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The perception and application of computer education by inservice teachers: A follow-up study of ITEC education, Regional Computer Resource Center, College of Education, Temple University

Chambers, Margaret B., Ed.D.

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THE PERCEPTION AND APPLICATION OF COMPUTER EDUCATION BY INSERVICE TEACHERS:

A FOLLOW-UP STUDY OF ITEC EDUCATION, REGIONAL COMPUTER RESOURCE CENTER, COLLEGE OF EDUCATION, TEMPLE UNIVERSITY

A Dissertation

submitted to

the Temple University Graduate Board

in Partial Fulfillment of the Requirements

for the Degree of Doctor of Education

by

Margaret B. Chambers

June 1988

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Title of Dissertation: THE PERCEPTION AND APPLICATION OF COMPUTER EDUCATION BY INSERVICE TEACHERS: A FOLLOW-UP STUDY OF ITEC EDUCATION, REGIONAL COMPUTER RESOURCE CENTER, COLLEGE OF EDUCATION, TEMPLE UNIVERSITY

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Date .....

.....
(Dean of Graduate School)

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Chapter I

INTRODUCTION

The National Commission on Excellence in Education, while examining the state of the educational system of the United States, recommended the use of "new instructional materials to reflect the most current applications of technology" (1983, p. 29). In a similar statement, the Carnegie Forum on Education and the Economy, in discussing the teacher's place in the educational system, endorses "more effective use of technology, thereby increasing the schools' productivity" (1986, p. 93). Both groups point to computers as a technology that is accelerating rapidly.

"Technology, in particular microcomputer technology, is fast becoming not a luxury but a necessity to most schools," (Diem, 1982a, p. 1). "Not since the invention of the printing press has a technological device bourne such implications for the learning process" (Bork, 1985, p. 1). The number of computers in schools is growing rapidly. Between the spring of 1983 and spring 1985, the number of computers in use in elementary and secondary schools in the United States quadrupled from about 250,000 to over one million (Becker, 1986-1987). Rogers (1983) states "the historic objection to computer use, the high cost of hardware, is no longer valid" (p. 1).

Along with the increased access to computer hardware has come the need for teachers to have the ability to make use of the equipment. School administrators and parents now expect teachers to use the computer both to teach computer skills and to deliver instruction in other subject areas (Luehrmann, 1985). Many educators believe existing computers in schools are being under-utilized or used poorly and educational opportunities are being lost because teachers do not understand how computers can be used in instructional settings (Beck, 1980; Luehrmann, 1985; Milner, 1980; Zuckermann, 1983). The lack of computer training in teachers has become a limiting factor in the use of computer technology in schools (Diem, 1982a).

A growing number of educational institutions currently offer courses to prepare teachers to use computers for instruction and classroom management (Sattler, 1985). Studies by Hilgenfeld (1983) and Singer (1984) show that the content of existing computer education courses offered by different institutions varies considerably. The variations are in the intended audience, number of hours of instruction, and content of the courses.

Johnson (1985) suggests several alternative course formats for preservice teachers: free standing course, computer science faculty cooperating with regular faculty in the same course, and faculty in each discipline teaching

computer literacy in their own courses. For the preservice teacher computer training is often part of mathematics courses (Thomas & Thompson, 1986). Introductory courses to instructional technology may also include computer instruction (Anderson, 1982; Ganske & Hamamoto, 1984; Poirot & Muro, 1983). Rogers (1983) recommends that, after computer basics are established, the teaching aspects of computers be presented to preservice teachers in methods courses.

Although there is considerable feeling that inservice teachers should have the same computer competencies as preservice teachers (Rogers, 1983), the material should be presented differently (Ganske & Hamamoto, 1984). Inservice teachers have less time, less adaptive mind sets to training, and are more concerned about the relevance of their training to classroom teaching (Ganske & Hamamoto, 1984). Usually inservice training builds on existing skills, but inservice teachers are often completely unfamiliar with computers (Carrier, Glenn & Sales, 1985). Recommended inservice teacher training may consist of one or two day workshops (Poirot & Muro, 1983), a one week summer course (Diem, 1981), or a 45-hour course delivered by a school district or a university (Martin & Heller, 1982). Bork (1982) suggests a self-paced computer course.

There is little consensus among experts on the content for either preservice or inservice computer training for teachers (Bruwelheide, 1982). Suggested computer competencies vary from the ability to select and use software (Hoth, 1985; Schiffman, 1986b) to the ability to design, develop and program instructional materials (Henderson, 1978).

