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Teacher preservice experiences and classroom computer use of recent Iowa State University graduates

Neal Wade Topp
Iowa State University

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Teacher preservice experiences and classroom computer use of recent Iowa State University graduates

Topp, Neal Wade, Ph.D.
Iowa State University, 1993
Teacher preservice experiences
and classroom computer use
of recent Iowa State University graduates

by

Neal Wade Topp

A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY

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

Approved
Signature was redacted for privacy.
In Charge of Major Work
Signature was redacted for privacy.
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For the Graduate College

Iowa State University
Ames, Iowa

1993
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I. INTRODUCTION

The education community at all levels is struggling to make changes, changes that will help prepare students to live in the twenty-first century (Carlson, 1991). One of the areas of change is the use of computers and computer-related technology. These technologies are a day-to-day part of most people's lives, whether the technology be a computer on the desk at work, a robot at a factory, or a laser scanner at the grocery store check-out counter. American society is in the midst of the information age, an age when the management and manipulation of information is a vital skill, and technology is one of the tools that can be used to achieve this skill.

Schools, especially at the K-12 level, have begun to see the importance of using technology in the classroom. The large increases in the numbers of computers in American schools over the last two decades illustrates the commitment to technology. In 1975, very few computers were found in schools, and Becker (1990) estimated that in 1989, there were about 2,000,000, which is about one per each teacher, or about one for each 20 students.

Not only was the numbers of computers changing during this time, the types of uses of computers changed. Bork (1991) considered the late 1970's and early 1980's as the "lets get lots of hardware" period in educational computer history. It was a time when no one had a clear idea of how the computer was to be used. At about this same time, Becker (1985) found that the computers in schools were being used to teach computer programming languages, to practice skills, and to learn about the computer itself.
In the middle 1980's, as many educators began to understand the power of the computer to improve learning, the types of preferred uses began a switch to using the computer as a tool. It was used as a tool for such procedures as writing using a word processor, organizing and manipulating data in a data base, crunching numbers in a spreadsheet, and communicating with other computers in other places by using telecommunication (Office of Technology Assessment, 1988). Dede (1987) identified this type of computer use as an empowering environment. "The machine handles the routine mechanics of a task while the person is immersed in higher-order meaning" (1987, p. 21).

During the mid-1980's, many teachers began to realize the potential of the computer to give students a variety of experiences in all curricular areas (Sheingold, 1990a). Educators incorporated the technology into activities that were designed to improve problem solving skills and develop students' higher level thinking skills.

Also in the past decade, states, communities, and organizations began to place great importance on the use of computer-related technologies in K-12 classrooms. Several state boards of education encouraged the use of technology by requiring school district technology plans (Novak & Berger, 1991b). The state boards also began to support the use of computer-related technologies through model lessons and expert-consultants. Also, educational associations recognized the need for computers in schools. In a 1989 resolution, the Association for Supervision and Curriculum Development noted that schools used technology less than other sectors of society, yet the need for the use of technology grows more critical (Carlson, 1991).
George (1991), stated that in education, the twentieth century belonged
to the chalkboard and the twenty-first century will belong to the computer.
With recent developments in computer-related technologies and continued
learning about learning, the computer's role in education is still changing
rapidly (Sheingold, 1990).

Not only are K-12 schools expected to use computers in their
classrooms, teacher education programs are also being expected to equip
future teachers with an understanding of computer-related technologies. At
least 23 state boards of education have mandated teacher preservice
institutions include computer education as a part of their teacher education
programs. In addition, two educational organizations, the International
Society for Technology in Education (ISTE), and the National Council for
Accreditation of Teacher Education (NCATE), have jointly developed twelve
goals for graduates of teacher education programs (Wetzel, 1992). These goals
include computer knowledge and skills, both for personal use and for
classroom use.

To help meet the state board mandates and the ISTE/NCATE goals,
most teacher preservice institutions have begun to included technology in
their programs (Johnson & Harlow, 1993). The computer-related technologies
often have been included in two different methods, the computer-specific
course and incorporation of the computer into some or all education courses.

The computer-specific course has usually been the first attempt to
include the computer in the teacher preservice program. Most of these
courses have given the students an introduction to using computers. It is
estimated that 85% of the teacher education programs offer a computer-
specific course and 50% of the programs require this type of course (Johnson & Harlow, 1993).

Although the computer-specific courses each are somewhat different, many include topics such as: becoming comfortable using computers, learning how to use tool software (word processing, data base, spreadsheet, graphics/paint, and desktop publishing programs), memorizing computer terminology, learning computer history, and evaluating educational software (Novak & Berger, 1991b; Tashner et al., 1991; Wetzel, 1992).

Some authors believe this type of course has several problems, and should only be a short-term solution to infusing technology into teacher education programs (Strudler, 1991). One potential problem with such a course is that faculty members may leave computer education up to the specialist in the special course, instead of using the computer themselves in their teaching (Novak & Berger, 1991a).

Other educators believe the computer course is necessary in a teacher preservice program. Maddux (1989) emphasized that future teachers need to be taught to use the computer, as well as be given an introduction to this important educational tool.

While many colleges of education have been offering the computer-specific course, little research can be found on its effectiveness. Whether such a course provides future teachers with experiences that will help them to use the computer wisely in their own classrooms is unknown. Also, little is found in the literature about teachers' evaluation of these types of courses.

Another way to prepare preservice teachers to use computer-related technologies in their classrooms, is by incorporating computers in most or all
education courses. This modeling by instructors requires many changes from the traditional role of the college teacher. Active learner exploration, cooperative groups, and new delivery systems are three of the changes that go hand-in-hand with the effective use of technology (Johnson & Harlow, 1993). "Teachers teach the way they were taught" is a phrase mentioned by authors who believe that computers should be incorporated into all education courses (Harrington, 1991; Nelson, Andri, & Keefe, 1991). Although, infusion of computers in general courses is highly recommended by several authors, a recent national survey indicates only five percent of teacher education programs actually integrate computers into these types of courses (Johnson & Harlow, 1993).

In order to use computers effectively in all courses, three elements seem to be needed. First, equipment must be available for use by students and faculty (Novak & Berger, 1991a). Students need to be able to use classrooms and labs where computers and other related technologies are available (Gunn, 1992). In addition, faculty members need daily access to a computer (Johnson & Harlow, 1993). Many teacher education institutions have placed a high priority on equipment acquisition.

Second, faculty members, as they learn new technologies, need training and support (Wetzel, 1992). It is often assumed that college faculty do not need help in learning something new, but in the case of computer-related technologies, this is often not true.

Third, faculty members need to receive encouragement to use computers in their courses (Nelson, Andri, & Keefe, 1991). Many institutions
have begun to include incorporation of technology into their faculty growth formulas (Gunn, 1992).

Changes in education, both at the K-12 level and also at the college level include the increased use of computers in the teaching/learning process. Although there is criticism that colleges are not changing fast enough (George, 1991), many colleges of education are making changes to facilitate the use of computer-related technologies.

**Statement of the Problem**

Many preservice teacher programs are providing experiences that focus on using computer-related technologies in classrooms. Little is known, however, about the ways recent graduates are relating to the technologies in their classrooms. The way they rate their proficiency in using, their interest in using, and their frequency of using various types of computer-related technologies is unknown. In addition, recent graduates' attitudes toward computers are not documented.

For several years, computer-specific courses have been offered in teacher preservice programs, but teachers' opinions concerning these computer-specific courses are not known. Also, practicing teachers are seldom asked how they rate their teacher preservice preparation for using computer-related technologies in their classrooms.

The relationships of teacher preservice experiences and teacher behavior dealing with computer-related technologies is also an area that has not been studied to a great extent. It is unknown if such relationships do
exist, and if they do, if preservice experiences can be used to predict a
computer-using teacher.

**Purpose of the Study**

The overall purpose of this study was to investigate attitudes toward,
and use of, computer-related technology by teachers who were recent college
graduates. The main foci of the research were: descriptions of teacher
preservice experiences, teacher computer proficiency, frequency of computer
use, interest in using computer-related technology, and attitude toward
computers; teachers' opinions about teacher preservice preparation dealing
with the use of technology in their classrooms; and relationships among
preservice teacher experiences and teacher behaviors.

**Research Questions**

This study sought to address the following questions.

1a. How do Iowa teachers, who are recent college graduates, rate their
own proficiency in using various computer-related technologies, and how does
their rating compare to Iowa teachers' 1991 rating?

1b. How do Iowa teachers, who are recent college graduates, rate their
own interest in using various computer-related technologies, and how does
their rating compare to Iowa teachers' 1991 rating?

1c. How often do Iowa teachers, who are recent college graduates, use
computer-related technologies in their classrooms?
1d. What is the attitude toward computer-related technologies by Iowa teachers who are recent college graduates, and how does their attitude compare to Iowa teachers' 1991 rating?

2a. How do Iowa teachers, who are recent graduates, rate the importance of a computer-specific course in teacher preservice programs?

2b. What do Iowa teachers, who are recent graduates, believe is the most important focus in a teacher preservice computer-specific course?

2c. How do Iowa teachers, who are recent graduates, rate their preservice preparation in using computer-related technologies?

3. What are the relationships among variables in this study, including preservice experiences, personal demographics, teacher computer use, teacher computer proficiency, teacher computer interest, and teacher computer attitude?

4. What is the combination of preservice predictors in determining:
4a. teachers' proficiency in using of computer-related technologies?

4b. teachers' interest in using computer-related technologies?

4c. teachers' frequency of use of computer-related technologies?
4d. teachers' overall computer rating when combining computer use, proficiency, and interest?

4e. teachers' attitude in using of computer-related technologies?

5. When dividing recent Iowa State graduates who are teaching,
5a. into groups of high and low proficiency of computer use, what is the combination of preservice experiences that will predict placement in either group?

5b. into groups of high and low interest in computer use, what is the combination of preservice experiences that will predict placement in either group?

5c. into groups of high and low frequency of computer use, what is the combination of preservice experiences that will predict placement in either group?

5d. into groups of high and low, using a combination of computer use, proficiency, and interest, what is the combination of preservice experiences that will predict placement in either group?
5e. into groups of high (positive) and low (negative) attitude toward computer use, what is the combination of preservice experiences that will predict placement in either group?

Limitations

This study was conducted with acknowledgment of the following limitations:

1) The sample was not selected randomly, although the randomly selected follow-up telephone interview indicated the survey respondents were representative.

2) The teacher preservice program and courses at Iowa State University are continually evolving. Because preservice experiences spanning a time frame of over eight years are included in the preservice responses, it was difficult to generalize the preservice independent variables.

3) The varying experiences of the respondents after receiving their teaching certificates affect current behavior. These experiences were not studied nor included in the research.

Definition of Terms

A. Computer-related technologies - Hardware and/or software used in conjunction with a computer.

B. Teacher preservice - Experiences of teachers before they received their teaching certificate.

C. Computer-specific course - A college course designed to focus on computer introduction, skills, and/or competency.
D. Secondary Education 101- An undergraduate education class entitled "Educational Applications of Computers". This entry level course includes topics related to educational technology including microcomputer hardware, computer applications for the classroom, word processing, interactive multimedia, database management, spreadsheets, desk top publishing, LogoWriter, and telecommunication.
II. LITERATURE REVIEW

This chapter will focus on three topics that provide a foundation for use of computer-related technologies in preservice teacher education, as well as K-12 education. These areas are (1) the history of microcomputers in American schools, (2) the research on the effectiveness of computers in education, and (3) the role of preservice teacher education in preparing future teachers to use technology in their classrooms.

History of Microcomputers In American Schools

During the past 15 years, educators in America have begun to make several changes, and one of the most visible changes is the use of computers and related technology to improve learning by students. "In the 1980's, no single medium of instruction or object of instructional attention produced as much excitement in the conduct of elementary and secondary education as did the computer" (Becker, 1991, p. 385). One way to note this changing emphasis on computers is the increased number of computers in schools. Over the past decade, it is estimated that the number has grown from about 50,000 to about 2,000,000.

Not only did the availability of computers in schools change during the 1980's, but the ways in which the computer was used also changed. One of the first comprehensive national surveys conducted to study how teachers were using computers in schools was completed during the 1982-1983 school year by Henry Becker (Becker, 1985). The results of this research indicated the three most common instructional uses of computers were: to provide
computer literacy instruction, to teach programming skills, and to practice skills through drill and practice programs. Other less frequent uses included games, simulations, administrative uses and word processing. Eighty-five percent of the responding secondary teachers, and 64% of the responding elementary teachers reported the most regular computer use was to teach computer literacy skills. The next most preferred use in the secondary was the teaching of a programming language. Elementary school teachers reported drill and practice as their second most popular use of computers in the classroom.

Becker conducted a follow-up survey in 1985, called the "Second National Survey of Instructional Uses of School Computers" (Becker, 1986). Respondents reported that at the elementary level, teachers were using computers for drill and practice and tutorials 56% of the time. Other computer activities used less often included problem solving, programming, and word processing. The most frequent use in the secondary schools was programming, but word processing was gaining popularity. During the mid-1980s, most national and many state surveys results paralleled the findings of the Becker study (Beaver, 1989; Minnesota Department of Education, 1989; Office of Technology Assessment, 1988; Schmidt, 1991; Sheingold & Hadley, 1990).

As noted throughout this section, surveys have played an important role in understanding what is happening in schools with respect to microcomputers. In the spring of 1991, a comprehensive survey of Iowa teachers was conducted by Denise Schmidt, of Iowa State University (Schmidt, 1991). Data were collected from 1,934 Iowa teachers that included
their proficiency in using computers, their interest in using computers, the frequency in which they use computers, and their attitudes toward computers. When asked about proficiency in specific areas, teachers rated themselves most proficient in word processing. They also rated themselves proficient with drill and practice, educational games, and tutorials. The proficiency rating for all other applications was low.

The Iowa teachers' interest in using computers was generally high. Teachers expressed the most interest in using word processing programs, problem solving software, and educational games. They were least interested in using spreadsheets, graphing utilities, telecommunications, hypermedia and CD ROM applications. It is interesting to note that these Iowa teachers were, in general, most interested in using the applications they felt most proficient in using (Schmidt, 1991).

A third area of the Iowa survey dealt with frequency of use of different computer applications. Again, word processing, drill and practice, educational games, and tutorials had the highest mean score for all applications. Less than one-third of the respondents reported using any of the other computer applications listed on the survey. This low frequency of use paralleled other state and national surveys (Becker, 1990, Sheingold & Hadley, 1990).

Teacher attitude toward computers and computer-related technologies was another topic studied by Schmidt. The data revealed an overall positive teacher attitude toward computer-related technologies. The responding teachers considered computers as an important part of the future of education, and they believed that computer-related technologies should be used across the curriculum. A very high percentage (91%) indicated that
teachers needed to know how to use a computer successfully. A somewhat lower attitude rating was given for items dealing with teacher confidence in using computer-related technologies (Schmidt, 1991).

A national report, "Power On! New Tools for Teaching and Learning" issued in 1988, stated that software applications such as word processors, simulations, databases, and telecommunication technologies were the emerging types of applications (Office of Technology Assessment, 1988). But in Becker's third nation-wide survey, "1989 Computers in Education Survey," the teachers' uses of computers had only made minor changes. Although the power of the computer to be used as a productivity tool was beginning to be realized, the most common use in elementary schools was still the sharpening of basic skills, although the percentage of use had declined since the 1985 survey. In high schools, 49% of the teachers indicated that computers would function best as a productivity tool. Other surveys also indicated that uses of school computers was changing (Sheingold & Hadley, 1990). Telecommunications, multimedia, music composition programs, hypermedia and drawing programs were emerging uses of the microcomputer (Thompson, et al., 1990).

As educators began to see the power of using the computer as a productivity tool, they began to integrate computer use into all disciplines. Educational futurist, Christopher Dede, suggested that the computer could be used not only to handle the routine aspects of a task so that the human user could focus on higher level activities, but also the computer could provide hypermedia and microworld activities that would greatly expand the students' learning environment (Dede, 1987).
With these expanded computer uses, educators at all levels and all disciplines needed to be able to use the computer in effective ways (Sheingold, 1990). The computer was no longer for a few selected teachers to use, but it was needed to be viewed as a tool to be used to enhance student learning across the curriculum.

**Research on the Effectiveness of Computers in Education**

Educational use of computer-related technology has become part of schools in the United States over the past two decades. As discussed in the previous section, the number of computers and the types of computer-related technology uses have been frequent topics in the literature during the past decade. Another area of study has dealt with the question of why and how computers should be included in education. This section will briefly summarize the literature dealing with the effectiveness of the use of computers in schools. The summary will be divided into four general categories. The categories include: 1) computer literacy, as well as studies based on computer based instruction (CBI) and programming; 2) research on computer tool applications; 3) research on newer, emerging computer-related technologies, such as hypermedia and telecommunications; 4) future research trends in educational use of computer-related technologies.

**Computer literacy, computer based learning applications, and programming**

The first wave of educational computer applications was based on the idea that students needed to be familiar with the computer. (Maddux, 1993). Because software was scarce and expensive, most exposure was in the
programming language, BASIC. The justification given by educators for programming instruction was usually that in order to get a good job, students needed to know how to use the computer, especially to program with it. This proved incorrect, as only an estimated 20,000 programming jobs were available at that time (Kelman, 1984).

One other early strategy at using the computer in schools was for computer based instruction (CBI), when the computer was either the deliverer of instruction or the deliverer of practice sessions. Usually these types of programs were called drill and practice, educational games, or tutorials. Educators tried to use this new machine to do things that were already doing, such as using the computer as an "electronic worksheet" to deliver drill and practice lessons (Maddux, 1993). One specific example was the use of a computer program to learn basic math facts. The user was asked to answer math questions, if the answer was correct, the computer program responded and a new math problem appeared. If the answer was incorrect, another response was required, until the correct response was given (Bork, 1991).

One of the first studies that investigated the effectiveness of computers in schools was conducted in the 1960's, when Suppes and Atkinson of Stanford University studied the effectiveness of their main-frame computer drill and practice and tutorial programs when used by high school students for math lessons (Suppes & Fortune, 1985). The researchers compared two groups of students, one group used the computer programs and one group used traditional classroom methods. The students who used the computer programs scored higher on posttests than did the students that did not use the computer.
Several studies were conducted subsequent to the Suppes and Atkinson studies, seeking to find the effectiveness of varied microcomputer based instruction applications. In the 1980's, James Kulik, of the University of Michigan, conducted two meta-analyses of the research on computer-based teaching in K-12 education. One study examined effects of computer based learning on elementary students, and one examined effects on secondary students.

Kulik and colleagues studied 32 comparative studies dealing with elementary students and 51 studies dealing with secondary students. Most of these studies involved using computer-assisted instruction programs, usually drill and practice or tutorial instruction. In most cases, subjects were divided into two groups; one group, the experimental group used the computer for instruction, and the other group, the control group, did not use the computer, but rather used traditional instructional methods. At the completion of the treatment, students took a posttest. These tests were then scored and analyzed.

The results of this meta-analysis indicated an improvement in student achievement when the computer was used for instruction or drill. In analyzing studies using elementary students, the effect size was .47 standard deviations higher in the computer use groups (Kulik et al., 1984). The studies dealing with grades 6-12 students showed an overall effect size of .32 standard deviations for the students that had used the computer (Kulik et al., 1983). Such an effect size indicates a small to moderate increase in performance (Hinkle, Wiersma, & Jurs, 1988).
Another review of the research was completed by Roblyer, Castine, and King (1988), using research completed in the 1980's. They, like Kulik, investigated studies that compared students who used computers and those who used traditional educational methods. The results of their meta-analysis indicated that computer applications were more effective than traditional methods, especially in the areas of mathematics and science. Also, of interest, Roblyer et al. found computer use to be more effective when used with low achieving students.

Niemiec and Walberg, in 1987, took meta-analysis one step further by publishing a synthesis of sixteen meta-analysis reviews of the research concerning computer-assisted learning. These reviews included studies that involved elementary, secondary, and college students. Most of the studies in the reviews included comparing student outcomes after using computer-assisted instruction (drill and practice and tutorials) with a control group (no computer use). Niemiec and Walberg concluded from the sixteen reviews or meta-analyses that CBI was effective, although moderately, with an overall effect size advantage of .41. The average effect of CAI was to move the typical student from the 50th percentile to the 66th percentile, a statistic the researchers considered a substantial, though not overwhelming advantage. One particularly interesting finding in this synthesis was the differences between main-frame-based studies and microcomputer-based studies. In general, microcomputer-based studies showed much larger effects at all age levels. The largest difference was at the elementary school level, where the micro-based studies produced an average effect size of 1.12, while the
mainframe-based studies produced an effect size of .38 (Niemiec & Walberg, 1987).

