practice are home made by 1 or 2 computer-smart types on our faculty.

Teachers are not given enough time to sit at an individual computer and experiment or practice using materials so they feel comfortable. Teachers are capable!

I hope this helps. I would love to use the computer in my classroom, but we have to share. I don't always have time to go thru the programs - half the time the directions are missing. Yes, I am discouraged!

(Computer inservice) Across town - during after school planning time (which I don't have enough of anyway.)
Since I teach second grade I feel I have to teach the children good reading skills, listening skills and how to follow directions first, which are all part of using a computer. They have their place.

Being a special ed. teacher I interact with K-6th teachers daily. Several have told me that they don't want me wasting time with their student by spending time using computer. Although there is 1 computer in each room, some teachers never allow them to be used - others are frustrated with 6+ month break-downs.

Not necessary in elementary.

Money is lacking for technology.

I teach Kdg. and have chosen not to use computers, so am returning it (survey) unmarked.

I'm a poor choice to answer a questionnaire about computers. I teach K-3 elem. vocal music, and though I have taken computer classes, cannot find time in the computer labs to take my classes. They are usually booked on a year long basis by classroom teachers - so music classes don't have the opportunity to use them. We are purchasing a Macintosh LC for our home and I am excited about learning to use it for my daily work. I hope my input answers don't throw off your results.

It seems inconceivable that school districts in Iowa would be moving to more and more computer hardware and related technologies when they have never even moved to use the most basic technology - A TELEPHONE - to the fullest. In our district, as in most, it is impossible to communicate with parents privately because of the lack of simple phone service for each professional on staff. We have a long way to go.

The assumption is made that the person(s) receiving these surveys are computer literate. This is not the case for me. Many words/terms used were unfamiliar to me. I know very little about computers and have had limited experience working with them. Thus far, those experiences have been very frustrating for me. I fear I'm developing a mental block about using computers!

I do not have enough background in computer knowledge to make this response valid. I do see some value for LD children using the processor as a writing tool when letter formation and midline difficulties are a problem area for them.

I feel computers at K level are not necessary. At upper levels they are an important part of the curriculum.
We have no money. We need $50,000 to even come close to competing with other districts but where will it come from? The government keeps taking money away. Rural schools are dying our because the big cities are affording the technology equipment with no problem. We have to have fund raisers for everything. Something is wrong. Can you help?

I think Jr. High and High School are the best places to really use them, but I don't object to them in the elementary if a teacher desires. I have plenty to do with other activities so hope the students aren't being neglected too much.

We have just recently purchased a computer for our room. I have very limited knowledge and experience. We are encouraging the children to experiment with it. Using the computer is completely by choice of the children.

We do not have enough programs that kindergarten children can do easily.

I feel you need a computer lab with a teacher instead of one computer in a classroom of 26 students.

We have a computer lab in our school. That teacher spends time problem solving and programming as well as tutorials. Also our school will be passing the Ile's down to K-3 and getting new Mac's next year.

Australian teacher - My K's in Australia use computers-often-no chance of that here!! We have Apple Macs for all!

I do not use our school's computer lab it only has 11 or 12 computers, with one headset per computer. As a music teacher, dealing in sound, I feel I need a headset for each student to lessen the distraction of sounds from other machines.

We have every student take a computer course in 7th and 8th grade. We have a computer lab with 25 computers plus a computer instructor that teaches the use of the computers. Many students use the word processor to write assignments of term papers.

This time of year is a poor time to send out a 16 page survey/questionnaire!

Key word in Section One is "available" in the building - yes; but difficult to use (1 IIGS for 10 teachers)
I am not comfortable at all doing this survey - I don't use the computers in my classroom (PE) - I still use other methods in organizing my information - I am not afraid of computers - I just don't use them - they are available in our district and used by many teachers and students - I think it's great - I still use typewriters and calculators - Anyway, here is your survey - one comment - not a good idea to send surveys like this (length) out the last month of school - too many other things to do.