A review of the literature shows several studies where inservice teachers were asked to select topics or reply to open ended questions recommending competencies for the computer training of other teachers. The National Education Association (1983), surveying NEA members, found at least 50% were interested in learning about applications of computer- assisted instruction, how to operate a computer and how to write computer programs. In a question about the purpose of using computers, more than 60% of the NEA subjects would like to use computers for enrichment and simulations.

Jarchow & Hunter (1983) reported that 85% of the Iowa teachers in their study agreed that teachers should have six basic computer competencies. (Teachers should be able to describe the use of the computer, to recognize the components of computer hardware, to identify the major functions of a computer system, to describe the uses of computers in society, to use a software package and to value

the potential role of computers.) Elementary teachers preferred drill and practice and tutorial inservice training, while computer-managed instruction was more important for secondary teachers.

Hilgenfeld's (1983) subjects were administrators and teachers identified as members of computer-user groups. Hilgenfeld listed 15 computer topics or competencies that at least 66.7% of the respondents perceived as necessary in a teacher training program. The items included the availability and evaluation of instructional software, using computer-assisted and computer-managed instruction, determining the computer needs of a school and trouble shooting hardware.

Stasz, Winkler, Shavelson, Robyn and Feibel (1984) asked teachers who were "nominated as 'successful' [computer] users in mathematics and science instruction" (p. 3) to recommend content for inservice training. The topics most frequently included were: operation of a computer, computer programming, and the selection and evaluation of courseware. In the four studies mentioned above, the subjects did not necessarily have formal computer training, nor were the responses related to the subjects' own computer training.

Evaluations of inservice computer courses (Masden & Sebastiani, 1987; McDermott, 1985; Ogletree, 1984) have measured cognitive and affective gains at the end of instruction, but generally have not looked at the results of training when the teacher returns to classroom teaching. Extensive studies of computer use in schools (Becker, 1985, 1986-1987; Hood, 1985) give a descriptive picture of the number of computers in the schools, student/computer ratios, subject matter taught and grade level use but do not relate computer use to teacher training.

Teachers, school boards, governments, and teacher educators recognize the problem of computer education for teachers and call for a massive training program to solve it (Ganske & Hamamoto, 1984) yet the literature indicates that little is known about the perceptions of the teachers taking an inservice course or about the classroom implementation of such training. "Gathering information about the outcomes of [computer] training from the teachers who participate" is even more important than the identification of needs (Ganske & Hamamoto, 1984, p. 112).

The Commonwealth of Pennsylvania has been well aware of the problems of computer technology in education. Neights (1981), while describing a State program to bring computer literacy to administrators and intermediate unit personnel, writes "The Keystone State is rapidly positioning itself as

the keystone among states adopting instructional technologies on a large scale" (p. 27).

Dr. Kenneth R. Mechling has had a continuing concern about teacher education and the implementation of teacher training in the classroom (Mechling et al., 1982; Mechling & Oliver, 1983). Dr. Mechling was president of the Pennsylvania Science Teachers' Association (PSTA) when a 1982 PSTA survey revealed a need for training science teachers in the use of the technologies available in the classroom. To meet this need, Dr. Mechling, with Donna Oliver and other leaders of PSTA, and with the cooperation of, and funding by, the Pennsylvania Higher Education Assistance Agency (PHEAA), started the Computer Orientation for Reshaping Education in Science (CORES) project. Through CORES, a computer course for inservice teachers was offered at six locations in the Commonwealth during the 1983-84 academic year (Regional Computer Resource Center Management Group, 1986).

The success of the CORES program was noted by the General Assembly of Pennsylvania. In the spring of 1984, Dr. David Wright, a member of the Pennsylvania House of Representatives and the PHEAA Board of Directors, introduced House Bill #1898 to "improve and strengthen computer education" in schools throughout the Commonwealth of Pennsylvania (Information Technology Education Act). The

bill was passed by the General Assembly of the Commonwealth and signed into law by Governor Dick Thornburgh in July, 1984, as Act 145, the Information Technology Education Act (Appendix A) (Regional Computer Resource Center Management Group, 1986).

The Information Technology Education for the Commonwealth program (ITEC) which was created by Act 145 is designed to coordinate computer education activities in the Commonwealth, encourage orderly planning of the use of microcomputers in the schools, improve teacher education in the field of computer education and assist schools to acquire computer hardware and software. Priority was given to the equalization of the development of computer skills for both students and teachers in all the school districts. The ITEC program was implemented by the Pennsylvania Higher Education Assistance Agency (PHEAA). As of 1986-1987, Pennsylvania had spent $15.7 million "on improving microcomputer educational opportunities" (Mechling, 1987, p. 4).