In the 1980's, several studies were conducted on the effectiveness of using computer programming languages, such as BASIC, Logo, and Pascal. Usually the studies were investigating cognitive outcomes, often dealing with problem solving skills. The results of these studies were often conflicting. A meta-analysis of 65 studies was conducted by Liao and Bright (1991). Each of these studies compared two groups of students. One group (experimental) received computer programming instruction and the other (control) did not receive programming instruction. Pre-post test gains were measured, with the testing being various cognitive-ability tests. The results of the meta-analysis indicated that 89% of the studies showed a positive effect size for the groups learning computer programming. An overall grand mean of the effect size for all studies involved was .41, which suggested that students having computer programming experiences scored about sixteen percentile points higher on cognitive-ability tests than students who did not have programming experiences (Liao & Bright, 1991).

Several researchers have investigated the use of a specific programming language developed at MIT, called Logo. Logo was a language usable by children, and was touted as being a vehicle to improve cognitive skills such as general problems solving (Maddux, 1993). Pea and Kurland (1983, 1984) conducted a series of research studies on the use of Logo and in general, concluded that learning to program in Logo did not improve problem-solving skills. But, other research has shown some positive effects of Logo use. In a meta-analysis by Roblyer, Castine, and King (1988), the reviewers
selected fourteen studies that they considered used sound conceptual practices and sound methodology. They concluded that these studies showed that the use of Logo did improve children's problem solving skills.

It should be noted that several researchers have questioned many of the studies included in these reviews of computer effectiveness in learning. Richard Clark pointed out that there were potential problems when studies compare computer use and non computer use. One specific problem was confounding, the uncontrolled effect of different instructional methods, content and/or novelty (Clark, 1985). He noted that most computer studies compare two groups of students, one who used the computer and one who did not. Clark, along with Gabriel Solomon (1981) went on to suggest the issue should not be which media (computer or traditional methods) is more effective, but rather what are the most effective instructional approaches to use with a media, in this case, the computer. C. D. Maddux identified media comparison studies as too "simplistic" (1993, p. 16). He also cites two weaknesses in many of these early studies. First, the exposure to the computer program was a short period of time, such as in the Pea and Kurland studies, and second, little if any attention was usually given to learner variables, or to teaching variables.

**Tool applications**

Tool software is the category of software currently receiving the most attention from educators (Maddux, 1993; Sheingold, Martin, & Endreweit, 1987). Tool software in the classroom setting, includes word processing, database, spreadsheet, desktop publishing, and graphics/drawing programs.
Vockell and Schwartz, in their book, *The Computer in the Classroom*, suggested that one of the beauties of computer tool applications is that they "facilitate routine tasks, therefore freeing teachers and students to engage in more profitable activities" (1992, p. 17) Another term for tools used in the literature is "cognition enhancer," a way to expand the capabilities of the student (Dede, 1988). When using the computer as a cognition enhancer, the user is empowered through a division of labor: the machine handles the routine mechanics of a task while the person is immersed in higher-order thinking. Examples of this type of activity include the use of a computer-assisted drawing program. The computer program allows the "painter" to use hundreds of colors, without the bother of hundreds of bottles of paint, but rather with an easy to use "palette of colors" right on the computer monitor.

The specific tool application most often used in schools was the word processor (Becker, 1990; Ely, 1992; Schmidt, 1992; Sheingold & Hadley, 1990). The advantages of using the computer for word processing included ease of entering, ease of editing and revising, use of spell checkers, use of thesauruses, and use of grammar checkers (Diaute, 1985).

Research studies in the area of writing with word processors have shown some mixed results (Grejda, & Hannafin, 1991). But in several of the studied with positive results, the students using a word processor showed improved revising, longer writing, and better writing (Grandgenett, Lloyd, & Hill, 1990/91; Grejda & Hannafin, 1991; Owston et al., 1991). The 1988 meta-analysis (Roblyer et al., 1988) found word processing as one of the most promising uses of computers. Daiute (1985) reported that middle level students using word processors were more likely to expand their compositions,
as well as correct errors, than were paper-and-pencil students. Other studies have found word processing students revised more, both for mechanics and higher level organizations, than control group students (Barber, 1984).

Several researchers have pointed out, however, that the use of a word processor alone will not improve student writing. The teacher is still one of the key elements in the effectiveness of instruction (Cooper, 1990; Maddux, 1992; Vockell and Schwartz, 1992). Teachers need to encourage students to view writing as a recursive process, with editing and revision as an integral part of the process of writing (Reynolds & Hart, 1990). Also, young writers need to have their writing read by others, both peers and mentors.

Other tool applications of the computer were also used in schools. Database and spreadsheet were shown to be powerful tools that help the user by making certain tasks much easier (Brady, 1991). Students used these tool software applications while learning to input, manipulate and/or manage data. The OTA report (1988) suggested that the manipulation of data was one of the areas of computer use with the most promise. In addition, these two types of applications have shown to be effective in the development of higher order thinking skills (Hannah, 1987; Watson & Strudler, 1988). In the Watson & Strudler study, students were observed as they participated in a computer data base activity designed to improve their higher-order thinking skills. These skills improved as the students progressed through the activity.

**Hypermedia, telecommunication, and video disk applications**

Several new or emerging computer-related technologies applications, such as hypermedia, telecommunication, and video disk have recently been
receiving attention in the literature. Educators have begun searching for effective uses for these applications. Most of the research that has been conducted on many of these applications is in its preliminary stages. In this section of this review, the three applications, hypermedia, telecommunication, and video disk, will be defined. Also, possible classroom uses, along with research findings for each application will be discussed.

Hypermedia has received a great deal of attention in the last five years. Hypermedia is the combining of several media (sound, text, graphics, video) in a non-linear format (Sheingold, 1990). Hypermedia programs, such as Hypercard, Linkway, and Hyperstudio, are authoring tools that allow teachers or students the flexibility to create programs to meet their needs. Educational technology futurist Christopher Dede (1987) defined hypermedia as the framework for non-linear representation of symbols. Marchionini (1988), believes hypermedia has the potential for new strategies of learning, studying, and creating. The ability to combine sound, text, graphics, and video, allows possibilities not available with text-based media. The learner often can select the media best suited for his/her learning. Along with the multimedia advantages, hypermedia is non-linear. This means that the user has much control of the learning environment. The direction and pathway of the lesson is chosen, at least in part, by the learner. This possibility has the capacity to change the responsibilities of both teachers and students (Dede, 1987; Marchionini, 1988).

The two basic uses of hypermedia in classrooms are instructional delivery and student projects. A study using hypermedia for instructional delivery was conducted by a team of educators from Vanderbilt, who designed
a project that used hypermedia to help students learn new information through meaningful activities delivered by the computer using hypermedia (Cognition and Technology Group at Vanderbilt, 1990).

There seemed to be three advantages for using hypermedia as an instructional delivery method. 1) The hypermedia lessons seem to motivate the learner more. They tend to engage learners more and make the content of the lesson more interesting. 2) The hypermedia lessons may be better suited for those who have difficulty learning by traditional methods. 3) The hypermedia lessons give individuals more control of the learning process (Allred & Locatis, 1988).

One concern of researchers has been that a student browsing in a hypermedia environment can become disoriented or overlook necessary information (Marchionini, 1988). Possible solutions to these problems have included the use of learning objectives and mapping devices (Heller, 1990, Moraiu, 1988). This research has shown a significant improvement in learning when these strategies are used in conjunction with hypermedia exploration.

Student generated hypermedia projects provide another way to use hypermedia in the classroom. Students can use hypermedia to collect, organize, and present information about a topic. Video cameras, scanners, and graphic applications can be used to make hypermedia "reports". Although the research on hypermedia projects is limited, a Rochester, NY, project, called "Discover Rochester", involving junior high students is one example. The purpose of the project was to develop thinking and problem solving skills. Students created a hypermedia product using Macintosh
computers and a hypermedia program called Hypercard. The student authors incorporating text, audio, graphics, video, music and maps into their products. This completed final product was then displayed in a local museum. The project resulted in improved student attendance and improved class participation (Sheingold, 1990b).

Another powerful use of the computer in education is telecommunication, which can be defined as using the computer to communicate to others at a distance. Using the computer in this manner has given educators a way of "breaking down the walls of the classroom" (Ely, 1991). Students can communicate with others, both adults and students, from around the world. Also, by using a network like Internet, students can transfer files from other computers, as well as investigate bulletin boards and on-line databases.

Educators have used telecommunications in many ways and in several different disciplines. In a study where seventh and eighth graders used a combination of telecommunications and word processing, the students began to write longer texts as they shared information with their partners in distant places (Newman, 1989). In addition, the students' attitudes toward writing and their language development were improved.

Kids Network and GTE activities, usually science experiments, have used telecommunication for several activities (Kurshaw & Harrington, 1991). In a 1991 study, involving 56 teachers and over 2,000 students, the use of National Geographic Society's Kids Network program was evaluated. This program allows students from around the world to participate in real science experiments, using telecommunications for communication. The results were encouraging, with teachers and students alike, benefiting from the experience.
Major strengths of the program included increased student global awareness and increased knowledge about scientific concepts and procedures.

Video disks are storage devices that combine video and audio, that can be used in conjunction with a computer or as a "stand alone" application. The advantage over videotape is the rapid access time to different parts of the video disk. While searching a certain segment of a video tape may require several seconds, maybe even minutes, to complete, any segment of the video disk can be searched within a few seconds. This quick availability of different segments of the video disk allows for efficient uses of video clips for instruction. At Vanderbilt University, a series of video disk lessons were developed to help students develop language arts and social studies content while involved in an environment using hypermedia and video disks (Cognition and Technology Group at Vanderbilt, 1990). The data indicated that in comparing student performance on student generated stories, the video disk group wrote stories that contained more story elements. This group wrote plots that were more likely to link character actions to goal statements and goal resolution, which was one of the objectives of the lesson. Results also indicated that low-achieving learners and students with little knowledge in the subject were the most positively affected by the treatment.

Future research trends in educational computer-related technologies

Many educational technologies researchers have begun to develop new schema and objectives for studies dealing with the effectiveness of educational computing (Willis, 1993). Instead of asking whether learning to use a specific computer application improved the performance or learning regardless of who
was taught and how they were taught, these researchers are asking "which and how learner and learner variables interact with teaching variables as they relate to specific dependent variables" (Maddux, 1993, p. 18). The questions to be answered include the age and ability levels most appropriate for using discovery teaching methods, and how different teaching methodologies affect learner performance. Maddux stated his beliefs simply by writing: "nothing miraculous happens automatically as a result of putting a child and a computer in the same room" (1993, p. 14).

In summary, educational uses of computers have become popular in the last two decades, and many studies have been completed researching the effectiveness of various applications of the computer. These studies have focused on computer use with various disciplines, with various age groups of learners, and with various teaching/learning styles. The results of many of the studies seem to indicate that computer use had a positive effect on learning.

The Role of Preservice Teacher Education in Preparing Future Teachers to Use Technology in Their Classrooms

With the greatly expanded use of computer-related technology in the K-12 schools, preservice teacher education programs must train their future teachers to use technology in ways that will enhance student learning, as well as prepare those K-12 students for lives in the twenty-first century (Berney, 1991). Teacher preparation programs have been criticized for not taking a lead in this area (Kaye, 1991). Some of the reasons this has not happened include lack of funding, lack of faculty consensus, and the slow decision
making processes in many institutions (George, 1991). "Teacher educators are faced with a two-headed monster. They must prepare future teachers for classrooms that will undoubtedly include technology, and in order to do this, they must also prepare themselves to use technology" (Novak & Berger, 1991b, p. 84). George (1991) stressed the fact that the preservice teachers of today will be teaching in the schools of 2025, and he questioned whether we are giving them the knowledge and methods that will work at that time. In a 1990 national survey, 81% of the student teachers surveyed rated their undergraduate preparation in technology use as inadequate (Fratianni et al., 1990).

The literature dealing with technology in preservice teacher education programs can basically be divided into the following areas: 1) The rationale behind including technology as part of the program, 2) the use of specialized classes, specifically dealing with computers and applications of computer-related technology in schools, and 3) the empowering of faculty to be able to integrate technology into existing general courses.

**Rational for including technology in preservice teacher programs**

Educational use of computer-related technology in K-12 schools is becoming an issue of change in schools around the country. During the 1980's, the number of microcomputers and computer terminals in U.S. schools increased over 2 million, more than a 50-fold increase, with approximately 300,000 added each of the last few years (Becker, 1991). Teachers were using the computer for many purposes, including drill, tutorials, simulations, and as a tool, to enhance the abilities of the student (Simonson & Thompson, 1990).
One of the biggest problems with computers in the schools is the lack of training of the teachers who use the machines in their classroom (Becker, 1990; Carlson, 1991; OTA Report, 1988). Teachers have felt uncomfortable with the new technology, and with that lack of confidence, have not used the machines to their potential. In a 1989 survey conducted by the IBM corporation, more than one-half of the teachers felt that their students were more computer literate than the teacher her/himself (Nelson, Andri, & Keefe, 1991). Also, 38 percent of the teachers surveyed felt that inadequate computer experience and training was one of the obstacles to their more effective use of computers in the classroom.

During the early 1980's, attention was placed on educating teachers, both practicing and future teachers, in the effective use of computers. Schools districts were demanding teachers who were computer literate (Carlson, 1991, Johnson & Maddux, 1991). "As preservice teachers leave their teacher preparation programs, they are often faced with the realities that school districts demand they use technology, parents expect them to use it, and students want them to use it" (Novak & Berger, 1991a. p. 89). At least twenty-three state boards of education have enacted mandates requiring preservice teacher programs to include technology training in the curriculum (Bullock, 1991, Novak & Berger 1991b). Several other states have considered such a requirement.

Two organizations, the International Society for Technology in Education (ISTE), and the National Council for Accreditation of Teacher Education (NCATE), have jointly written 12 goals for the educational computing and technology preparation of education programs that include
demonstrating knowledge about computers and the effective use of computers in classrooms. They are:

1. demonstrate knowledge and ability in the everyday operation of a computer system in order to successfully utilize software,
2. evaluate and use computers and related technology to support the instructional process in one's subject area,
3. apply instructional principles, current research, and appropriate instructional grading practices to the use of computers and related technologies,
4. explore and examine computer/technology-based materials in one's subject area, including experiences in using education application software and documentation,
5. demonstrate knowledge of uses of computers for problem solving, data collection, information management and decision making,
6. design and develop student learning activities that integrate computing and technology for diverse student populations,
7. evaluate, select and integrate computer/technology-based instruction in the curriculum of one's subject area and/or grade level,
8. demonstrate knowledge of methods for using multimedia and telecommunications activities to support instruction,
9. be skilled in using productivity tools for professional and personal use, including word processing, database, spreadsheet, introductory desktop publishing and print/graphics utilities,
10. demonstrate knowledge of equity, ethical, legal and human issues of computing and technology use as they relate to society and model appropriate behaviors,
11. use technology to access information and identify resources for staying current in application of computing and related technologies in education,
12. use computer-based technologies to access information to enhance personal and professional productivity (Wetzel 1992, p. 148).

These goals are not only focused on individual computer proficiency, but also, strategies and skills needed to incorporate computer-related technologies into learning and teaching. Many practicing teachers, as well as
future teachers do not have these skills. "It is apparent that the level of computer knowledge of current and future teachers must be improved, and the advantages of learning and teaching with computer must be made clear" (Nelson, Andri, & Keefe, 1991, p. 104).

Providing technology-specific courses

One of the methods of providing preservice teachers with experiences in computer-related technology has been the development and implementation of computer-specific courses. These courses were usually introductory in nature, with computer skills emphasized (Strudler, 1991). Often these computer-specific courses included how to use the technology, and strategies for using computer-related technology in classrooms. The actual modeling of teaching methods using technology was usually very limited.

Johnson and Harlow (1993) found that roughly 85% of the teacher training programs in the United States offered at least one course in educational computing and about 50% of the American teacher preservice programs required a computer-specific course. In an extensive survey of Michigan preservice institutions, it was reported that 95 percent of the schools offered at least one computer-related course, with some having as many as nine courses (Novak & Berger, 1991b). Twenty-five percent of the Michigan teacher programs required at least one technology-specific course for all education majors. Some schools reported having up to nine technology-specific courses, with many offering these types of courses at the graduate level.
These technology-specific courses range widely in content. Topics included in these courses included learning to use computers, memorizing terminology, learning to construct computer-assisted lessons, experiencing technology use in classrooms, operating systems, software evaluation and selection, introduction to programming, hardware evaluation and selection, classroom management, and computer ethics (Novak & Berger, 1991b; Wetzel, 1992).

Several specific examples of teacher preparation institutions using technology specific courses are included in the literature. Georgia Southern University has developed a course which has six competencies (Downs, 1992). These competencies include introduction to the computer, instructional uses of the computer, the computer as a tool of instruction, using the computer as a production tool, emerging technologies, and equipment operation. Also, Appalachian State University has a technology-specific class required of all education majors. The topics include word processing, database, spreadsheet, telecommunication, computers in the classroom, evaluation of the uses of computers, and concepts related to the use of LOGO and interactive multimedia (Tashner et al., 1991).

Although most preservice teacher institutions have implemented such a technology-specific course as a first step in the use of computers in their curriculum, some problems with technology-specific courses were identified by the Michigan survey. The problems include: 1) the curriculum of the preservice institution is very crowded, 2) the preservice students' schedules are also crowded, with little available time to take technology-specific courses, and 3) the faculty of the preservice teacher schools may view the course as
taking the burden off them. The faculty will "leave it up to computer specialist" to use and teach with technology, and integration and use by the general faculty may not take place.

Even with these difficulties, some educators believe the computer-specific course is needed. Maddux (1989) put it this way:

More teachers must acquire general computer competencies as well as pedagogical competencies before it will be realistic to move toward widespread integration. I believe that state departments of education must require at least one course in computer education, colleges of education must institute their own computer education graduation requirements, and school districts must offer quality inservice programs. (p. 36)

Integrating technology into general courses

Many authors suggest that these technology-specific courses should be an interim solution, which leads the preservice teacher institutions to integrating technology in all classes (Novak & Berger, 1991a; Strudler, 1991). "The technology-specific course should serve to fill the gap while teacher educators develop their own competence and confidence with technology, and then integrate it into their preservice instruction course" (Novak & Berger, 1991b, p. 86). This integration should transform the teaching and learning experience, including the active exploration of ways to facilitate learning, experimentation with new delivery systems, and modeling of progressive teaching methods using technology (Johnson & Harlow, 1993). The theme, "teachers teach the way they were taught," is the underlying theme behind using computer-related technology as a teaching tool in the preservice teacher

The results of the Michigan surveys of 1989 revealed that many teacher education faculty are ill-prepared to be technology-using role models (Novak & Berger, 1991a). Other research finds this true at the national level as well. In their national survey of teacher preservice institutions, Johnson and Harlow (1993) found only five percent of the institutions integrated technology successfully into the teacher education curriculum. They concluded that the future teachers receiving training in technology are receiving it in a very isolated manner.

Although not widespread, several universities are integrating technology into the teacher preservice curriculum. Southern Illinois University has focused on the integration of technology. This commitment, a departure from a more traditional approach to teacher education, requires a number of people to become involved. Faculty and administration met and discussed the issues, problems, and possible solutions. Computer-using faculty were identified, and encouraged to become a part of the development stages. The non-using faculty members were involved by encouraging or requiring students to use word processors and other tools for assignments. Also, all faculty were encouraged to volunteer a minimum of eight hours of their class time each semester to focus on computer instruction. Workshops were held for faculty, as well as the purchasing of equipment to help facilitate the transition to a technology-rich environment. At this time, Southern Illinois University has not evaluated these changes, although the reactions
have been positive, both by students and faculty (Nelson, Andri, & Keefe, 1991).

Another example of integration into all curriculum is at Northern Arizona University. They have implemented a plan involving integration of technology into courses, as well as training staff members on uses of computer technology. Each faculty member was encouraged to include one personal technology component in their 1991 fall growth plans, plus one technology-oriented instructional component in their course syllabi. They have reassigned a staff member to a position called the Coordinator of Instructional Technology, who was charged with the responsibility to gather information and form alliances for cooperative planning, grant writing, and sharing of expertise and equipment (Gunn, 1992).

Schools, such as George Mason University and Spalding University have focused their attention on integrating technology in some or all of the classes offered in their teacher preparation curriculum (Young, 1991; White, 1991). Northwest Missouri State University has developed a plan for constructing instructional units using technology. The four phases of their plan includes 1) a search of the literature to summarize the technology-based educational practices in K-12 schools, 2) a determination of the facilities, hardware and expertise available on the campus, 3) a survey of teacher education faculty to determine what technology was being used by the faculty, and what technology was being taught in educational methods courses, and 4) selection of interested faculty to help develop a unit of instruction for each of their courses, using technology that is already available on campus (Fero, 1992).
Although this approach is being encouraged, very little formal evaluation of its effectiveness has taken place. Evaluation is planned in many models, including the recommended model developed from the Michigan survey (Novak & Berger, 1991b). Berney (1991) suggested evaluation should be an integral part of both technology-specific courses and the technology integration-rich general courses. As plans are implemented, evaluation should be an important part of developing a technology-rich experience for preservice teachers.

In addition to the technology-specific courses and the encouragement of technology integration in other education courses, many teacher preservice institutions are trying to provide the teaching faculty with the equipment and training to use technology effectively. This training is important because most of the university/college teachers have not been previously educated in the use of computer-related technology.

Three elements seem to be key in the increased use of technology. First, the equipment must be available for both faculty and student use (Johnson & Harlow, 1993; Novak & Berger, 1991a). A computer on the faculty member's desk is one of the first steps in using the computer in teaching. When the computer becomes a necessary tool for the teacher, then the use in the classroom is the next logical step (Johnson & Harlow, 1993). In addition, if computers are to be used for class purposes, a facility that will accommodate such activity is necessary (Gunn, 1992). Many teacher preservice schools have made a major effort to acquire the equipment needed to furnish computer labs that can be used both by students for homework, as well as whole-class activities.
The second element involved in teacher empowerment with technology involves training. Because of the stature of the higher education faculty member, it is often assumed that they need little training in the use of something new, in this case, computers. This seems to be untrue, and the training and subsequent support and coaching are vital if effective use of technology in higher education is going to take place (Wetzel, 1992). Some teacher preparation schools have assigned a staff member to facilitate the training and coaching, while others have acquired the services of outside sources to begin the training, and are using existing staff for the on-going support.

Encouragement to include technology in courses is the third element of staff empowerment. Faculty members need to feel that they are being supported, as well as encouraged to try to use and model teaching techniques that include efficient uses of technology (Nelson, Andri, & Keefe, 1991; Novak & Berger, 1991b). Some universities have included the integration of technology into classroom teaching as a part of the faculty growth formula (Gunn, 1992). The perception that using technology in teaching is expected, is important in the continued increase of educational technology use in teacher preservice programs.

Summary

The use of technology to improve the learning of students is a goal of many teacher education programs. One way of reaching this goal can be improved technological training of preservice teachers in higher education settings. From reviewing the literature, it appears that the reasons this is
necessary are clear: 1) our society is information-based and technology is a vital part of this society, 2) with our current knowledge of learning and teaching, especially with the assistance of technology, learning can be improved with the use of the new tools and techniques, and 3) K-12 schools are using computer-related technology more and more, and future teachers are now expected to have the skills to use technology in their teaching.

The technology-specific course is one way of exposing the preservice teacher to the computer and its uses in the classroom. But, many feel that these courses should be an interim solution, with the full integration of technology in all teaching as a final solution.

The modeling of technology-rich teaching by university faculty, is the current goal of many teacher education programs. The idea that "teachers teach as they were taught" is a driving force for this concept. Preservice teacher students need to experience learning and teaching with computer-related technology before they can effectively use it in their own classroom.

In order for increased technological experiences by preservice teachers, faculty must become comfortable and knowledgeable about using technology in a variety of ways, including integrating technology in their teaching methods. The faculty must have the equipment available to them and their students, must be trained and encouraged to use technology, and they must understand there is an expectation that technology should be included in teaching.

Many changes in preservice teacher education are necessary if future teachers are to effectively teach the students of the twenty-first century. One
important change is the inclusion of computers and other technology in teaching and learning at all levels of schooling.

Summary

In this chapter, literature on computer-related technologies in preservice teacher education, as well as computer use in K-12 schools, was reviewed. This review included a history of school computer use, research on the effectiveness of computer-related technology use in K-12 schools, and trends in teacher education programs concerning preparation of future teachers to use computer-related technologies in their teaching.

The focus of this study will deal with teacher preservice experiences and teacher computer proficiency, frequency of use, interest in using, and attitude. The next chapter will describe the methodology used in this study.
III. METHODOLOGY

In this chapter, a description of the procedures and methods used in this study will be presented. Topics included are: 1) subjects, 2) instruments, 3) data collection, 4) research design, and 5) data analysis.

The Subjects

Iowa teachers who graduated from Iowa State University from 1986 to 1990 were sent the data collection survey. A list of 1986-1990 teacher preservice graduates and their addresses was obtained from the Iowa State University Alumni Office. The 1600 entries on the list included all Iowa State graduates who had received a bachelor's degree and had been in the teacher education program during their undergraduate experience. The accuracy of the addresses on this list was unknown, although past studies indicated a better than 75% accuracy rate.

In addition, a list of Iowa teachers was provided by the Iowa Department of Education. This list included all K-12 Iowa teachers for the school year 1991/1992, who had received a degree from Iowa State University. Three-thousand, one-hundred and thirty-seven teachers' names, school names in which the teacher had started the 1991/1992 school year, along with the school address and telephone number were included on this list. Note that this list included teachers of all ages, and that the information was from the previous school-year.

These two lists were cross-checked and 403 names were on both lists. For two reasons, it was initially decided to send the survey to the home
address on the Iowa State University Alumni Office list. First, in case the subject had moved in the last twelve months, the survey sent to a home address would more likely be forwarded than if sent to a school address, and second, it was believed that a busy teacher may be less likely to complete the questionnaire at school, as compared to home. As the mailing procedure was in process, a decision was made to sent 56 of the subjects' surveys to school addresses because of incomplete or apparently incorrect home addresses.

One-hundred thirty-five subjects returned completed surveys and answer sheets. Three surveys were returned only partially completed by respondents and data from these surveys were included in the results.

The Instruments

Two instruments were used to gather data, a questionnaire and a telephone interview. The questionnaire was sent to 408 subjects and a telephone interview was conducted on 50 of the subjects not responding to the questionnaire.

The questionnaire titled "Survey of K-12 Computer-Related Technology Use by Iowa State Graduates"

The questionnaire titled "Survey of K-12 Computer-Related Technology Use by Iowa State Graduates" was developed by the researcher, with much input from various sources. After selecting a research topic, several meetings were held with the researcher and two Iowa State University faculty members. They included the chair of the Department of Curriculum and an instructor in the Department of Curriculum and Instruction who was the
author of the 1991 Iowa Survey. The purposes of the research project were discussed and objectives for the survey process and the survey itself were developed.

The first objective was to gather personal information about the respondent. With this in mind, the first part of section one included items dealing with gender, age, general computer use and access, and teaching experiences. The second objective was to find out about the respondents' teacher preservice experiences, including courses taken and student teaching experiences. These items were also incorporated into section one of the survey.

Another objective was to gather information from the respondents that would give the researchers a picture of teachers' computer use and attitudes. The two Iowa State faculty members had been involved in an extensive survey of Iowa teachers in 1991, and it was decided that portions of that survey, the "Iowa Survey of Computer-Related Technology Use by K-12 Teachers" (Schmidt, 1991) could be adapted to met the objectives of this study. The main topics that were deemed most useful to this study were: teacher proficiency of using computers-related technologies, teacher interest in using computers-related technologies, teacher frequency of using computers-related technologies, and teacher attitude toward computer-related technologies.

A draft of the survey was completed and given to the researcher's graduate committee, as well as the Dean of the College of Education at Iowa State University, for their input. After considering their suggestions, the second draft was written. The main additions to this draft were suggested by the Dean. She suggested two items be added to the survey, one item that
would ask graduates to rate their teacher preservice computer preparation, and one item to ask the respondents to rate the importance of computer-specific courses in teacher education programs. It was decided to add the two items requested by the Dean, plus one more item that would ask the teachers to select the most important topic of a teacher preservice computer-specific course. A second draft of the survey was completed with these additions.

This second draft of the survey was piloted by an Iowa State University graduate class containing 19 graduate students, many of whom were practicing teachers. The respondents not only completed the survey, but also made written and oral suggestions. Minor changes were made on the survey using these suggestions. These revisions included clearer instructions, simpler formatting, and more precise tags for the likert-type scales.

The completed survey contained 102 questions. The first 100 questions were answered by the respondent on a general purpose National Computer System, Inc. answer sheet containing spaces for 200 responses with five choices per question. The last two questions on the survey were open-ended questions that were to be answered by writing on the questionnaire.

The four main sections of the survey were as follows: (Section One) general respondent information, (Section Two) teacher computer use, (Section Three) teacher attitude toward computers, (Section Four) respondent rating of preservice computer preparation. A sample survey is included in Appendix C.

Section One contained 24 general information questions about the respondent, including gender, age, general computer use and access, and teaching experiences. Also, questions were included dealing with the respondent's teacher preservice experiences such as the year of graduation,
whether the Iowa State course called Secondary Education 101 was completed, the number of completed computer-specific courses, grade point average, the accessibility of a computer, the amount of technology witnessed during student teaching, and some opinions regarding preservice computer-specific courses.

The three parts of section two were 1) proficiency in using computer-related technologies, 2) interest in using computer-related technologies for instruction, and 3) frequency of use of computer-related technologies in the classroom. This section of the questionnaire was adapted from the "Iowa Survey of Computer-related Technology Use by K-12 Teachers" (Schmidt 1991).

In parts I & II of section two, the proficiency and interest portions of the Iowa survey were used verbatim, with the exception of a change in the likert-type scale. To give respondents more choices, this survey used a five option likert-type scale, while the Iowa survey used a four option likert-type scale. In this portion of the survey, teachers were asked to rate their proficiency and their interest in using computer-related technologies instructional applications. The respondents used the following likert-type scale to answer the 17 items on their proficiency in using various computer-related technologies:

A. Unfamiliar - I do not know what this item is.
B. None - I have no proficiency. I know what this item is, but do not know how to use it.
C. Low - I have a little proficiency with this item.
D. Medium - I have some proficiency with this item, but could use some
advanced training.

E. High - I am very highly proficient with this item.

In Part II, teachers responded to the 17 questions about their interest in using different types of computer-related technologies based on a likert-type scale with the following values:

A. Unfamiliar - I do not know what this is.
B. None - I have no interest in using this in my classroom or computer lab.
C. Low - I have little interest in using this in my classroom or computer lab.
D. Medium - I have some interest in using this in my classroom or computer lab.
E. High - I am very interested in using this in my classroom or computer lab.

In part III of section two, the respondents reported their frequency of using various types of computer-related technologies. This portion of the survey was taken from the 1991 Iowa survey verbatim. The topic, teacher frequency of computer use had been included in several previous national surveys (Becker, 1985, 1986, 1990). The teachers' responses were reported in a likert-type scale with the following values:

A. Unfamiliar - I do not know what this terminology means.
B. Never
C. Sometimes (1-4 times per year)
D. Often (5-10 times per year)
E. Very often (more than 10 times per year)

Section Three focused on teacher attitude toward computers and computer-related technologies. The 23 items were designed to reveal the attitudes of the respondents concerning computer use personally, as well as attitudes concerning computer use in classrooms. The questions in this section were similar to the Iowa survey questions. Respondents indicated to what extent they agreed or disagreed with each item using the following five-point agreement scale as explained by Henerson, Morris, and FitzSimmons (1978, p. 86-88):

A. Strongly Disagree
B. Disagree
C. Undecided
D. Agree
E. Strongly Agree

In order to collapse the items in this section into a manageable number of variables, a rotated varimax factor analysis was conducted to measure the unifying concepts that characterized the responses of the twenty three attitude items. From this analysis, three factors emerged. Items with a loading above .40 were kept in each factor. The items in the first factor related to teacher confidence toward using computer-related technologies. The items listed for the second factor related to teacher general attitude toward computer-related technologies and the items of the third factor related
to teacher attitude toward the necessity of computer-related technologies in education. A descriptive list of the items included in each of the attitude factors is included in Appendix A. The item numbers and their loading included in each of three factors were as follows:

**Factor 1:** teacher confidence toward using computer-related technologies - item #78, (.74); item #79, (.57); item #81, (.79); item #84, (.81); item #95, (.76).

**Factor 2:** teacher general attitude toward using computer-related technologies - item #80, (.67); item #92, (.47); item #93, (.60); item #94, (.66); item #97, (.74); item #98, (.47); item #99, (.76).

**Factor 3:** teacher attitude toward the necessity of computer-related technologies in education - item #77, (.45); item #83, (.70); item #89, (.69); item #90, (.65); item #96, (.55).

The eigenvalues for each factor are included in Table 1.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>Percent of Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Teacher confidence toward using computer-related technologies</td>
<td>7.04</td>
<td>30.6</td>
</tr>
<tr>
<td>2. Teacher general attitude toward using computer-related technologies</td>
<td>2.53</td>
<td>11.0</td>
</tr>
<tr>
<td>3. Teacher attitude toward the necessity of computer-related technologies in education</td>
<td>1.41</td>
<td>6.1</td>
</tr>
</tbody>
</table>
A Cronbach alpha reliability coefficient was obtained for each of the three attitude factors, in order to test the internal consistency of these items on the instrument. The reliability coefficients for the three attitude factors were as follows:

**Factor 1:** teacher confidence toward using computer-related technologies, $r = .87$

**Factor 2:** teacher general attitude toward using computer-related technologies, $r = .83$

**Factor 3:** teacher attitude toward the necessity of computer-related technologies in education, $r = .56$

These coefficients are within the range (.47-.98) of generally accepted standard attitude scales (Borg & Gall, 1989).

Section Four was a brief section of the survey containing three items. The first item was designed to encourage the respondent to rate Iowa State's teacher preservice preparation program in the area of educational computer-related technologies. The rating was given on a likert-type scale as follows:

A. Very Inadequate
B. Inadequate
C. Adequate
D. More than Adequate
E. Outstanding

In the next item, the respondents were asked to describe their major reasons for their rating. This item was in an open-ended format. A space was
provided for several lines of writing for the response, along with the suggestion that another sheet of paper could be used if necessary. Also, an item designed to encourage suggestions, comments, and concerns was included in this section, along with space for several lines of writing.

The validity of a survey instrument must be considered in all survey research (Borg & Gall, 1989). One of the ways to assess the content validity of a questionnaire is to have experts familiar with the purpose of the survey examine the items to determine whether they measure what they are said to measure. As noted earlier, professors who were teachers and researchers in the area of educational computing, were asked to comment on the accuracy of the survey for measuring the desired questions. After studying the survey, these seven educators assured the researcher that the questions seemed appropriate and would be an accurate measure.

The Telephone Interview

In survey research, when lower than desired response rate to the written survey is received, it is suggested that a telephone interview of a random sample of the non-respondents be conducted (Brownell, 1993). This interview should contain sample items from the written survey. With this in mind, a telephone interview was conducted with 50 subjects who had not returned the written questionnaire. There were two purposes of the telephone interview process. One was to help estimate the number of actively teaching subjects who actually received the survey packets. The other purpose was to be able to compare responses from similar questions obtained from both the
written survey respondents and the telephone interview respondents (a random sample of the written survey non-respondents).

A member of the research team tried to call 50 randomly-selected survey non-respondents. The researchers did not have access to the subjects' home telephone number, so the phone calls were placed to the school telephone number, as provided by the Iowa Department of Education. The respondent was asked if he/she would be willing to participate in the short telephone interview, and was assured that all individual information gathered would be kept confidential. The interviewer asked twelve questions and recorded the response on an answer sheet. The first five questions dealt with personal demographics and teacher preservice experiences. The last seven questions focused on the respondent's interest in using computer-related technologies in his/her classroom. The selected items were chosen from the interest section of the survey because many feel the primary goal of teacher preservice programs should be to spark an interest in its graduates to use computer-related technologies in effective and efficiency ways (Strudler, 1991). These seven questions focused on areas of computer-related technologies that were directly covered in the Iowa State course, Secondary Education 101. All twelve questions were taken directly from the written survey, so the information could be compared with the written questionnaire respondents' responses. A text of the telephone interview is included in appendix E. The written survey items included in the phone interviews were as follows: #7, #11, #12, #14, #21, #45, #46, #47, #48, #49, #50, and #56. After completion of the interview, the interviewer coded the answers on a general purpose National Computer System, Inc. bubble sheet.
Data Collection

Before sending the questionnaire to subjects, the Iowa State University Committee on the use of Human Subjects in Research approved the study. A copy of the approved human subjects form can be found in Appendix B. The survey and cover letter were printed by the Iowa State University Copy Center.

The questionnaire "Survey of K-12 Computer-Related Technology Use by Iowa State Graduates" (Appendix C), along with a bubble answer sheet, a cover letter and a postage-paid, business reply envelope, were sent to 408 subjects on October 29, 1993, from Iowa State University in Ames, Iowa. Each survey was assigned an identification number for the purpose of monitoring the rate of return. The survey respondents were asked to complete the bubble answer sheet, along with the open-ended questions to be answered on the survey, and return both the survey and answer sheet in the business reply envelope provided. Two weeks after the initial mailing, 289 reminder post cards asking the subjects to complete the survey and mail their responses, were sent to non-respondents. Eleven surveys were returned uncompleted, either by a family member or roommate of the subject, explaining the subject no longer was at that address, or by the subject, him/herself stating that he/she was no longer teaching. Of the remaining 397 possible subjects, 135 (34%) returned the completed survey and answer sheet.

The telephone interview process began on February 11 and was completed February 22, 1993. Of the 50 random selected written survey non-respondents, 33 (66%) agreed to complete the interview. Six (12%)
respondents declined to participate, and eleven (22%) respondents had moved or were no longer teaching in the area.

As noted earlier, one of the objectives for the telephone interview process was to get a profile of the survey non-respondents. If the telephone interview sample was typical of the whole group, the data from the telephone interview would suggest that about 15% of the original subjects did not receive the survey mailing or were not actively teaching. Therefore, only about 342 teachers received the mailing, which would make the written survey return rate about 40% of the total delivered surveys.

Another objective of the telephone interview process was data comparison of survey respondents and survey non-respondents. When comparing the data from both the written survey and the telephone survey, there were very small differences on the demographic questions, and no significant difference in the mean scores of the interest in using computers items (Table 2 and Table 3). This would seem to indicate that the written survey respondents are representative of the population.

Table 2. One-way ANOVA for the average difference in telephone interview responses and written survey responses on corresponding computer interest items

<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>1</td>
<td>.4482</td>
<td>.4482</td>
<td>.7821</td>
<td>.3778</td>
</tr>
<tr>
<td>Within Groups</td>
<td>166</td>
<td>95.1172</td>
<td>.5730</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3. Comparison of corresponding responses from written survey respondents and telephone interview respondents

<table>
<thead>
<tr>
<th>Item</th>
<th>Written</th>
<th>Telephone</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed SecEd 101</td>
<td>43.7%</td>
<td>45.5%</td>
<td>+1.8%</td>
</tr>
<tr>
<td>Use a computer in teaching</td>
<td>85.2%</td>
<td>87.9%</td>
<td>+2.7%</td>
</tr>
<tr>
<td>Mean - number of computer courses taken in preservice program</td>
<td>1.96</td>
<td>1.97</td>
<td>+.1</td>
</tr>
<tr>
<td>Mean - number of times respondent witnessed computer use during student teaching</td>
<td>2.27</td>
<td>2.55</td>
<td>+.28</td>
</tr>
<tr>
<td>Mean - interest in using problem solving</td>
<td>4.30</td>
<td>3.73</td>
<td>-.57</td>
</tr>
<tr>
<td>Mean - interest in using simulation</td>
<td>4.13</td>
<td>4.24</td>
<td>+.11</td>
</tr>
<tr>
<td>Mean - interest in using word processing</td>
<td>4.44</td>
<td>4.24</td>
<td>-.20</td>
</tr>
<tr>
<td>Mean - interest in using data base</td>
<td>3.64</td>
<td>3.70</td>
<td>+.06</td>
</tr>
<tr>
<td>Mean - interest in using spreadsheet</td>
<td>3.54</td>
<td>3.36</td>
<td>-.18</td>
</tr>
<tr>
<td>Mean - interest in using data base</td>
<td>3.84</td>
<td>3.70</td>
<td>-.14</td>
</tr>
<tr>
<td>Mean - interest in using hypermedia</td>
<td>2.99</td>
<td>2.76</td>
<td>-.23</td>
</tr>
<tr>
<td>Mean - all interest items common to both the telephone interview and the written survey</td>
<td>3.81</td>
<td>3.68</td>
<td>-.13</td>
</tr>
</tbody>
</table>
Research Design

This survey research included multiple dependent and multiple independent variables. The dependent variables included main categories of teachers' responses concerning computer related technology. They were frequency of use, level of interest, level of proficiency, and attitude, plus a variable called computer use profile, that included a combination of frequency, interest, and proficiency. Also, specific types of computer-related technology use, such as tool use, higher-order thinking skills/problem-solving development, and emerging developments, such as laser disk usage, were investigated within several of these categories. In addition, a section on teacher opinions concerning their preservice preparation was included.

The independent variables were the respondents' preservice education factors, personal factors, and teaching experience factors. Specifically, the following variables were used:

Preservice education experiences: year when receiving teaching certificate, completion of SecEd 101, number of computer courses completed, grade point average, daily access to a computer, amount of modeling of technology by instructors, amount of technology witnessed during student teaching, and amount and type of computer use in high school.

Personal: gender, age, computer ownership

Teaching experiences: grade level, years of teaching experience, access to computer and LCD
Written Survey Data Analysis

The completed answer sheets were scored by the Iowa State University Test and Evaluation Center, and the data were sent electronically to the researcher's account on one of the Iowa State mainframe computers. The statistical analysis program, SPSS, was used to analyze the data.

Before the data were analyzed, nine attitude items that were negatively worded were reversed scored (i.e. 1=5, 2=4, 4=2, 5=1) using the recode procedure in SPSS. The item numbers of the nine attitude items that were reversed scored were #77, #81, #82, #84, #88, #90, #95, #96, and #98.

Five new variables were calculated to facilitate the answering of several of the research questions. These variables were designed to provide a computer-related technology profile score for the respondents. A panel of five experts were asked to help design these variables. The panel included three faculty members from the Department of Curriculum and Instruction at Iowa State University, one faculty member of the Department of Teacher Education from the University of Nebraska at Omaha, and one faculty member of the Department of Curriculum and Instruction from the University of Nevada at Las Vegas. These five professors were asked to rate the computer-related technology use items, according to the importance of each item in rating a teacher's effective computer use. After receiving the opinion of the panel of experts, the following variables were calculated: proficiency of use mean, the mean of items #28 through #41; interest in using mean, the mean of items #45 through #58; frequency of use mean, the mean of items #61 through #76; general computer use profile mean, the mean of the three variables named above, proficiency of use, interest in using, and frequency of use. In addition,
an attitude mean was the calculated. Given the eigenvalues of the three factors (Table 1), only the responses from factor 1 were used in this mean. The items included were #78, #79, #81, #84, #86, and #95.

The data from the survey response were analyzed in several ways. First, to help answer question #1, which dealt with descriptions of the ratings of the respondents, descriptive statistics such as frequency, mean, mode, and standard deviation were calculated for each variable.

In reference to research question #2, which dealt with relationships of variables, a Pearson product-moment correlation was calculated using the "Correlation" procedure of SPSS. This correlation matrix provided information showing the relationships between the independent and dependent variables. Then cases were sorted and the file split by the year the teaching certificate was received, and the correlation matrix was once again calculated.

To identify predictors as stated in questions #3a through #3e, a multiple regression was computed using each of the five dependent variables: frequency of computer use mean, computer proficiency mean, computer interest mean, general computer use profile mean, and computer attitude mean. The independent variables used in the regression included the number of computer-specific courses completed and the number of courses computer-related technologies were modeled in by the instructor in college.

To investigate questions #4a through #4e, the respondents were divided into three groups based on the basis of the variable, computer proficiency mean; three groups based on the variable, computer interest mean; three groups based on
the variable, computer attitude mean; and three groups based on the variable, general computer use profile mean. One group, the **high group**, included approximately 25% of the respondents with the highest scores. A second group, the **low group**, included approximately the 25% with the lowest scores, and a third group, the **middle group** included the remaining 50%.

A discriminate analysis was employed to discriminate between the high and low groups on the basis of a set of variables that included gender, the amount of technology witnessed in student teaching, the number of computer-specific courses completed, and the access to a computer daily during college. These analyses were used to find attributes that can be used to predict high computer-related technology frequency of use, proficiency, interest, and attitude of preservice teacher students when they become practicing teachers.

**Summary**

In summary, survey methodology was used in this study to answer the research questions. Included in this chapter were descriptions of the subjects, instruments, data collection, research design, and data analysis procedures.

On October 29, 1992, a survey containing 102 questions was sent to 397 teachers who graduated from Iowa State University during the years of 1987 to 1990. This survey included questions dealing with six topics: 1) general information about the respondent, 2) self-rated proficiency in using computer-related technologies, 3) interest in using technologies in teaching, 4) frequency of use of computer-related technologies, 5) attitude concerning computers, and 6) evaluation of preservice experiences dealing with the use of computer-related technologies in teaching and learning.
In February of 1993, researchers attempted to contact a random-selected sample of 50 of the survey non-respondents. Of the 50 contacts, 33 completed the telephone interview. The result indicated that the written survey respondents were similar to the non-respondents, both in their preservice activities and interest in using computers.

After the data were collected, it was analyzed in several ways, in order to help answer the research questions dealing with teachers' computer proficiency, interest, frequency of use, and attitude, as well as preservice experiences. This study was designed to describe, find relationships, and predict.
IV. RESULTS AND FINDINGS

In this chapter, an analysis of the data gathered from the questionnaire, "Survey of K-12 Computer-Related Technology Use by Iowa State Graduates" is presented. The data summarized below includes a description of the respondents and the findings that address the research questions presented in Chapter 1. The responses from the respondents of the survey were used to compute statistical analyses that describe, find relationships, and search for predictors.

The descriptive information about respondents included: (1) personal demographic information; (2) teaching experiences information; (3) teacher preservice information; (4) opinions concerning undergraduate computer-specific courses; (5) evaluation of the preservice educational computer-related technologies preparation; (6) proficiency in using computer-related technologies; (7) interest in using computer-related technologies; (8) frequency of using computer-related technologies; and (9) attitude toward computer-related technologies.

Description of the Respondents

One of the purposes of section one of the questionnaire was to obtain descriptive information about the 135 respondents. The demographic information showed that 74.8% were female and 25.2% were male. Most of the teachers (41.5%) were 25 to 27 years old, with 32.6% reporting an age of 28 to 30 (Figure 1). The other age groups were less well represented, with the 30 to 35 year old category including 10.4% of the respondents, the over 35
The number of respondents under age 25 was very small (1.5%). It should be noted that the subjects who were asked to participate in this questionnaire, were teachers who had graduated from college from two to six years before the survey was completed. A "traditional" college graduate would be a person who graduated from high school at age 18 or 19, and completed college in 4 to 5 years, therefore they would be about 22 to 24 years of age at graduation. Thus 24.5% of the subjects could be considered "non-traditional" students.

Two questions on the survey dealt with general computer use and computer ownership. A very small proportion (2.2%) of the teachers stated...
that they had no experience with a computer. Less than one-half (43.7%) of the respondents, had a computer in their home. This is about eight percentage points higher than reported by the Iowa teachers in 1991.

Teaching Experience Information

Over half (51.1%) of the teachers were elementary teachers, 19.3% were middle level teachers, and about one-fourth (25.2%) of the respondents were high school teachers (Figure 2). A small proportion (4.4%) of the responding teachers taught in the complete grade range from K-12. These teachers were probably music teachers, art teachers, physical education teachers, counselors, media specialists and computer coordinators.

![Figure 2. Grade levels taught by respondents](image)

Grade level taught

Elementary  51.1%
Middle/ Junior High  19.3%
High School  25.2%
K - 12  4.4%
Figure 3 presents the years of teaching experience of the respondents. Forty percent of the respondents had taught for five or more years and 34.8% reported teaching four years. The others reported their experience as three years (21.5%), two years (3%), and one year (.7%).

A large majority (85.2%) of the subjects reported using a computer in their teaching. About the same percentage (86.7%) said that they had access to a computer daily to use with students in their school. See Figure 4. Only 25.2% have access to a LCD (liquid crystal display) daily in their school. The LCD is a valuable tool when using one computer with whole class instruction.
Figure 4. Respondents' daily access to a computer and LCD

Teacher Preservice Experiences

The survey contained a group of questions asking about preservice experiences. Figure 5 presents the year that the respondents received their teaching certificate. Almost 18% receiving their certificate in 1986, with one-quarter in each of the years 1987 (24.4%), 1988 (25.9%) and 1989 (23%). A smaller percentage (8.9%) reported 1990 or later as the year that they received their teaching certificate from the state of Iowa (Figure 5).
The respondents reported their grade point average using a four point scale. The largest percentage (43.7%) had a GPA range of 3.0 to 3.49, while 27.7% were in the highest range of 3.5 to 4.0. About one-fourth (25.2%) reported a 2.5 to 2.99 and only 2.2% under 2.5.

Less that one-half (43.7%), completed the Iowa State University course, Secondary Education 101, entitled "Educational Applications for Computers". This is about the same proportion of the total education students who completed this course. About this same percentage (45.2%) reported not taking any computer-specific courses in their undergraduate work (Figure 6).
About one-third (30.4%) completed one course, 12.6% completing two courses, and a small percentage (7.4%) completed three courses, and even less (4.4%) completed four or more courses.

**Teacher Computer-Related Technology Use**

The first four research questions, 1a through 1d, addressed teachers' computer-related technology use. The specific topics included 1) proficiency in using, 2) interest in using, 3) frequency of using, and 4) attitude toward using.
Teachers' proficiency in using computer-related technologies

Question number 1a was stated as follows: How do Iowa teachers, who are recent college graduates, rate their own proficiency in using various computer-related technologies, and how does their rating compare to Iowa teachers' 1991 rating?

There were seventeen items on the survey measuring teachers' proficiency in using computer-related technology applications. The likert-type scale was as follows: 1 = Unfamiliar - I do not know what this item is; 2 = None - I have no proficiency. I know what this item is, but do not know how to use it; 3 = Low - I have a little proficiency with this item; 4 = Medium - I have some proficiency with this item, but could use some advanced training; and 5 = High - I am very highly proficient with this item. These seventeen items were grouped into three categories: computer based instruction (e.g. drill and practice, tutorials, educational games, simulations); computer tool software use (e.g. word processing, databases spreadsheet, desktop publishing, graphics); and other computer-related technology applications (e.g. hypermedia, telecommunication, video disk). All proficiency items had a range of responses from one to five.

The mean for the responses dealing with computer based instruction was 3.64; this mean indicated that teachers rated their proficiency between "Low" and "Medium". The highest mean response in this category was 4.04 for education games. The next highest was drill and practice at 3.93. The other three items were very close in mean response, with tutorials at 3.50, problem solving/higher order thinking at 3.42 and simulations at 3.32 (Figure 7).
3.93
Drill and Practice

3.50
Tutorials

4.04
Educational games

3.42
Problem solving

3.32
Simulations

1 = Unfamiliar - do not know what item is
2 = None - no proficiency
3 = Low - little proficiency
4 = Medium - some proficiency
5 = High - very proficient

Figure 7. Mean responses of respondents for proficiency in using computer based instruction
The second group of proficiency responses dealt with computer tool software. The mean for these applications was 3.44, which was just .2 lower than computer based instruction. Word processing was the application with the highest proficiency rating, 4.40, which indicated the mean rating was between "medium - I have a little proficiency with this item, but could use some advanced training," and "high - I am very highly proficient with this item." The other four items were rated about equal with each other and much lower than word processing. Their ratings were: graphics/drawing programs, 3.26; databases, 3.24; desktop publishing, 3.16; and spreadsheets, 3.15 (Figure 8). These ratings were between "low - I have a little proficiency with this item," and "medium - I have some proficiency with this item, but could use some advanced training."

The applications in the "other" category include seven items, some were considered new or emerging computer-related technologies, such as telecommunications, distance learning, hypermedia, CD ROM, and videodisks. Two other types of applications in this group included teacher utilities and programming. The category mean was 2.30, which meant a rating between "none - I have no proficiency," and "low - I have a little proficiency with this item." Figure 9 shows the mean responses. Teacher utilities and programming were the highest, (2.94 and 2.44), with the new or emerging technologies having a lower rating. A mean rating of 2.40 was given for videodisk proficiency, followed by CD ROM at 2.33, telecommunication at 2.19, and hypermedia at 2.10. Distance learning was rated the lowest proficiency of this category, as well as all applications, at 1.67, which is between "unfamiliar" and "none." In each of these applications, over 20% of
Figure 8. Mean responses of respondents for proficiency in using computer tool applications
Figure 9. Mean responses of respondents for proficiency in using other computer-related technologies

1 = Unfamiliar - do not know what item is
2 = None - no proficiency
3 = Low - little proficiency
4 = Medium - some proficiency
5 = High - very proficient
the respondents stated that they were "unfamiliar - I do not know what this item is," with 45% indicating this response for hypermedia and 51% of indicating this response for distance learning.

In the 1991 survey, "Iowa survey of computer-related technology use by K-12 teachers", respondents answered the same series of questions as did the respondents of this research, but the likert-type scale was a four level scale, instead of the five level scale used in this survey. The 1991 survey respondents were teachers from Iowa who were all ages and who had received their education from a variety of teacher preservice institutions. The proficiency responses were similar in order in both studies, with computer based instruction rated the highest, tool software rated somewhat lower, and other technology rated the lowest. The rank orders of both surveys are included in Table 4.

Within the group of computer based instruction, the mean rating for each application was in the same order on both surveys. The order from most proficient to least proficient was: educational games, drill and practice, tutorials, problem solving/higher order thinking, and simulations.

When comparing the results from the two surveys dealing with tool proficiency, the similarities were again very noticeable. Word processing was considerably higher than all other specific items (.77 for the 1991 survey and 1.10 for this survey), with the other specific items being very even. The range of databases, spreadsheets, desktop publishing and graphics was .21 for the 1991 survey and .11 for this survey.

The other computer-related technologies groups were also similar. The overall ratings were much lower, with teacher utilities being the highest on
Table 4. Rankings of mean responses for respondents for proficiency in using computer-related technologies, comparing the 1991 Iowa survey and the 1992 Iowa State survey

<table>
<thead>
<tr>
<th>Rank</th>
<th>1991 Iowa Survey Application</th>
<th>Mean</th>
<th>Rank</th>
<th>1992 Iowa State Survey Application</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Word Processing</td>
<td>3.01</td>
<td>1</td>
<td>Word Processing</td>
<td>4.40</td>
</tr>
<tr>
<td>2</td>
<td>Educational Games</td>
<td>2.96</td>
<td>2</td>
<td>Educational Games</td>
<td>4.04</td>
</tr>
<tr>
<td>3</td>
<td>Drill and Practice</td>
<td>2.94</td>
<td>3</td>
<td>Drill and practice</td>
<td>3.93</td>
</tr>
<tr>
<td>4</td>
<td>Tutorials</td>
<td>2.56</td>
<td>4</td>
<td>Problem Solving</td>
<td>3.42</td>
</tr>
<tr>
<td>5</td>
<td>Problem Solving</td>
<td>2.42</td>
<td>5</td>
<td>Tutorials</td>
<td>3.50</td>
</tr>
<tr>
<td>6</td>
<td>Data Base</td>
<td>2.24</td>
<td>6</td>
<td>Simulations</td>
<td>3.32</td>
</tr>
<tr>
<td>7</td>
<td>Simulations</td>
<td>2.20</td>
<td>7</td>
<td>Graphics</td>
<td>3.26</td>
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<td>8</td>
<td>Spreadsheet</td>
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<td>8</td>
<td>Data Base</td>
<td>3.24</td>
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<td>9</td>
<td>Graphics</td>
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<td>Desktop Publishing</td>
<td>3.16</td>
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<td>Desktop Publishing</td>
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<td>10</td>
<td>Spreadsheet</td>
<td>3.15</td>
</tr>
<tr>
<td>11</td>
<td>Teacher Utility</td>
<td>1.97</td>
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<td>Teacher Utility</td>
<td>2.94</td>
</tr>
<tr>
<td>12</td>
<td>Programming</td>
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<td>Programming</td>
<td>2.44</td>
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<tr>
<td>13</td>
<td>Telecommunication</td>
<td>1.43</td>
<td>13</td>
<td>CD-ROM</td>
<td>2.33</td>
</tr>
<tr>
<td>14</td>
<td>CD-ROM</td>
<td>1.36</td>
<td>14</td>
<td>Telecommunications</td>
<td>2.19</td>
</tr>
<tr>
<td>15</td>
<td>Hypermedia</td>
<td>1.32</td>
<td>15</td>
<td>Hypermedia</td>
<td>2.01</td>
</tr>
</tbody>
</table>

1991 Iowa survey scale
1 = Unfamiliar
2 = Low
3 = Medium
4 = High

1992 Iowa State survey scale
1 = Unfamiliar
2 = None
3 = Low
4 = Medium
5 = High
both surveys, followed by programming. CD ROM was rated next on the current survey, while on the 1991 survey, it ranked behind telecommunications.

Teachers' interest in using computer-related technologies

Question 1b was stated as follows: How do Iowa teachers, who are recent college graduates, rate their own interest in using various computer-related technologies, and how does their rating compare to Iowa teachers' 1991 rating?

The teacher interest in using various types of computer-related technologies was measured in part II of this section of the questionnaire. There were 17 questions related to the teachers' interest. The specific computer applications were the same as on the proficiency part of the survey. Also, the grouping of the questions was the same, with the three groups being computer based instruction, computer tool software, and other. The likert-type scale used by the respondents was: 1 = Unfamiliar - I do not know what this is; 2 = None - I have no interest in using this in my classroom or computer lab; 3 = Low - I have little interest in using this in my classroom or computer lab; 4 = Medium - I have some interest in using this in my classroom or computer lab; and 5 = High - I am very interested in using this in my classroom or computer lab. All interest items had a range of responses from one to five.

The mean of all responses on the interest section was 3.49, which meant that the mean rating was between "low - I have little interest in using this in my classroom or computer lab" and "medium - I have some interest in
using this in my classroom or computer lab." Note that this score was considerable higher than the mean of 2.86 in the proficiency section of this research. The scales of the two sections were very similar.

In the computer based instruction group, the group mean was 4.06, and three applications had a mean score over 4.0. The highest mean score was problem solving/higher order thinking (4.30), with education games (4.22), and simulations (4.13). These ratings are between "medium - I have some interest in using this in my classroom or computer lab" and "high - I am very interested in using this in my classroom or computer lab." The other two application in this group were just below 4.0, with drill and practice having a mean score of 3.87 and tutorials have a mean score of 3.78 (Figure 10).

The second group of applications dealt with computer tools. The mean for this group was 3.90, which was just below "medium - I have some interest in using this in my classroom or computer lab". Figure 11 shows the mean scores for each application. Word processing rated as the application in this group with the highest mean score of 4.44, with graphics/drawing programs also above 4.0, with a score of 4.04. The other three applications' scores were desktop publishing (3.84), databases (3.64), and spreadsheets (3.54).

The third category was called other applications. This group of seven computer-related technologies had a mean group score (2.99) which indicated "low - I have little interest in using this in my classroom or computer lab." The only two applications with a mean score above 3.0 were teacher utilities (3.56) and videodisks (3.29). The other mean responses are telecommunication and CD ROM, 2.99; hypermedia, 2.84; programming, 2.77; and distance learning, 2.49 (Figure 12).
Figure 10. Mean responses of respondents' interest in using computer based instruction
Figure 11. Mean responses of respondents' interest in using computer tool applications
Figure 12. Mean responses of respondents' interest in using other computer-related technologies
When compared to the 1991 Iowa survey, the rank order of the mean scores for the three groups was the same, with computer based instruction being the highest, followed by computer tool software and other applications. Table 5 shows the rank order comparison of the means for the two surveys. Note that word processing, problem solving/higher order thinking, and educational games were ranked the top three applications in both surveys.

**Teachers' frequency of use of computer-related technologies**

Question 1c was stated as follows: How often do Iowa teachers, who are recent college graduates, use various computer-related technologies, and how does their frequency of use compare to Iowa teachers' 1991 rating?

Eighteen items on the survey asked teachers to indicate how frequency they used computer-related technology application in their classroom or computer laboratory. The likert-type scale used by the respondents on the survey included five response options: 1 = Unfamiliar; 2 = Never; 3 = Sometimes; 4 = Often; and 5 = Very often. For this study, the first two options, unfamiliar and never, were collapsed together to make the scale more accurate when using mean scores. If a respondent was unfamiliar with the item, he/she probably had never used the item. The likert scale used for analysis of these 18 items was as follows: 1 = unfamiliar and/or never; 2 = sometimes (1-4 times per year); 3 = often (5-10 times per year); and 4 = very often (more than 10 times per year). All frequency of use items had a range of responses from one to four.
Table 5. Rankings of mean responses for respondents for interest in using computer-related technologies, comparing the 1991 Iowa survey and the 1992 Iowa State survey

<table>
<thead>
<tr>
<th>Rank</th>
<th>1991 Iowa Survey Application</th>
<th>Mean</th>
<th>Rank</th>
<th>1992 Iowa State Survey Application</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Word Processing</td>
<td>3.31</td>
<td>1</td>
<td>Word Processing</td>
<td>4.44</td>
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<tr>
<td>2</td>
<td>Problem Solving</td>
<td>3.27</td>
<td>2</td>
<td>Problem Solving</td>
<td>4.30</td>
</tr>
<tr>
<td>3</td>
<td>Educational Games</td>
<td>3.21</td>
<td>3</td>
<td>Educational Games</td>
<td>4.22</td>
</tr>
<tr>
<td>4</td>
<td>Drill and Practice</td>
<td>3.15</td>
<td>4</td>
<td>Simulations</td>
<td>4.13</td>
</tr>
<tr>
<td>5</td>
<td>Tutorials</td>
<td>2.97</td>
<td>5</td>
<td>Graphics</td>
<td>4.04</td>
</tr>
<tr>
<td>6</td>
<td>Simulations</td>
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<td>6</td>
<td>Drill and practice</td>
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<td>Graphics</td>
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<td>8</td>
<td>Desktop Publishing</td>
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<td>Tutorials</td>
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<td>Data Base</td>
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<td>Data Base</td>
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<td>Teacher Utility</td>
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<td>Telecommunication</td>
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<td>Hypermedia</td>
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<td>Hypermedia</td>
<td>1.81</td>
<td>15</td>
<td>Programming</td>
<td>2.77</td>
</tr>
</tbody>
</table>

1991 Iowa survey scale
1 = Unfamiliar
2 = Low
3 = Medium
4 = High

1992 Iowa State survey scale
1 = Unfamiliar
2 = None
3 = Low
4 = Medium
5 = High
The highest average response for any of the frequency in use categories was for using computer-based instruction; the mean for this group of items was 2.08. According to the likert-type scale used for these items, teachers' average response ranked closest to sometimes (1-4 times per year). Figure 13 presents the mean for each computer-based instruction specific applications. Teachers indicated frequency of use were drill and practice (2.64), tutorials (2.11), problem solving/higher order thinking (1.85), and simulations (1.73).

The second highest ranked category of computer use was computer tool software. The mean for these five items was 1.65; a score between never and sometimes. Word processing was the most used by the respondents, with a mean score of 2.39 (between sometimes and often). The rest of the specific applications received a mean score of less than 2.0, with graphics/drawing programs at 1.81, desktop publishing at 1.53, databases at 1.34, and spreadsheets at 1.19 (Figure 14).

In the other applications group of items, teacher utility was a popular use, with an average score of 2.34. Figure 15 shows that videodisks, CD-ROM, hypermedia, and telecommunications were seldom used with scores just above 1.0 (1.27, 1.19, 1.15, 1.06 respectively), which according to the scale used is a score close to the choice, never.

One other type of item was included in this frequency of use section. These two items sought to find what kind of type of teaching/learning setting the computer is used. Question #69 of the survey asked the respondent how often they provided opportunities for students to work on the computer in groups. The average response was 2.54, which according to the scale used indicated a score between sometimes (1-4 items per year), and often (5-10
Figure 13. Mean responses of respondents' frequency of using computer based instruction
Figure 14. Mean responses of respondents' frequency of using computer tool applications

1 = Never
2 = Sometimes (1-4 times per year)
3 = Often (5-10 times per year)
4 = Very often (more than 10 times per year)
Figure 15. Mean responses of respondents' frequency of using other computer-related technologies.
times per year). Question #65 dealt with using the computer to explain or demonstrate an idea or skill to the entire class. The average score of this item was 1.77, well below the response to question #69 mentioned above.

**Teachers' Attitude Toward Computer-Related Technologies**

Question 1d was stated as follows: What is the attitude toward computer-related technologies by Iowa teachers, who are recent college graduates, and how does their attitude compare to Iowa teachers' 1991 rating?

Section three of the survey included items dealing with teachers' attitude toward computer-related technologies. The scale used was; 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, 5=1) using the recode procedure in SPSS. The item numbers of the nine attitude items that were reversed scored were #77, #81, #82, #84, #88, #90, #95, #96, and #98. The analysis of the data in this section was completed after the recoding had taken place and the wording in this narrative will reflect the reversal of the tone and scale of those appropriate items.

Three factors emerged from these 23 items: 1) teacher confidence toward using computer-related technologies; 2) teacher general attitude toward computer-related technologies; 3) and teacher attitude toward the necessity of computer-related technologies in education.

Figure 16 presents the mean scores for the three attitude factors. The mean response score for the factor, teachers' confidence toward using computer-related technologies, was 3.93. This score indicated a score close to
agree. The two specific items in this factor with a mean score above 4.0 were "I think computers make work more enjoyable" (4.18) and "I am comfortable in using computer-related technologies for my own work" (4.12). The lowest mean for a specific item in this factor was 3.70, a mean shared by "it has not been a struggle for me to learn how to use a computer successfully" and "I do not lack confidence in using a computer to complete my work."

The factor, teacher general attitude toward computer-related technologies received a mean score of 4.30, which was 0.37 higher than the
previous factor dealing with general attitude. All specific item mean scores in this factor were above 4.0.

The third attitude factor had an average score of 4.55, which indicated a score between agree and strongly agree. This factor was called teachers' attitude toward the necessity of computer-related technologies in education. This was the highest mean score for the three factors, and the two highest specific item means for the complete attitude section were included in this factor.

When comparing this study's results with the 1991 Iowa teacher's responses, the mean scores of each of the three factors were higher in this current research (Figure 17). A comparison of the means of the attitude factors of the two surveys is as follows: teachers confidence toward using computer-related technologies, (1991 - 3.60, 1992 - 3.93); teachers' general attitudes toward computer-related technologies, (1991 - 4.05, 1992 - 4.30); teacher attitude mean score toward the necessity of computer-related technologies in education, (1991 - 4.24, 1992 - 4.55).

Rating of Importance of a Computer-Specific Course in Teacher Preservice Programs

Question 2a was stated as follows: How do Iowa teachers, who are recent graduates, rate the importance of a computer-specific course in teacher preservice programs?
Figure 17. Mean scores of teacher attitude factors, comparing the respondents from the 1991 Iowa survey and the respondents from the 1992 Iowa State survey

Item #23 on the questionnaire asked the question, "What is the importance of undergraduate education majors completing a course dealing with educational computing in the classroom?" The likert-type scale for this question was as follows: 1) Not important at all; 2) Not very important; 3) No opinion; 4) Very important; 5) Very important and should be a requirement. Less than 6% of the respondents did not use one of the "very important"
choices. Over two-thirds (67.4%) selected "very important and should be a requirement," and 26.7% selected "very important." The other choices received the following percentages: No opinion, 5.2%; Not very important, .7%; Not important at all, 0% (Figure 18).

![Bar graph showing ratings of the importance of a computer-specific course.](image)

Figure 18. Respondents' ratings about the importance of a computer-specific course in teacher preservice programs

**The Most Important Focus of a Computer-Specific Course**

Question 2b was stated as follows: What do Iowa teachers, who are recent graduates, believe is the most important focus in a teacher preservice computer-specific course?
The last question of section one of the survey was: If you were designing an undergraduate educational computer class, what would be the most important focus that should be covered? The respondents were instructed to choose one answer. Almost forty percent (39.3%) selected "Developing strategies used to integrate computers into all disciplines." "Using tool software (word processing, database, spreadsheet) in the classroom," was the second most popular answer with 28.1%. "Learning how to use the computer" was the selected answer of 17.8% of the respondents, Reviewing a variety of educational software packages was selected by 11.1%, and only 3.7% choose "Experiencing the newest developments in education technology" (Table 6).

Table 6. Most important focus of a preservice computer-specific course

<table>
<thead>
<tr>
<th>Focus</th>
<th>Number of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing strategies used to integrate computers into all disciplines</td>
<td>53</td>
<td>39.3</td>
</tr>
<tr>
<td>Using tool software in the classroom</td>
<td>38</td>
<td>28.1</td>
</tr>
<tr>
<td>Learning how to use the computer</td>
<td>24</td>
<td>17.8</td>
</tr>
<tr>
<td>Reviewing a variety of educational software packages</td>
<td>15</td>
<td>11.1</td>
</tr>
<tr>
<td>Experiencing the newest developments in educational technology</td>
<td>5</td>
<td>3.7</td>
</tr>
</tbody>
</table>
Rating of Preservice Preparation in Using Computer-Related Technologies

Question 2c was stated as follows: How do Iowa teachers, who are recent graduates, rate their preservice preparation in using computer-related technologies?

Section four of the survey asked the respondents to make an evaluation of their teacher preservice preparation in regard to computer-related technologies. The first question in this section was: "Using the following scale, please mark the bubble on the answer sheet that best indicated your evaluation of the preparation you experienced for using educational computer-related technologies at Iowa State?" The likert-type scale used provided the following choices: 1) Very inadequate; 2) Inadequate; 3) Adequate; 4) More than Adequate; 5) Outstanding.

Over two-thirds of the respondents selected one of the "inadequate" choices, 27.4% selected very inadequate and 40% selected inadequate. About 30% believed the program was adequate (23.7%) or more than adequate (6.7%). Only 2.2% choose to rate the program as outstanding (Figure 19).

The responses to this item by graduates who had completed the course, SecEd 101, were significantly different that those graduates who had not completed the course. The mean score for those completing SecEd 101 was 2.68, while the mean score for those not completing the course was 1.76. The t value was 5.76, a two-tailed probability of < .0005 (Table 7). The ratings comparing respondents who completed SecEd 101 and those who did not complete SecEd 101 are shown in Figure 20.
Evaluation of the preparation for using educational computer-related technologies

Figure 19. Respondents' ratings of their evaluation of the preparation experienced for using educational computer-related technologies during their teacher preservice program

Table 7. Comparison of mean scores for both groups, those who completed SecEd 101 and those who did not, on evaluation of preparation experienced for using educational computer-related technologies during their teacher preservice program

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>t-Value</th>
<th>2-Tailed Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed SecEd 101</td>
<td>59</td>
<td>2.6780</td>
<td>1.058</td>
<td>5.76*</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Did not complete SecEd 101</td>
<td>76</td>
<td>1.7632</td>
<td>.690</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$p < .05$
Evaluation of the preparation for using educational computer-related technologies

Figure 20. Respondents' evaluation of their preparation for using educational computer-related technologies comparing those who completed SecEd 101 and those who did not complete SecEd 101.
The last two questions of the survey were open-ended questions designed to encourage respondents to contribute their opinions about their preservice preparation and/or any other topic they desired. Question #101 asked the teacher to describe the major reasons for the rating selected in the previous question (the evaluation of preparation for using computer-related technologies), and question #102 requested any additional comments, suggestions, or concerns. Over 80% (109/135) responded to these questions.

After reading through all the open-ended responses, the researcher noted that three themes were included in several responses. The importance of computer-related technologies to the field of teaching seemed to be the most popular theme and one that was stated or implied in over 50 of the respondents' answers. The following respondents' answers are just two which contain this theme: "Computers are becoming a thing of the future. Informing new students of this technology will be most beneficial to them." "Teacher need to know all the wonderful uses for computers in the classroom and the most current developments."

The requiring of a computer-specific course was mentioned in twenty-one of the answers. Many teachers believed that educational computer-related technologies was important to the teaching field and therefore should be a required class. The following answer was an example communicating this theme: "I was not required to take one computer class at ISU. Make it a requirement! Our children's future is in computers and being able to use them. If a teacher is afraid of them, I guarantee that the computer will not be a point of emphasis in the classroom."
A third theme mentioned in several answers was the need for modeling of computer use in methods and general education classes. One respondent wrote: "All methods classes should have to show how computers can be used in that area!" Another teacher stressed the addition of computer use in all courses: "I feel computers should be a part of every ISU class. Computers are becoming an important part of the classroom, and teachers need to know about this before they enter their own classroom."

Many other types of information were included by the teachers in this section. Several teachers related the problems they have encountered while teaching, while others spoke of their naiveté about computer use when they were in their preservice preparation. The complete answers of all open-ended questions is included in Appendix F.

The Relationships Among Preservice Variables and Teachers' Computer Use and Attitude

Question 3 was stated as follows: What are the relationships among variables including preservice experiences, personal demographics, teacher computer use, teacher computer proficiency, teacher computer interest, and teacher computer attitude?

To find relationships among the variables, a Pearson product moment correlation coefficient was calculated using SPSS. Before the correlation matrix was calculated, five variables, proficiency mean, interest mean, frequency of use mean, attitude mean, and profile mean, were developed using collapsed data.
Relationships among preservice experiences and teacher responses were strongest between the number of computer courses completed during teacher preservice preparation and the computer-related technology proficiency mean. This correlation was $r = .28$ and was statistically significant. The other significant relationships (at the .05 level) included number of computer courses completed and: profile mean, $r = .27$; interest mean, $r = .20$; frequency of use mean, $r = .18$; attitude mean, $r = .21$.

One other pair of variables had a significant relationship. They were the number of courses that computer-related technology was modeled by instructors, and frequency of use mean ($r = .17$). The complete correlation data for the complete data set is included in Table 8.

The above correlation values were statistically significant, but were very low. A correlation below .30 is considered low (Hinkle et al., 1988), and may not be practically significant.

After completing the above correlation matrix, the complete file was sorted and split into three groups by the year the teachers received their teaching certificate. These three groups were as follows: 1) 1987 or before (42.2%); 2) 1988 (25.9%); 3) 1989 or later (31.9%). After splitting the file, another correlation matrix was calculated. Correlation values for groups one and two were very similar to the correlation values for the complete data set, but when considering only group three, there was a moderate relationship between the completion of the computer-specific undergraduate course, SecEd 101, and the following variables: teacher computer proficiency mean ($r = .50$), teachers computer interest mean ($r = .35$) teacher computer frequency of use mean ($r = .35$), and the teachers computer use profile mean ($r = .49$).
Table 8.  Correlation matrix for preservice experiences and teacher computer mean, teacher computer interest mean, teacher computer frequency mean, teacher computer profile mean, and teacher attitude mean

<table>
<thead>
<tr>
<th></th>
<th>N.MOD</th>
<th>PROFM</th>
<th>INTM</th>
<th>FREQM</th>
<th>ATTDMA</th>
<th>PRFLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM.C</td>
<td>-.0585</td>
<td>.2810*</td>
<td>.2007*</td>
<td>.1839*</td>
<td>.2094*</td>
<td>.2676**</td>
</tr>
<tr>
<td>N.MOD</td>
<td>.1129</td>
<td>-.0113</td>
<td>.1744*</td>
<td>-.0192</td>
<td>.0909</td>
<td></td>
</tr>
<tr>
<td>PROFM</td>
<td></td>
<td>.6268**</td>
<td>.6199**</td>
<td>.5388**</td>
<td>.9018**</td>
<td></td>
</tr>
<tr>
<td>INTM</td>
<td></td>
<td></td>
<td>.4138**</td>
<td>.3758**</td>
<td>.8596**</td>
<td></td>
</tr>
<tr>
<td>FREQM</td>
<td></td>
<td></td>
<td></td>
<td>.5565**</td>
<td>.7359**</td>
<td></td>
</tr>
<tr>
<td>ATTDMA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.5657**</td>
</tr>
</tbody>
</table>

* p = < .05
** p = < .01

COM.C = Number of computer courses in college
N.MOD = Number of education method courses that computer use was modeled
PROFM = Mean of teacher computer proficiency variables
INTM = Mean of teacher computer interest variables
FREQM = Mean of teacher computer frequency of use variables
ATTDMA = Mean of teacher computer attitude variables
PRFLM = Mean of PROFM, INTM, FREQM
Teacher Preservice Experiences That Predict Teacher Computer Use

Research questions 4a through 4e dealt with this topic. These questions, along with responses to all five questions will follow.

Question 4a was stated as follows: What is the combination of preservice predictors in determining teachers' proficiency in using computer-related technologies?

Question 4b was stated as follows: What is the combination of preservice predictors in determining teachers' interest in using computer-related technologies?

Question 4c was stated as follows: What is the combination of preservice predictors in determining teachers' frequency of use of computer-related technologies?

Question 4d was stated as follows: What is the combination of preservice predictors in determining teachers' overall computer use rating when combining computer proficiency in using, frequency of use, and interest in using into a variable called computer use profile?

Question 4e was stated as follows: What is the combination of preservice predictors in determining teachers' attitude toward using computer-related technologies?

Although no independent variable was highly correlated with any of the dependent variables, teacher computer proficiency mean, teacher computer interest mean, teacher frequency of computer use mean, teacher computer use profile mean, or teacher computer attitude mean, a stepwise regression was completed. As expected, there was no independent variable that was a
practical predictor of any of the teacher computer variables, since the $R^2$ values were below .10. Table 9 provides the adjusted $R^2$ statistic for all five dependent variables.

Table 9. Multiple regression results of preservice criterion variables and teacher computer proficiency, teacher computer interest, teacher computer frequency of use, teacher computer use profile, and teacher computer attitude

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Criterion Variables in the Equation</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Computer Proficiency</td>
<td>COM.C</td>
<td>.08</td>
</tr>
<tr>
<td>Teacher Computer Interest</td>
<td>COM.C</td>
<td>.06</td>
</tr>
<tr>
<td>Teacher Computer Frequency of Use</td>
<td>COM.C, N.MOD</td>
<td>.04</td>
</tr>
<tr>
<td>Teacher Computer Use Profile</td>
<td>COM.C</td>
<td>.07</td>
</tr>
<tr>
<td>Teacher Computer Attitude</td>
<td>COM.C</td>
<td>.03</td>
</tr>
</tbody>
</table>

COM.C = Number of computer courses in college
N.MOD = Number of education method courses that computer use was modeled

Teacher Preservice Experiences That Predict Placement Into a High or Low Teacher Computer Use Group

Research questions 5a through 5e dealt with this topic. These questions, as well as a response to all five questions will follow.

Question 5a was stated as follows: When dividing recent Iowa State graduates who are teaching, into groups of high and low proficiency of
computer use, what is the combination of preservice experiences that will predict placement in either group?

Question 5b was stated as follows: When dividing recent Iowa State graduates who are teaching, into groups of high and low interest of computer use, what is the combination of preservice experiences that will predict placement in either group?

Question 5c was stated as follows: When dividing recent Iowa State graduates who are teaching, into groups of high and low frequency of computer use, what is the combination of preservice experiences that will predict placement in either group?

Question 5d was stated as follows: When dividing recent Iowa State graduates who are teaching, into groups of high and low, using a combination of computer use, proficiency, and interest, what is the combination of preservice experiences that will predict placement in either group?

Question 5e was stated as follows: When dividing recent Iowa State graduates who are teaching, into groups of high (positive) and low (negative) attitude toward computer use, what is the combination of preservice experiences that will predict placement in either group?

The results of a discriminant analysis using the teacher preservice independent variables, indicated that no independent variable was a significant predictor of placement into any high or low group, using any of the dependent variables stated in the questions. See Table 10.
Table 10. Discriminant analyses results of preservice criterion variables and placement into a high or low group using the following dependent variables: Teacher computer proficiency, teacher computer interest, teacher computer frequency of use, teacher computer use profile, and teacher computer attitude

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Dependent Variables</th>
<th>Wilks' Lambda</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROF.CAT</td>
<td>SEX, COM.C, ST.TEACH, ACCESS.C</td>
<td>.81</td>
<td>.11</td>
</tr>
<tr>
<td>INT.CAT</td>
<td>SEX, COM.C, ST.TEACH, ACCESS.C</td>
<td>.89</td>
<td>.11</td>
</tr>
<tr>
<td>FREQ.CAT</td>
<td>SEX, COM.C, ST.TEACH, ACCESS.C</td>
<td>.91</td>
<td>.21</td>
</tr>
<tr>
<td>PRFL.CAT</td>
<td>SEX, COM.C, ST.TEACH, ACCESS.C</td>
<td>.89</td>
<td>.11</td>
</tr>
<tr>
<td>ATTD.CAT</td>
<td>SEX, COM.C, ST.TEACH, ACCESS.C</td>
<td>.87</td>
<td>.13</td>
</tr>
</tbody>
</table>

PROF.CAT = Proficiency groups  
INT.CAT = Interest groups  
FREQ.CAT = Frequency of use groups  
PRFL.CAT = Computer use profile groups  
ATTD.CAT = Attitude groups

SEX = Gender  
COM.C = Number of computer courses in college  
ST.TEACH = Amount of computer use witnessed computer use witnessed  
ACCESS.C = Access to a computer daily during college
Summary

This chapter has described the results and findings of this research study. The responses from the survey, "Survey of K-12 Computer-Related Technology Use by Iowa State Graduates" were used to compute statistical analyses that described, searched for relationships, and searched for predictors.

The responding teachers reported computer use similar to the respondents of the 1991 Iowa teacher survey, with the most frequent computer uses being drill and practice and word processing. The respondents' interest and proficiency was the highest in the use of word processing. The attitude toward computers was positive, with the attitude factor dealing with the necessity of computers in education having the highest mean response.

Respondents believed that a computer-specific course was important in teacher preservice programs. They indicated that the most important focus of such a course would be learning strategies to incorporate computers and computer-related technologies into the curriculum.

When asked to evaluate their preparation in college to use computer-related technologies, over 67% indicated inadequate or very inadequate. But, only 30% of teachers who had completed an introductory computer-specific course, SecEd 101, chose an "inadequate" response.

There were no practical relationships between teacher computer use variables and teacher preservice experiences, except when using only data from respondents who were very recent graduates. In the responses from the teachers who had received their teaching certificate after 1989, there were low to moderate relationships between the variable, completion of SecEd 101, and
teacher computer use variables, teacher computer proficiency, teacher computer interest, teacher frequency of computer use, and teacher computer use profile.

No teacher preservice variables were found to predict teacher computer use. Also, no teacher preservice variables were found to predict placement into high or low teacher computer use groups.
This chapter begins with a summary of the background and methodology for the study, followed by a summary and discussion of the major findings. Then, two types of recommendations from the study will be presented. The first type will be recommendations to help teacher preservice institutions better prepare future teachers to use technology effectively in their classrooms, and the second type will be recommendations for future research in the area of educational computer-related technologies use and teacher preservice education.

Summary of the Background and Methodology of the Study

Computers and computer-related technologies have become an emphasis in many American schools over the last fifteen years. The number of computers in schools have increased dramatically, with the current estimation being over two-million total computers in K-12 schools nationwide (Bork, 1991).

Not only have the numbers of computers increased in schools, but also the attention given to the need for computers to be used by educators at all levels has increased. Several research projects have focused on the effectiveness of computer use in schools. By looking at a number of meta-analysis of these studies, it appears that computer use is effective in improving learning by students (Kulik et al., 1983, 1984; Niemiec & Walberg, 1987; Robyler, Castine, & King, 1988).
The number of computers and the ways they are used in instruction, have been the foci of many national, as well as state-wide surveys during the last one and one-half decades (Becker, 1985, 1986, 1990; Bitter, 1980; Office of Technology Assessment, 1988; Schmidt, 1991; Sheingold & Hadley, 1990; Thompson et al., 1990). Two of the major themes of these surveys dealt with types of instructional uses of computer-related technologies and teacher attitude toward computers.

Given the increased emphasis on using computer-related technology in classrooms, some teacher preservice programs have tried to provide preservice experiences to help future teachers use computers effectively in their instruction. But, often, the teacher preparation programs have been criticized for reacting to what is already happening in K-12 schools instead of leading (George, 1991). To address this issue, twelve goals for educational computing and technology preparation in teacher education programs were written jointly by the International Society for Technology (ISTE) and the National Council for Accreditation of Teacher Education (NCATE). These goals emphasized that future teachers should be able to demonstrate knowledge about computers and the effective use of computers in classrooms.

The literature dealing with preservice teacher education programs and the emphasis on computer-related technologies can be categorized into three themes. These include the rationale for including computer-related technologies in the programs, the use of computer-specific courses, and the integration of computer-related technologies into all or most education courses.
The rationale for making changes that include computer-related technologies has several bases. With the increasing number of computers in schools, school districts expect teachers, especially new teachers to be familiar with the technology and be able to use computer-related technologies effectively in their classrooms (Carlson, 1991; Johnson & Maddux, 1991; Novak & Berger, 1991a). Not only do school districts demand computer-literate teachers, but also, at least 23 state boards of education have requirements dealing with computer experiences in teacher preservice programs.

In most teacher education institutions, the first attempt at preparing their future teacher students to use computer-related technologies has been computer-specific courses. These courses, often introductory in nature, usually emphasized computer skills (Strudler, 1991). Some topics included in these courses were learning to use computers, memorizing terminology, learning to construct computer-assisted lessons, and evaluating software and hardware.

Although the computer-specific courses provided an introduction to computer use in classrooms, many authors believed the key to providing quality computer experiences was to incorporate computer-related technologies into all or most education courses. The modeling of teaching strategies that utilize the power of computers by college instructors has been the emphasis in many institutions (Harrington, 1991; Nelson, Andri, & Keefe, 1991; Novak & Berger, 1991a; Strudler, 1991). The three important elements to achieve incorporation of computers in existing courses included equipment availability for both students and faculty (Gunn, 1992; Novak & Berger,
1991a), faculty training in the uses of computer-related technologies (Wetzel, 1992), and the encouragement to include technology in courses (Nelson, Andri, & Keefe, 1991; Novak & Berger, 1991b).

The purpose of this study was to investigate teachers who are recent college graduates. The main emphasis was on computer use by the teachers, relationships among preservice teacher experiences and teacher computer use, and teachers' evaluation of their preservice preparation for using computer-related technologies. Data were collected from results of a survey that was completed by 135 Iowa teachers who had graduated from Iowa State University during the years of 1986 through 1990.

The researcher-designed survey called "Survey of K-12 Computer-Related Technology Use by Iowa State Graduates", included four sections. Section one contained general information questions about the respondent, such as gender, age, general computer use and teaching experiences. Information about the respondents' preservice experience, such as number of completed computer-specific courses and year of graduation, was also included in this section. The respondents were asked to rate the importance of a computer-specific course in teacher preservice programs, and to choose the most important topic of such a computer-specific course.

Section two contained three parts. In part I and II, the respondents were asked to use a likert-type scale to answer questions on their proficiency in using various computer-related technologies and their interest in using computers in their classrooms. The respondents' reported in part III, the frequency that they used certain computer-related technologies during the past school year.
The third section of the survey dealt with teacher attitudes toward computers and computer-related technologies. The survey included items on attitudes about personal, as well as classroom use of computers.

In section four, respondents evaluated their preservice preparation program in the area of educational computer-related technologies. This was done both in a numeric, likert-type response, and also in an open-ended format.

**Summary and Discussion of Results**

**Description of the respondents**

Most responding teachers (97.8%) had used a computer at some point in their life. Over 85% of the teachers reported that they used the computer in their teaching and about 44% owned a computer for their home. Both of these percentages are higher than the 1991 Iowa teacher survey, in which 77% used a computer and 36% owned a computer. Thus, these newer teachers had more experience with computers more than Iowa teachers in general.

Computers were available daily in their school to about 87% of the respondents, but a liquid crystal display (LCD) panel was available to only 25% of the teachers. This is problematic, because many Iowa schools have only a few computers in each classroom (Schmidt, 1991), and an LCD panel would be an excellent way for the teacher to demonstrate ideas to the whole group using only one computer. Without the LCD panel, it would be very difficult for use the computer in a large group setting.
Teachers' use of computers and attitude toward computers

Items on the survey dealing with teacher computer use was divided into three sections. They were teachers' proficiency in using computer-related technology, teachers' interest in using computers, and teachers' frequency of using computers.

Teachers' average response to their proficiency in using computer-based instructional applications (e.g. drill and practice, tutorials, educational games, problem solving/higher order thinking, simulations) was 3.64 (between low[3] and medium[4]), with the highest being 4.04 for educational games. Their proficiency in using computer tool software applications (e.g. word processing, databases, spreadsheets, desktop publishing, graphic/drawing programs) averaged 3.44, with the highest being 4.40 for word processing. Their proficiency in using other computer-related applications (e.g. utilities, programming, telecommunications, videodisks) averaged 2.26, with the highest being 2.94 for teacher utilities. In the newer, emerging technologies of this category, the highest was 2.40 for videodisk usage. When comparing these proficiency ratings with a survey given to Iowa teachers in 1991, the results are very similar. The respondents of this survey, although they had recently graduated from college, rated their proficiency in using certain computer applications in similar order as the total Iowa teacher population, which would tend to be much more experienced.

The responding teachers rated their interest in using specific computer applications in their classrooms or computer labs. The overall mean of this section was 3.49 (between low and medium), which was much higher than the mean of the proficiency section (2.86, between none and low). The application
with the highest interest rating was word processing (4.44, between medium and high) followed by problem solving/higher order thinking skills (4.30). Once again, the comparison between this data and the data from the 1991 Iowa teachers' survey showed many similarities.

Respondents also reported their frequency of using different types of computer-related application. The most often used computer application was drill and practice with an average rating of 2.64, followed by word processing, with an average rating of 2.39. These mean scores indicated teachers use these types of computer-related technologies between sometimes (1-4 times per year) and often (5-10 times per year). Videodisks, CD-ROM, hypermedia, and telecommunications were seldom used. Their average scores were between 1.06 and 1.27, indicating between never and seldom (1-4 times per year). These results paralleled many national teacher surveys completed over the past eight years (Becker, 1985, 1986; Office of Technology Assessment, 1988; Sheingold & Hadley, 1990). As the results indicate, these newer teachers were not using the newer applications of computer-related technologies to a great extent, even though almost one-half of them had been introduced to the applications in college. The reasons for this are unclear, but the lack of equipment, as indicated by the low number of LCD panels available, may be one of the large barriers to the use of these newer, emerging types of technology.

In the attitude section of the survey, three factors emerged from the 23 teacher attitude items. The mean responses for the factor, teacher confidence toward using computer-related technologies, was 3.93 (close to agree). The mean response for the factor, teacher general attitude toward computer-
related technologies, was 4.30 (between agree and strongly agree). The mean response for the factor, teacher attitude toward the necessity of computer-related technologies in education, was 4.55. The average scores for all three factors were somewhat higher in this study, when comparing them to the scores of the 1991 Iowa survey.

The results of this study dealing with teacher computer use and attitude indicated that teachers had a very positive attitude toward computer-related technologies. They believed strongly that using the computer is a necessity in education, yet they seemed only somewhat interested in using various types of computer applications in their teaching. Yet, with many of the newer, emerging types of computer applications, they did not feel proficient in the use of the computer. In addition, they actually used the computer infrequently, especially with regard to the newer uses that have much potential for improved student learning, such as hypermedia, video disk, and telecommunications (Dede, 1987; Maddux, 1993; Newman, 1987; Sheingold, 1990). The reasons behind this finding are unclear. Lack of equipment and lack of proficiency would seem to be two logical barriers to frequent use of the technologies. Also, another possible reason for this phenomenon could be the lack of preparation in their teacher preservice experiences (this will be discussed in later in this chapter).

**Teacher preservice experiences**

The respondents' teacher preservice experiences are varied. About 43% of the total respondents completed the computer-specific course, "Educational Applications of Computers". Almost one-half (45%) of the respondents
indicated they completed no computer-specific courses in college and about 30% completed one course. About 25% of the teachers completed two or more computer courses during their preservice education.

These figures are noteworthy for two reasons. First, several state boards of education (not Iowa) have required such a class be included in teacher preservice programs. Second, when the respondents were asked to rate the importance of a computer-specific course in teacher preservice program, over two-thirds selected "very important and should be a requirement". "Very important" was selected by 26.7%, with less than 6% selecting "no opinion" or "not important".

It should be noted that the computer-specific course has fallen out of favor with many authors (Novak & Berger, 1991a; Strudler, 1991). These authors suggested the infusion of technology in all teacher preservice classes should be the direction of most teacher education programs, not the computer-specific course. The responding teachers in this study seemed to disagree. They viewed the computer-specific course as very important. The reasons for this view are unknown. One possible reason may be that although the teachers were interested in using technology, they were not actually using it themselves to a large extent, and with this finding in mind, they may have seen the computer-specific course as the only solution to computer competency. Since they were not modeling technology use in their classrooms to a great extent, they may not have thought about modeling in college courses as the best possible situation for learning about the use of computer-related technology in classrooms.
The recent graduates were asked what should be the main focus of an undergraduate computer-specific course. Almost 40% believed the development of strategies used to integrate computers into all disciplines, was most important. Using tool software (which is often usable in many different disciplines) was the second most chosen response (28%). Only 17% indicated that learning to use the computer should be the main focus of such a course. It is noteworthy that these teachers have the same basic priority for a computer-specific course as many authors do for computer-related technologies in general (Maddux, 1993; Sheingold, Martín, & Endreweit, 1987; Vockell & Schwartz, 1992).

When asked how many of their educational methods courses included modeling of computer-related technology by the instructor, 53% of the respondents indicated zero, 30% indicated one, and 11% indicated two. The results of this item are of concern. Much of the current literature dealing with computer-related technologies in teacher education emphasize the importance of instructor modeling in educational methods courses. (Gunn, 1992; Johnson & Harlow, 1993; Novak & Berger, 1991a; Strudler, 1991).

The respondents, recent Iowa State University graduates, were also asked to rate their preservice preparation in using computer-related technologies. About two-thirds (67.4%) of the total number of respondents selected either "very inadequate" (27.4%) or "inadequate" (40%). Comparing these figures to a nation-wide survey of students teachers by Fratianni, Decker, & Korver-Baum (1990), the Iowa State graduates were somewhat more satisfied with their preservice preparation. About 81% of the student teachers in the Fratianni et al. study, compared to 67.4% of the teachers in
this study, felt that their undergraduate preparation in technology use was inadequate.

It should be noted that the teachers who had not taken the computer-specific introductory course, SecEd 101, reported a much lower rating for their preparation, than those respondents who had completed such a course. In fact, over 85% of the "non-SecEd 101" respondents rated their preparation in technology as either very inadequate or inadequate, compared to a 30% figure for the respondents who had completed SecEd 101. This would seem to indicate that SecEd 101 may have given teacher preservice students opportunities that they felt helped them prepare for computer use in their teaching.

The relationships among preservice variables and teachers’ computer use and attitude

When considering all respondents, there were statistically significant relationships between the number of computer courses completed during college and teacher computer proficiency of use, teacher interest in use, teacher frequency of use, teacher computer profile, and teacher attitude toward using computers. Also, there was a relationship between the number of courses where computer related technology was modeled by instructors, and teacher frequency of use. Although statistically significant, these correlation values were relatively low. These correlations, although low, may indicated that the number of computer-specific courses and amount of instructor modeling may be an area preservice programs may want to investigate when planning for educational computer-related technologies experiences.
When using only the data from respondents who had received their teaching certificate in 1989 or later, there were moderate correlations ($r = .35$ to $.50$) between the completion of the computer-specific course, SecEd 101, and the following variables: teacher computer proficiency mean, teachers computer interest mean, teacher computer frequency of use mean, and the teachers computer use profile mean. The reasons why relationships occur just in this group of respondents are unclear. One possible explanation could be that these very recent graduates are beginning their teaching careers in schools that are much more supportive of technology use than the beginning teachers of just a few years ago. With this support, the teachers who completed the introductory computer course were more able to immediately apply what they had learned.

**Teacher preservice variables that predict teacher computer use or attitude and teacher preservice variables that predict placement into a high or low teacher computer use group**

No preservice variables were found to be significant predictors of teacher computer use/attitude or placement into high/low groups. The reasons for these findings are unclear. One possible reason may be that the school environment, specifically the amount of technology richness, limits computer use of all teachers.
Recommendations

The following section of this chapter will include two types of recommendations. First, recommendations will be directed at teacher preservice institutions concerning the preparation of future teachers to use computer-related technologies in their classrooms. Then, recommendations will be suggested for future research in this area.

Teacher preservice recommendations

Recommendation #1: Colleges of education need to provide, possibly even require, at least one introductory computer-specific course. Although most authors emphasized the need to move past such a course, this research indicated that teachers believe this type of course is very important.

As indicated by the teachers' responses, the main goal of this course should be the learning of strategies for integrating computers into all disciplines. In order to achieve this goal, the course should be designed to address as many of the ISTE/NCATE standards (see chapter II) as possible. Personal computer proficiency (#1, #9, #11, and #12) should be one objective of the course. Another objective should be introduction to using the computer in teaching/learning (#2, #3, #4, #5, #6, #7, and #8).

Recommendation #2: College instructors must model teaching and learning strategies that include computer-related technologies in all their courses (Harrington, 1991; Johnson & Harlow, 1993; Novak & Berger, 1991a; Strudler, 1991). It must be understood that a computer-specific course, as described above is not the extent of technology in a teacher education.
program. It is just the beginning, a sort of foundation, for the preparation of future teachers to use computer-related technologies effectively in their classrooms. Preservice teachers need to experience learning while using computer-related technologies in all courses.

**Future research recommendations**

Recommendation #3: This type of study needs to take place on a large scale, with many teacher preservice institutions involved. The research project should focus on teachers' evaluation of different aspects of their technology preparation during teacher preservice, as well as suggestions for improvement of the undergraduate programs. Also, possible relationships between preservice experiences and teacher computer uses and attitudes should be investigated.

With many different, varied teacher preservice programs included in a study, all colleges of education could learn from each others experiences. When refining a program, knowledge of what others are doing and what apparently has been successful would be of great benefit to teacher education programs.

Recommendation #4: This same type of study needs to be conducted longitudinally. This study's data could serve as baseline data. Also, the subsequent studies could be one type of evaluation for the improvements and changes to the teacher preservice program. In addition, it would be interesting to see how the teachers of that time compare to today's teacher when considering their computer use and attitude.
Recommendation #5: Much could be learned from conducting a case study of a small group of graduates who become teachers. This research could study in detail their experiences dealing with computer-related technologies, their attitudes toward the technologies, and their reasons for using or not using these technologies. Also, of interest would be the different types of barriers to using computers, as well as the different types of encouragement for using computers and related technologies, they encounter as they teach in K-12 schools. This type of research would help colleges of education interface with K-12 schools and K-12 teachers.

Conclusion

This study, based on a survey of recent graduates of Iowa State University who are teachers in Iowa, examined teachers' computer use and attitude toward computers, as well as their preservice experiences. The respondents' computer use and their attitude toward computer-related technology was very similar to the 1991 Iowa survey, as well as many national surveys. They were somewhat interested in using technology, but they rate their proficiency low. Although the teachers indicated that computer-related technologies are important to K-12 education, they reported they used computers infrequently.

In regards to teacher preservice programs, most of the teachers believed the computer-specific course was important, with many suggesting such a course should be required. In addition, when asked to rate their teacher preservice preparation for using computer-related technologies in
their classrooms, many felt they were inadequately prepared. These findings seem to indicate teacher preservice institutions need to carefully examine their programs. K-12 students deserve teachers who are able to use computer-related technologies in ways that will facilitate and encourage learning. With this in mind, all teacher education graduates need to have had experiences that will help them develop strategies for using computer-related technologies in their own classrooms.
REFERENCES


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Many friends need to be thanked. I wish to begin with Arlan Thorson. Together, the two of us headed into "uncharted waters" when we developed a junior high computer program way back in 1985. Without his imagination and his encouragement, I would not have written this paper. Also, Mandy Ross, Connie Hargrave, and all the other Iowa State graduate students, helped much in this process. But most of all, I must thank my dear friend and colleague, Denise Schmidt. Without her vast knowledge and wisdom, and her never ending encouragement, this study would not have been completed.

With much gratitude and enthusiasm, I want to thank my family. For the work ethic that I learned as a child, I thank my parents. For the constant love and continued support, I thank my brother and sister. Of course, the biggest thank you must go to my special wife, Linda, wonderful daughter, Lynelle, and tremendous son, Gregory. I know your sacrifices,
have at times, been great. The most painful part of the graduate school process has been the times I decided to study rather than spend time with my family. I am a very fortunate person to have three people like you that I can say, "this is my family."
APPENDIX A: SURVEY ITEMS INCLUDED IN EACH ATTITUDE FACTOR AND FACTOR LOADING
SURVEY ITEMS INCLUDED IN EACH ATTITUDE FACTOR
AND FACTOR LOADING

Factor 1: Teacher Confidence in using Computer-Related Technologies

item 78: I am comfortable in using computer-related technologies for my own work. (.74)
item 79: I think computer make work more enjoyable. (.57)
item 81: It has been a struggle for me to learn how to use a computer successfully. (.79)
item 84: I lack confidence in using a computer to complete my work. (.76)
item 86: I don't feel threatened by computers. (.81)
item 95: I do not feel comfortable using computer-related technologies in my teaching. (.76)

Factor 2: Teacher General Attitude Toward Using Computer-Related Technologies

item 80: I would use computer-related technologies for my own work. (.67)
item 92: Computers are useful for teaching thinking and problem solving skills. (.47)
item 93: Computer-related technologies should be used by teacher more than they are now. (.60)
item 94: My teaching is positively affected when using computer-related technologies. (.66)
item 97: Overall, I think the computer is a very important tool for instruction in my classroom. (.74)

item 98: Computer-related technologies are of little value in the classroom because they are too difficult to use. (.47)

item 99: I would like to use computer-related technologies more in my teaching. (.76)

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

item 77: I think that computers make my professional work more difficult. (.45)

item 83: Computer-related technologies are an important part of the future for improving the quality of education. (.70)

item 89: Computers are valuable tools that can be used to improve the quality of education. (.69)

item 90: Computers are of little value in education because they can be used to teach only one subject. (.65)

item 96: Computer-related technologies are unnecessary luxuries in most school settings. (.55)
APPENDIX B: 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) the 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: October 21, 1992
   Last Contact: December 16, 1992

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

   January 30, 1993

18. Signature of Departmental Executive Officer

   [Signature]
   Date: 10/27/92
   Department or Administrative Unit: Curriculum and Instruction

19. Decision of the University Human Subjects Review Committee:

   [X] Project Approved
   ___ Project Not Approved
   ___ No Action Required

   [Signature]
   Name of Committee Chairperson: Patricia M. Keith
   Date: 10/15/92
   Signature of Committee Chairperson: [Signature]
DATE: January 22, 1993

TO: Committee On the Use of Human Subjects

FROM: Neal Topp
N058 Lagomarcino Hall
294-0228

RE: Additional Research Procedures

I am requesting approval from your committee on a change in my research project, called "Relationships between teacher preservice experiences and teachers' computer use, proficiency, interest and attitude."

In addition to the approved procedures, I wish to contact about 100 nonresponding subjects by telephone and ask them to participate in a short, 12 question interview. The subjects will be informed that their individual responses will be kept confidential. As soon as the data is coded, the interviewer's data sheet will be destroyed.

Please find enclosed a copy of the text of the proposed telephone interview.

Thank You

[Signature]
1-26-93
APPENDIX C: COVER LETTER AND SAMPLE QUESTIONNAIRE
October 26, 1992

Dear Iowa State Graduate:

Computer-related technologies have become an integral part of our educational environment. Because teachers are using the computer in many ways in their classrooms, it is important for Iowa State's preservice teacher preparation program to give students experiences that will encourage effective computer use by those who have completed our program. There is no current information available regarding the relationships between teacher preservice experiences and teacher computer use, proficiency, interest, and attitude.

The College of Education at Iowa State University is sending this survey to all ISU graduates who are currently teaching in Iowa. Your participation is voluntary, but very important, to this research. The information gathered will be the analyzed in a thesis by a faculty member. To ensure that the information collected truly represents the experiences of teachers who are Iowa State graduates, it is extremely important that this survey be completed and returned to ISU. Successful completion of the survey will require approximately 20 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. At no time will the completed survey be associated with your name.

We are extremely interested in responses from practicing teachers who are inexperienced as well as those who are experienced in using computer-related technologies. Obtaining information from K-12 teachers who received their degree from Iowa State will help us in many ways, including the identification of relationships between preservice experiences and teaching experiences. Our goal is to improve our program, so that future graduates will be better prepared to teach effectively.

Please return the survey in the enclosed postage-paid envelope by November 6th. If you have any questions about the survey or for any reason are unable to complete the survey, please call us at (515) 294-0228. Your time and assistance are greatly appreciated.

Sincerely,

Norene F. Daly, Dean
College of Education

Ann Thompson, Chair
Department of Curriculum and Instruction
Survey of K-12
Computer-Related Technology Use
by Iowa State Graduates

Study sponsored by Iowa State University,
College of Education
October, 1992
Section One: Teacher Background Information

We need some information about you. Please fill in the corresponding bubble on your answer sheet to the letter which best answers each question. You do not need to complete the name, birth date, identification number, or special codes sections of the answer sheet.

1. What is your gender?
   A. Female   B. Male

2. What is your age?
   A. Under 25   B. 25 to 27   C. 28 to 30   D. 30 to 35   E. Over 35

3. Do you now have a computer at home?
   A. Yes   B. No

4. What grade level did you teach during the 1991-92 school year?
   A. Pre-K to 3   B. 4 to 6   C. Middle/Jr. High   D. High School   E. Complete School K to 12

5. How many years have you taught? (include this year)
   A. 1   B. 2   C. 3   D. 4   E. 5 or more

6. Do you have any experience using a computer?
   A. Yes   B. No

7. Do you use a computer in your teaching?
   A. Yes   B. No

8. Do you have access to a computer daily to use with students in your school?
   A. Yes   B. No

9. Do you have access to a LCD (liquid crystal display) daily in your school?
   A. Yes   B. No

10. What year did you receive your bachelor's degree?

11. What year did you receive your teaching certificate?

12. Did you complete Iowa State's course, Sec. Ed. 101, "Educational Applications for Computers"?
    A. Yes   B. No

13. What year of your college education did you complete Sec. Ed. 101, "Educational Applications for Computers"?
    A. Freshman   B. Sophomore   C. Junior   D. Senior or later   E. Did not complete

    A. 0   B. 1   C. 2   D. 3   E. 4 or more
15. Did you complete Iowa State's course, EL Ed. 422, "Reading Instruction and Microcomputers"?
   A. Yes  B. No

16. Did you receive an Educational Computing Minor?
   A. Yes  B. No

17. What was your undergraduate grade point average?
   A. 1.0 to 1.99  B. 2.0 to 2.49  C. 2.5 to 2.99  D. 3.0 to 3.49  E. 3.5 to 4.0

18. When you were in college, did you have daily access to a computer at your residence?
   A. Yes  B. No

19. During your undergraduate courses, did you see uses of computer-related technology modeled by instructors in any non-computer course?
   A. Yes  B. No

20. In how many education method courses did you see uses of computer-related technology modeled by the instructor at least 3 times per semester?
   A. 0 courses  B. 1 course  C. 2 courses  D. 3 courses  E. 4 or more courses

21. When you were student teaching, how often did you see computer-related technology used with students?
   A. Never  B. Less than once per week  C. About once per week  D. 2 to 4 times per week  E. Almost daily

22. When you were in high school, how did you use the computer most frequently for school-related activities?
   (Please choose one)
   A. Did not use  B. Programming  C. Word processing  D. Database or Spreadsheet  E. Computer assisted instruction

23. What is the importance of undergraduate education majors completing a course dealing with educational computing in the classroom?
   A. Not important at all  B. Not very important  C. No opinion  D. Very important  E. Very important and should be a requirement

24. If you were designing an undergraduate educational computer class, what would be the most important topic that should be covered? (Please choose one)
   A. Using tool software (word processing, database, spreadsheet) in the classroom  B. Learning how to use the computer  C. Developing strategies used to integrate computers into all disciplines  D. Reviewing a variety of educational software packages  E. Experiencing the newest developments in educational technology
Section Two: Instructional Uses of Computer-Related Technologies

In the following section we will be looking at these three areas of uses of computer-related technologies: 1) your proficiency in using these technologies, 2) your interest in using these technologies, and 3) your frequency of using these technologies.

Part I: Your proficiency

We would like you to rate your proficiency in using the following computer-related technologies. Please mark the corresponding bubble on the answer sheet to the number that best describes your proficiency in using each item.

A. Unfamiliar - I do not know what this item is.
B. Nil - I have no proficiency. I know what this item is, but do not know how to use it.
C. Low - I have a little proficiency with this item.
D. Medium - I have some proficiency with this item, but could use some advanced training.
E. High - I am very highly proficiency with this item.

Computer Based Instruction

<table>
<thead>
<tr>
<th>Item</th>
<th>Unfamiliar</th>
<th>Nil</th>
<th>Low</th>
<th>Med</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drill and practice</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Tutorials</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Educational games</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Problem solving / Higher order thinking</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Simulations</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
</tbody>
</table>

Computer Tool Software

<table>
<thead>
<tr>
<th>Item</th>
<th>Unfamiliar</th>
<th>Nil</th>
<th>Low</th>
<th>Med</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word processing</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Databases</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Spreadsheets</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Desktop publishing</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Graphics/drawing programs</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
</tbody>
</table>

Other

<table>
<thead>
<tr>
<th>Item</th>
<th>Unfamiliar</th>
<th>Nil</th>
<th>Low</th>
<th>Med</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Utilities</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Distance Learning</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Programming</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Hypermedia</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>(e.g., Hypercard, Hyperstudio, Linkway)</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>CD ROM</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Videodiscs</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
</tbody>
</table>
Part II: Your interest
Rate your interest in using the following computer-related technologies for instruction in your classroom or computer lab. Please mark the corresponding bubble on the answer sheet to the number which best describes your level of interest in using each item.

A. Unfamiliar - I do not know what this is.
B. Nil - I have no interest in using this in my classroom or computer lab.
C. Low - I have little interest in using this in my classroom or computer lab.
D. Medium - I have some interest in using this in my classroom or computer lab.
E. High - I am very interested in using this in my classroom or computer lab.

### Computer Based Instruction

<table>
<thead>
<tr>
<th>Item</th>
<th>Unfamiliar</th>
<th>Nil</th>
<th>Low</th>
<th>Med</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>42. Drill and practice</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>43. Tutorials</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>44. Educational games</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>45. Problem solving / Higher order thinking</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>46. Simulations</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
</tbody>
</table>

### Computer Tool Software

<table>
<thead>
<tr>
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<th>Nil</th>
<th>Low</th>
<th>Med</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>47. Word processing</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>48. Databases</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>49. Spreadsheets</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>50. Desktop publishing</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>51. Graphics/drawing programs</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
</tbody>
</table>

### Other

<table>
<thead>
<tr>
<th>Item</th>
<th>Unfamiliar</th>
<th>Nil</th>
<th>Low</th>
<th>Med</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>52. Teacher Utilities</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>53. Telecommunications</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>54. Distance Learning</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>55. Programming</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>56. Hypermedia (e.g., Hypercard, Hyperstudio, Linkway)</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>57. CD ROM</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>58. Videodiscs</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
</tbody>
</table>
Part III: Your frequency of use
We are trying to find out with what frequency these computer-related technologies are being used for instruction. Please mark the corresponding bubble on the answer sheet to the number that indicates the approximate number of times you have used these computer-related technologies in your classroom or computer lab during the 1991-1992 school year.

A. Not familiar with this terminology
B. Never
C. Sometimes (1-4 times a year)
D. Often (5-10 times a year)
E. Very often (more than 10 times a year)

59. I provide opportunities for my students to use drill and practice programs. ........................................... A B C D E

60. I provide opportunities for my students to use tutorial programs. ............ A B C D E

61. I provide opportunities for my students to use a word processing program as a writing tool. ........................................... A B C D E

62. I provide opportunities for my students to take tests or quizzes on the computer. ........................................... A B C D E

63. I provide opportunities for my students to use spreadsheet programs. ... A B C D E

64. I provide opportunities for my students to use database management programs to store, access and manipulate information. ........................................... A B C D E

65. I use a computer to explain or demonstrate an idea or skill to the entire class. ........................................... A B C D E

66. I provide opportunities for my students to use simulation programs. ...... A B C D E

67. I provide opportunities for my students to use desktop publishing programs. ........................................... A B C D E

68. I use the computer to teach problem solving skills. ........................................... A B C D E

69. I provide opportunities for my students to work on the computer in groups. ........................................... A B C D E

70. I use on-line databases and/or bulletin board systems. ........................................... A B C D E

71. I provide opportunities for my students to use interactive videodisc systems. ........................................... A B C D E

72. I use the computer to help manage student information. ........................................... A B C D E

73. I provide opportunities for my students to use art/graphic programs. .... A B C D E

74. I provide opportunities for my students to use telecommunication devices to communicate with others. ........................................... A B C D E

75. I provide opportunities for my students to use any type of CD ROM application. ........................................... A B C D E

76. I provide opportunities for my students to use hypermedia applications (e.g., Hypercard, Hyperstudio, Linkway). ........................................... A B C D E
## Section Three: 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 marking the corresponding bubble on the answer sheet to your response.

<table>
<thead>
<tr>
<th></th>
<th>A: Strongly Disagree</th>
<th>B: Disagree</th>
<th>C: Undecided</th>
<th>D: Agree</th>
<th>E: Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>77.</td>
<td>I think that computers make my professional work more difficult.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>78.</td>
<td>I am comfortable in using computer-related technologies for my own work.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>79.</td>
<td>I think computers make work more enjoyable.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>80.</td>
<td>I would use computer-related technologies much more if the necessary hardware and software were available in my school.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>81.</td>
<td>It has been a struggle for me to learn how to use a computer successfully.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>82.</td>
<td>Teachers do not need to know how to use a computer.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>83.</td>
<td>Computer-related technologies are an important part of the future for improving the quality of education.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>84.</td>
<td>I lack confidence in using a computer to complete my work.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>85.</td>
<td>I would like to improve my skills in the use of computer-related technologies.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>86.</td>
<td>I don’t feel threatened by computers.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>87.</td>
<td>The computer is useful for accessing and organizing information.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>88.</td>
<td>Word processing makes writing more difficult.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>89.</td>
<td>Computers are valuable tools that can be used to improve the quality of education.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>90.</td>
<td>Computers are of little value in education because they can be used to teach only one or two subjects.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>91.</td>
<td>Computer-related technologies should be used to improve learning throughout the curriculum.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>92.</td>
<td>Computers are useful for teaching thinking and problem solving skills.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>93.</td>
<td>Computer-related technologies should be used by teachers more than they are now.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
</tbody>
</table>
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Section Four: Evaluation and Suggestions for Iowa State's Teacher Preservice Program

100. Using the following scale, please mark the bubble on the answer sheet that best indicates your evaluation of the preparation you experienced for using educational computer-related technologies at IowaState.

A B C D E
Very Inadequate Inadequate Adequate More than Adequate Outstanding

Please write your answers to the following questions in the space provided. Continue your answers on another sheet of paper if necessary.

101. What is your rationale for the rating selected in question #100?

102. Please write comments, suggestions, or concerns.

Please mail the survey and the answer sheet in the enclosed self-addressed envelope. Thank you very much for your participation in this study!
APPENDIX D: REMINDER POSTCARD
November 11, 1992

Dear Iowa State Graduate:

We would very much like to include your responses in our study of computer-related technology used by K12 teachers who graduated from ISU. If you have mailed the questionnaire and answer sheet recently, we want to express our thanks to you.

If you have not mailed your questionnaire and answer sheet, please complete it and drop it in a mailbox.

Sincerely,

Ann Thompson, Chair
Curriculum and Instruction
Iowa State University
APPENDIX E: TELEPHONE INTERVIEW TEXT
Hello, my name is _______, and I am calling for a research team from the College of Education at Iowa State University.

In November, you were selected to be included in a study investigating the use of technology in classrooms in Iowa by ISU graduates. Did you receive the questionnaire entitled "Survey of K-12 Computer-Related Technology use by Iowa State Graduates"?

If yes --
We did not receive the completed survey from you, but your input in this study is very important to the teacher-preparation program at ISU. Would you be willing to answer 12 question over the phone?

If no--
We would like to include your input in this study. It is very important to the teacher-preparation program at ISU. Would you be willing to answer 12 question over the phone?

if "no" -- Thank you very much

Great! Please be assured that the responses you give will not be associated with you, but rather used as part of large group data.

1. What year did you receive your teaching certificate? (circle the appropriate answer)
   1) 1986 or before  2) 1987  3) 1988  4) 1989  5) 1990 or later

2. Did you complete Iowa State's course, Sec. Ed. 101, "Educational Applications for Computers"?
   1) Yes  2) No
   1) 0  2) 1  3) 2  4) 3  5) 4 or more

4. When you were student teaching, how often did you see computer-related technology used with students?
   1) Never
   2) Less than once per week
   3) About once per week
   4) 2 to 4 times per week
   5) Almost daily

5. Do you use a computer in your teaching?
   1) Yes  2) No

In the following questions, please rate your interest in using the following computer-related technologies for instruction in your classroom.

Would you rate your interest in:
6) Using the computer for problem solving and higher order thinking skills as:
   None Low Medium High or I do not know what this is
   2  3  4  5  1

Would you rate your interest in:
7) Using the computer for Simulations as:
   None Low Medium High or I do not know what this is
   2  3  4  5  1

Would you rate your interest in:
8) Using the computer for Word Processing as:
   None Low Medium High or I do not know what this is
   2  3  4  5  1

Would you rate your interest in:
9) Using the computer for Data Bases as:
   None Low Medium High or I do not know what this is
   2  3  4  5  1
Would you rate your interest in:

10) Using the computer for Spreadsheets as

None  Low  Medium  High or I do not know what this is
2  3  4  5

Would you rate your interest in:

11) Using the computer for Desktop Publishing as

None  Low  Medium  High or I do not know what this is
2  3  4  5

Would you rate your interest in:

12) Using the computer for Hypermedia as

None  Low  Medium  High or I do not know what this is
2  3  4  5

Thank you for your input in this study.

Are you willing to fill out the complete survey? Yes  No

if yes

Do you need us to send you a new one? Yes  No

Thank you for your cooperation.

Good-bye
APPENDIX F: RESPONDENTS' OPEN-ENDED RESPONSES
RESPONDENTS' WRITTEN RESPONSES TO QUESTION 101 AND 102

Included below are the responses to the following open-ended questions:

Question 101 "Please describe the major reasons for the rating you selected in question #100 (Evaluate the preparation you experienced for using education computer-related technologies at ISU)."

Question 102 "Please include any additional comments, suggestions, or concerns."

101
I was an instrumental music ed. major. None of the methods courses I took even touched upon the uses for a computer in my field. Quite frankly, I do not think many of my college instructors were aware of what was available and how to use it. Even if they were aware, they did not have the time to teach us in their courses. Anything I do know (which is not enough) has been self-taught since graduation.

101
I felt it was adequate for what I needed because it gave me some experience with a variety of programs.

102
I was frustrated with my intro. to computers class because I knew nothing—not even where to turn on the computer. The teacher didn't meet my needs at that point in time.

101
I was only required to use it three times in four years. It was very difficult to find one available to use: or someone to help you.

102
I teach pre & K. We have one computer in our room and various ed. games to play. But I am unable to use the word processing because I don't know how.

101
At the time I attended ISU as an undergrad(83-87), I was not aware of any computer classes offered other than through the computer science dept.

102
I believe that question #80 addressed my biggest concern. I would use computers more in my classroom if I had some science software. This is my largest limiting factor, unfortunately at the current time the cost is prohibitive.

101
Computers weren't in when I was in college in the 60's and early 70's.

102
I'm not in the regular classroom so use of computers is questionable for me in class work.
Everything I know about Apple and Macintosh computers I taught myself. I was never required to do much computer work in education classes at ISU. They were not available 5 years ago as they are now.

The technology has changed and improved since then. I do think that it made me aware and unafraid of them. I also feel comfortable evaluating software.

Classes that spend most of the semester reviewing educational software are totally worthless when you get out in the schools. You are required to use what they have, like it or not. That time could better be spent learning different technology to use in the classroom. Learning to use the video disc is absolutely necessary for middle and high school.

With my major I had very few electives to choose from. In fact, many of my electives were used to fulfill my requirements. I would have liked a class with evaluation of computer media and software on the market.

I didn't take that many courses.

I took comp sec for my math major. The programming course has not helped me in my teaching career (math). I learned to use the word processor/data base/software from teachers in my present school system.

Strongly encourage education computing to students. change math major computer requirements so that education computer courses can be taken instead.

Computer course was not required. The media class we did have to take as educators did not encourage us to use the computer lab. Is there a computer buy program a ISU like the U of I offers through Weeg?

I hope this is helpful. What type of computers are ISU students using? Our school uses Macintosh's but others us IBM.

The computer was used on a very limited basis when I was at ISU (81-6). I'm sure it is used much more now. Teachers need to be very comfortable using the computer themselves before learning to use it in the classroom.

I think the computer is a very useful tool. It is one among many strategies to choose from while teaching. A computer should be sued when it can enhance learning, but learning shouldn't be designed around the computer.
Word processing, database and spreadsheet in Sec Ed 101 was outstanding and has helped me with classroom management and curriculum writing. However, I feel that I needed more experience at ISU with computer-related instruction in the classroom (i.e., micro teaching with students in a student-teacher type setting.)

I have considered Sec Ed 101 as one of the best courses I took at ISU. It helped me tremendously in my first few years of teaching. Unfortunately, I switched school districts last year, and no longer have access to computers for myself or my students. I feel that Sec Ed 101 should be a required course for all education majors.

I felt the classes that I had in college using the computer were good. They gave me a broad exposure to what was available at the time.

The Biggest problem in education that concerns computers is that I, as a teacher don't have time to learn about software, technology, etc. When it comes down to it, you do what has to be done, first. there is little teacher time for "extras" such as computers. Also most schools do not have the $ to buy the necessary equip.

I learned enough to get by and to get started on the computer. Had I more time and money I would have taken other courses to better acquaint me in this area.

I work with special ed children in the home and have little or no access to computers for their use.

We were exposed to computers but not given very much modeling, time to use educational software, how to integrate software and what software is available. We need time, time to explore, time to enjoy and time to learn about computers in a stress free way.

Our school system is investing in an Integrated Learning System, and I plan on investing in my own computer. time for exploration is another problem. I would like the importance of computer literacy and the ability to read computer languages for all levels (special education also) stressed due to future demands.

Because I only had one course in computers and it was an elective.

Computers are becoming a thing of the future. Informing new students of this technology will be most beneficial to them.
The greatest problem I have encountered in the use of the computer in the classroom is -- how do you manage 30 students and one computer? After seven years I still have not found a good way.

Putting our grades on the computer has enhanced our parent relationship. Parents can have a daily or weekly update. Every teacher should do it.

I chose not to enroll in computer courses. I regret not taking computer courses now. I wish I had the confidence and opportunity to learn more about effective computer use in my classroom.

As an undergraduate, I was not aware of the need for computers. I left felt the college would require more it needed. Needless to say they didn't.

If ISU wishes to continue to attract education majors -- they need:

1. more computer courses
2. more in actual class time

The classes I took gave me a good introduction to computer technology, and I was then able to apply my skills more specifically when I started teaching.

There were not enough classes available or required before 1986 that emphasized computers in education -- mainly business.

I have one Apple II with color monitor and printer in my 1st grade classroom. With only one available I put 2 kids at a time on the computer using 3 groups. They get practice using the keyboard.

I did not take enough computer classes at Iowa State. I think the reason is because they were not required. Computer classes should be required!

Computers at my school are not of real importance because there are only three computers in the school which are in the library. There would be more computers if the money was available.

I'm very glad that I took El.Ed.422. I feel it should be a required class.

I feel like my education of computers helped me a lot. There are some things I still need to learn though. I really enjoyed getting my area of concentration in computers.

I plan on getting my Masters in Curriculum and Instructional Technology. I think computers are our future.
I received no computer education, except for one PASCAL programming course.

Require Secondary Ed methods courses to work with computers in the specific areas. Look at software and using computers in the curriculum.

With such a tight schedule of classes-trying to complete college in four years, I didn't have time for computer class that weren't required. I graduated without computer experience and had a brand new Mac in my classroom.

Please REQUIRE computer classes for your college students. If you don't -- they'll go to the classroom where the students will know more about computers than they do.

Computer courses were not required. I received a double major and did not take the time to enroll in courses that were not required.

I took one media class the whole time I was attending Iowa State. That class I don't even think introduced computers. I look back now and cringe at the fact that I had no experience with computers before entering a classroom.

I don't think I am alone in feeling this way. so many computers in my elementary building are not being utilized. One reason is that teachers are unfamiliar with computers and comp. tech.

The computer-related courses I enrolled in at ISU provided me with a variety of applications for the computer. Although I have the knowledge to use computers in my own teaching, I don't to the extent that I know I could for various reasons. The biggest one being lack of time to view, evaluate, and plan for the use of a particular piece of software to accomplish a learning objective.

Every school district seems to support different brands of computers. That's why it's so very important to provide education majors with a solid background in different applications of computers. Once they understand the uses of each application the computer brand name won't matter. Also, computer knowledge helps land education jobs.

Things that I was taught 3-4 years ago are just now getting out into the schools(others, think you are an expert when talking about video disks, interactive videos, hypercard, etc.) It is an area I feel I was best prepared in this area.
All students should be required to take 101 and all of the methods courses should require students to explore and evaluate software packages.

When I went through undergraduate work at ISU, computers in the classroom were still rare. I did get familiar with an apple computer by the time I graduated. I learned more on my own on-the-job with the help of other teachers.

I feel proficient on computers. My home computer is used for many reasons. I've used networking in my graduate work at ISU. Biggest obstacle to computer use in the classroom--NO FUNDS FOR HARDWARE &/OR SOFTWARE.

There are so many valuable discs available that teach problem solving skills and higher order thinking more time should be spent reviewing some of these.

I don't think the class I took taught us useful or valuable information. It didn't relate to what I needed to use in my teaching.

I double majored in Elementary Education and Child Development. There was not room in my program for even one elective. I could only complete required courses to finish in 41/2 years. I wish an education related computer course would have been one of those required courses. I feel it will become even more important in the future for more computers to be used in the classroom.

Classes were tough to get into and fit into my limited scheduling time. I also didn't have access to a computer and sometimes it was difficult getting on one in the lab when I had time.

Material was presently very quickly for those who were not computer literate. Many students had received an great deal of exposure and education regarding computer technology.

The course work at Iowa State did not cover any application of computer use. I have been interested so I have done further work in this area on my own. I feel student are of the computer age and enjoy using them in instruction. It's a great way to get through to some students.

I only took one computer class at ISU--It was for graphic design majors as well as other majors. We had to learn Pascal and write programs! I never had to take a class that taught me how to use a computer in my teaching. What I have learned was when I started to teach--from others and self learning.
I am an art teacher and I have a Mac in my room with superpaint, Pagemaker, Kid Pix and Microsoft etc. Currently I am using a laser disc with a program to go with it. All my curriculum work is done on a computer and so are my class handouts. Some computer education classes would be a great asset to the teaching program at ISU!

I had no preparation and most computer classes were closed because of too many students.

I graduated in Sp.86 and never used or saw computers being used for instructional purposes. Computer access and technology has changed vastly since that time, which no doubt is reflected in curriculum improvements in the area of technology. I am concerned the Education College consider the needs of all teacher candidates when designing curricula regarding technology rather than emphasizing only the classroom teacher.

I have no computers in my school capable of running the kinds of programs that will enhance my curriculum -- art. My lack of usage is because of this reason not my unwillingness to integrate technology.

I had no training in using computers/technology when attending ISU.

Computers are an important part of education today. I am getting more experience now as graduate student. It is also important that prospective teachers understand that because of monetary constraints, the use of new technologies is limited.

I was well prepared to use computer-related technologies because I was comfortable with computers, had a grasp of their capabilities and had practice using them in classroom settings. I have also used them for personal needs.

NO specific training in computers never touched one in the 4 yrs.

These courses were not required.

To teach preschool I felt I needed very little training. However for me personally, I wish I had more. I use word processing to write my monthly newsletters etc. but do not use computers in my classroom at all.

I teach preschool so feel the use of computers is not developmentally appropriate in my classroom. These children need to develop in so many ways before they are ready for computers. I feel young children spend too
much time in front of a video screen as it is and there are many other ways they can be taught the things that are on games appropriate for preschoolers. However I feel computers are extremely essential in our society and when the children are ready should learn to sue them in all ways. Just as a car is essential in our society but we don't teach children to drive until they are developmentally ready, I don't feel we should push our young children into computers.

I did not take any courses on using the computer while at Iowa State. The methods areas which required a visit to a lab were solely for review of software programs—a focus on word processing would have been much more beneficial.

It was just incredibly poor, and lacking in basic computer knowledge.

Now, I wished I would have been taught how to put my students' grades and scores on the computer. I wished the class would have showed me more educational software packages across the whole curriculum. In general, we need more knowledge on the things we can really use in our classroom.

Question #24—all of them are very important so it was difficult to answer.

Instructors assumed we knew more than we did about the computer and spoke over our heads. He was a younger man who had experience with computers in high school. We also never looked at software packages for classrooms. I would have liked a class that taught how to use these more popular programs.

Computer training should be a requirement in teacher preparation.

I feel adequate in using word processing programs, using MacDraw to help create worksheets, games, etc. for my classrooms, and do minor trouble shooting if something is wrong with the computer. However, I wish I had more ideas of how to incorporate the computer into all classroom subjects.

I wish I had had the opportunity to "experience" computers. As it was I was coming from a totally computer-illiterate world and one course was not enough. I have had to learn hands-on and on my own. Needed to teach me how to make do with nothing! (see response to 102)

I was given an old computer to use in my classroom but no software and no printer and no money. I have a couple of games of my own which I use to reward hard workers. My students are angry that they can't use it. It is not
compatible with my home computer so I can't use it for my own work or transfer programs, etc. Real BAD!

I took only one class related to computers. If I had known computers would be such an important part of teaching, I would have taken many more classes on the subject. I now teach a computer class, daily.

Computer courses should be a requirement! All methods classes should have to show how computers can be used in that area!

I had no classes in computer utilization in school. One related to integration of software into the classroom.

Grade management software is great. This is what I basically use our Mac's for. My room has an Apple II in it I use for word processing.

No computer classes were offered or required for my area of education at ISU.

Require more applications programs to graduate and drop some other unuseful classes.

SecEd 101 was a very helpful and informative course (Spring '89). The exposure to a variety of hardware and software provided a good base. I think that once a person has some understanding of the computer and software, as provided in the course, he or she will be more likely to expand on this base, and will be much more comfortable in doing so -- I was!

I have a ComSci minor and teach a computer programming and computer literacy class at my school. The current curriculum includes extensive use of word processing, data base, and spreadsheet, and then exposure to some other software (i.e. Printshop, MacPaint, etc.), but we intend to include HyperCard and desktop publishing (which I need to learn) in next year's curriculum. I teach 4 different math courses, and we make extensive use of graphing calculators in the classroom, using them practically every day in our 4th and 6th year math courses (SCSMP text). About half the student in those classes have purchased their own TI 81. I wasn't sure if this was considered part of computer-related technologies, but I feel it should be.

I didn't take a computer class at ISU. In media resource center, I gained some familiarity with Macs, but it was not emphasized or required.

I would be willing to come to an education class and demonstrate how I use computers in my English classes. That kind of practical experience would have really benefited me. I was not impressed by any education course I
took at ISU, because there was not enough hands-on learning and honest dialogue.

When I attended ISU, I owned a personal computer and was able to complete, practice, and reinforce computer related tasks that I learned in my course work. The addition work I did on my own made my preparation adequate.

It was not a required course and it should be. All schools today use some type of computers and one needs to be able to use a computer.

I was not offered any computer class nor did I ever see it being used as an educational tool.

My ability to use a computer in my classes is limited at best.

I am an art instructor -- teaching K-5th. Some of these questions do not allow for the variety of instruction offered in the Des Moines school system. I hope that this individual survey doesn't ruin your results.

More experiences with computers would have been helpful.

None were required. Yet, every school system is different. Thus, ISU needs to develop a program that can help the teacher adapt to various types of programs, computer, and curriculums.

My instruction was adequate for the time I was in college. Computers have grown a lot since that time. I had to keep us through teacher inservices.

I believe that there could be more computer emphasis in the methods courses, like social studies methods, math teacher methods, etc.

A computer course was never build into the Ag.Ed curriculum so I never took the time to take a course on computers.

When I took my education, computers were not as popular as they are now.

My one computer class was a marvelous class--one of the best instructors I have ever had during my entire education career.

I feel I was adequately trained, but, future graduates need to take additional courses to prepare for teaching.
I would use computers more in my classroom, but we have limited numbers of computers in my school. I wish more businesses would provide public schools with computers!

I was never required to take any computer courses in college. While I take some responsibility, I really was unaware.

The computer courses gave me a good base. I'm sure they have improved. I would hope current information on new software, hardware, and other technological advances are presented in these courses.

I am on the computer committee in my school. We will be choosing an Integrated Learning System in the next few weeks. I'd prefer spending the dollars ($200,00) on modems, LCD displays, and hardware (IBM). Perhaps you need to educate undergrads in what is available in schools (give examples). Although we have CD ROM and a beautiful computer lab, it is far from the ideal I have envisioned! Computers are our future, insist that ISU grade are prepared!!!

I believe it was inadequate because it was an option to take SecEd 101. Therefore, I was hesitant to take the course because I did not have any prior knowledge about computers. I am extremely glad I decided to take the class, and was able to gain confidence through the practices done during lab.

I would suggest making SecEd 101 a requirement for education majors. By doing this it would make people take the course and realize computers are not as threatening as they sometimes seem. The class would have to consist of basic instruction and serve as a "confidence booster" for students.

I also attended graduate school in C&IT. (this information may have you decide not to use my survey). The classes I took as an undergraduate gave me a great introduction to instructional computer—methods of use and a showcase of software.

Instructional computing courses (i.e., SecEd 101) should definitely be a requirement for teachers. No teacher should graduate without knowledge of computer use or software.

I was a computer science minor so I was already familiar with computers. I learned almost nothing about the use of computers in education a ISU.

If you expect to have people fill out your surveys. You need to shorten them!!
When I enrolled at ISU, I had no computer skills, and I felt very threatened by computers. SecEd 101 completely erased those fears. Teachers who are threatened by computers will not use them.

I would strongly recommend that Sec Ed 101 and Sec Ed 302 be required for all teaching majors. In fact, they should replace that outdated AV-film projector class with a computer class. Why place so much emphasis on laminating when most teachers send their materials to the AEA to be laminated? Computers are instructional tool that teachers need to know about.

I feel there are many inadequacies in the undergraduate program at Iowa State. I am proud to say that I graduated from ISU, but I am not honestly able to say that the undergrad program prepared me to become a teacher. This state holds true especially in the area of computer-technology.

I would like to see the results to this survey. I know there have been changes (positive changes) at ISU in the past 3 years and I am glad for that. I would be interested in seeing if I am the only one who feels totally inadequate on a computer.

In my teaching preparation I used the computer for mastery learning in phonics and looked at some software via another class. I learned more in high school about the use of computers that in college.

I would be very interested in serving on any technology committees and/or taking an educational technology course.

The classes were not stressed when I was taking classes. I did go back and take a class on computers and reading after I had taught several years.

I feel computers should be a part of every ISU class. Computers are becoming an important part of the classroom, and teachers need to know about this before they enter their own classroom.

Sec Ed 101 is irrelevant to freshmen. it would be more valuable later in teacher education. My college prep allowed me to learn how to use a computer and what to look for in educational software.

Training for a "One Computer Classroom" would be beneficial.

At the time I took 422, it was 433X. It was a good class. It did give me a good background in available reading programs and how to evaluate them, but what about the other subject areas? I did not take SecEd 101 because I was a CD/ElEd double major and could not fit it in my schedule. From what I
saw, it basically taught LOGO then. My best college computer experience was my work study job at Ag Engineering. I self-taught myself (here's the manual, learn it!) AppleWriter to put Dr. Carl Bern's book on it. The second year he wanted to learn and change the files to AppleWorks. I learned not to be afraid or scared of computers. Everything that could have happened, happened!

My answers might be a bit misleading because I teach 3rd-6th grade computers (soon to be K-6th). I was hired as a remedial teach (which I still teach 2 hours of) but when our school got its first computer in lower elementary (Spring '87). I began teaching mini-lessons. My job then went to upper elementary because the school wanted each student to have the same computer experience (some teachers used the computer, some didn't even turn it on- it just depended whose class you were in).

My goal in my class is that all elementary students have positive experiences with the computer, so when they are in high school they aren't afraid to use the computers for assignments or to take more computer classes.

I have worked quite extensively in teacher in-service regarding technology. I believe it is very important to offer more classes at the college level. I have talked to recent grades (not necessarily from ISU) and they don't have much computer experience from college. Many don't feel comfortable subbing for me. I feel it's important to offer classes on how to work the computer, how to integrate the computer (whole class, small group, individual), which software is best for whole class, small group or individual, and how to evaluate good software. (If they can't do this, they can't do much else!). Then teachers need to learn how computers make their job easier on a personal level. (Although when I'm working with seasoned teachers, it's best to get them comfortable using the computer personally first, then moving on to work with the computer with students. They are very afraid of making a mistake in front of their class.

We are currently opening a new computer lab (in a new addition). It is 30 X 30 with 12 Mac LC's, 1 IIGS, and 11 Ile's. We are not networking at this time, but have the wire run for availability.

As you can see I'm very excited about elementary computers and am currently writing our curriculum for K-6. Please let me know if I can help in any other way. Thank You!

I took only one course in computers. It was good, but not enough. I think that computer courses should be required because that is the direction that education is headed.

My major problem was that at the time I did not have a personal computer. The only way I truly believe to become proficient in computer use is to use one daily.
I am starting to use one now more and more but it is a slow process. I have yet to become very comfortable with a computer. Also most school application I see in my own school is almost entirely on the Mac. I had most of my training on an Apple and my personal computer is an IBM so I don't get much consistency across the board.

The one computer class that I took at ISU dealt mostly with programming. This is a very unnecessary skill, since you buy most of your software which you use in the classroom.

A helpful class on computers would be designed so that integration of computer application to the subject being taught would be the focus. And the class would be specifically for math, science, home ec, etc., not a general integration class.

I did not have any computer related coursework in any classes that were required and none of my instructor modeled any computer technologies.

It is difficult to be confident on a computer when your students have more experience on a computer than you got in college. Mandatory computer classes and more of them need to be put in place.

I don't feel I personally made use at the computer opportunities at ISU.

I feel the technology changes so quickly that many of the things I have learned while at ISU were outdated by the time I reached the classroom. I believe ISU students should be trained at how to apply computer use in the classroom and avoid software that will be outdated when they actually need to use it. ISU students can not anticipate the actual job they will land after graduation.

I did not know terminology, and I lacked confidence because I hadn't had hands-on experience. The computer courses I took were IBM which are not being used in the schools.

We were exposed to one computer class and I don't remember what it was called. I can't recall learning the necessary things in this class.

College students going into education should know basic programming! Also database, spreadsheet, etc. If they only know how much easier their record keeping could be!!

Only had one class. It should be required of seniors - so they take it seriously.
You should teach techniques in grade management, Hyperstudio, video laserdisc, word processing, AppleWorks, use of certain educational game, etc.

I never had any training in computer, only on word processing on Vax for a writing class.

I didn't have enough hand-on experience.

As a single mother -- trying to graduate by a certain date, I needed to take the classes that were mandated. I was a transfer student, so didn't really have the schedule to take electives. I wish that Sec.Ed. 101 and Reading 422 would have been required. I know people, who have taken those courses and they were great! I have learned a lot on my own and feel comfortable, but would like to know more.

Because in my field of Special Education, very little was discussed or explained in a college course. The knowledge I have and use was acquired by my own desire.

Teacher need to know all the wonderful uses for computers in the classroom and the most current developments.

The instructors could incorporate more computers into the course of study. I think the technology was at ISU but used after I graduated (Ex. the library is now computerized--in '87 it was in the process)

It was not nearly as extensive as needed, specifically word processing, data base, and desktop publishing.

I received almost no instruction on computer use in education during undergraduate at ISU.

The only reason I feel comfortable about using the computer is because I've taken a lot of classes on computers as a graduate student. My undergraduate experience would not of been enough.

Study is too long.

I have taken all of the educational computing courses available at ISU and I feel I am prepared to use technology in the classroom.

A course used to review educational software would be very beneficial to students who are planning to enter the teaching field.
Felt threatened by courses so avoided them when possible. The computer class I took I enjoyed. I didn't have the proper hardware so I didn't use what I learned and have not retained it.

The school I teach at has a very poor computer set up. The elementary gets all of the old high school equip. We have nothing for programs. I took a class this summer for the Macintosh-was very discouraged-I have no way to utilize what I learned. My school district buys the cheapest computer equip. they can.

I would like to have learned how to use computers in my specific area of teaching.

ISU never taught me how to sue computers as related to specific disciplines such as Physical Education. ISU must develop skills and abilities through use of computers if our nation is to maintain its position in the world-but our work force must use and understand computers!

I don't recall the variety of computer class offer at the time I attended ISU.

Pascal?

Most teachers now use computer grading systems. Training would be nice!

The only class I took was 101. It did a great job of showing me how to use AppleWorks and its 3 applications. Drills, tutorials, and other educational programs weren't discussed. But, I don't think a lot of time should be spent on going though programs because a teacher can only use what is available to them.

I wasn't required to take any computer classes. Although some fault lies with me, I think it should be a requirement, specifically in word processing, grade managing, database, and one computer classroom (instruction with an LCD). I don't feel like designing programs is valuable, but previewing software is. The regular classroom teacher has too many demands. It would help to know what is out there. I have been fortunate to have my district educate me and WOW! I think it has been great!

Because I did not take any classes for using computer-related technologies in the classroom. The need for taking such classes was not emphasized, nor was the use of computers modeled.

I am happy to hear of the College of Education's concern about improving the teacher preparation program.
I feel computer classes should be required along with the other classes that are required. A variety of makes and programs should be included so once you get in the classroom, you've got a good foundation to help make teaching more efficient.

The computers I was taught on are not used anymore. I feel the classes are offered, but time is wasted in too many methods classes. The methods classes do not properly prepare a teacher. The computer classes were a positive experience for me. They could be easily applied in a class. A major problem is that we do not have enough computers to efficiently use in class. Not enough courses and not enough emphasis given to computers.

Transferring to Iowa State and being an older student, I know nothing about computers. I was even frightened by them. I now have a computer at home and using it for composing written material as well as for keeping electronic grades in a spreadsheet. Because of my instruction at ISU I feel very confident about using the computer and appreciate its power and efficiency.

I have moved to a new building this year and the computer is very inadequate. It seldom works. It has no printer for printing out products and all my composition and grades have to be done at home. I would really like to see a computer lab in our building.

I was not required to take one computer class at ISU. Make it a requirement! Our children's' future is in computers and being able to use them. If a teacher is afraid of them, I guarantee that the computer will not be a point of emphasis in the classroom.

I did not receive any practical training for use of computers in the classroom. What education about computers that I did receive was quickly forgotten as I did not have easy access to a computer.