Act 145 mandated the establishment of a minimum of eight Regional Computer Resource Centers (RCRC). By the summer of 1985, fourteen Centers were established at four intermediate units, two colleges, one community college and seven universities across the state (Appendix B). The purposes of the RCRCs are "to increase teacher expertise

relating to computer information technology" and assist the school districts in the acquisition of hardware and software (Information Technology Education Act).

The RCRCs offer a variety of services to teachers and their schools including: workshops on special topics such as Appleworks or The Voyage of the Mimi; a software library which allows teachers to preview computer programs for different ages, subject areas and computers; and "a multifaceted educational advisory service" (Kerrigan, Mechling & Weiner, 1987, p. 18). The Centers also offer a three-credit (45 hour) graduate course to help inservice teachers use computers for instruction. The course is offered in two sections, one for elementary and one for secondary school teachers (Weiner & Bodek, 1987).

Statement of the Problem

Currently there is no information concerning the perceptions and applications of computer education by teachers who have completed an inservice course offered by the Regional Computer Resource Center at Temple University.

Purpose of the Study

The purpose of the study was threefold:

1. to determine how teachers who have completed a 3-credit inservice computer course at the Regional Computer Resource Center at Temple University perceive the importance and usefulness of selected computer topics.

2. to describe how ITEC trained teachers are currently using computers in education.

3. to determine the relationship of demographic and environmental factors influencing the use of computers in the classroom by ITEC trained teachers.

Research Questions

A. Teachers' Perceptions of the Course Content

1) Which course topics were most useful/important in using computers for instruction?
2) Which course topics were least useful/important in using computers for instruction?
3) What topics should have been included but were missing?
4) What topics should have been eliminated?
5) What topics are recommended for an another course?

B. Teachers' Instructional Computer Use.

6) Are computers available to the teacher? Where? How many?

7) Are computers available to the teachers' students? Where? How many?

8) What brands of computers are available in the schools?

If computer(s) is available for teacher use:

9) Does the teacher use the computer for computer managed instruction and/or administration? If so, how often?

10) Does the teacher use the computer for computer supported instruction? If so, how often?

If computer(s) is available for use with students:

11) Does the teacher use computer assisted and/or computer supported instruction with students? If so, how often?

12) Does the teacher teach about computers?

13) Are computers used for remedial or standard instruction or for enrichment?

C. Environmental Factors and Computer Use

14) Has the teacher's instructional computer use increased, diminished or remained constant since taking the course?

15) What other computer-related activities has the teacher become involved with since taking the course? Has the teacher taken other courses or workshops? Has the teacher written grant proposals involving computers? Has the teacher initiated or participated in computer projects in the classroom or school?

16) What is the relationship between environmental factors such as the availability of hardware and software, the quality of software, administrative or faculty support, student interest or teacher's confidence in using computers and teacher's use of computers in instruction?

17) Have any environmental factors influencing computer use changed since the teacher took the course?

D. Demographic Factors and Computer Use

18) What are the teacher's age, and sex? How long has the teacher been teaching?

19) What year did the teacher receive a Bachelor's Degree? What year and from what state was the teacher certified to teach?

20) Does the teacher have any advanced degrees?

21) What grade level and subject area does the teacher teach?

22) In what type of school, public, private or parochial, does the teacher work?

23) What computer training had the teacher had before taking the Regional Computer Resource Center course?

24) In which semester was the teacher enrolled in the course?

25) Is there a relationship between demographic factors and teachers' use of computers in instruction?

Significance

As the number of computers in classrooms grow, teachers are being asked to use the computers in the delivery of instruction, to teach their students about computers (Luehrmann, 1985) and to use computers to help with their administrative tasks. Computer skills are becoming a criteria in teacher selection (Nelson & Waack, 1985).

Despite the urgency to train teachers in computer skills (Bork, 1982; Levin, 1985) and the tremendous numbers to be trained (Rogers, 1983), "there is no consensus among experts regarding the minimum competencies required by teachers to implement computer technology in the classroom" (Bruwelheide, 1982, p. 29). Ganske and Hamamoto stress the importance of "gathering information about the outcomes of [computer] training from the teachers who participate" (1984, p. 112).

The computer courses for inservice teachers of Pennsylvania offered at Temple University through the Regional Computer Resource Center provide an opportunity to relate a specific curriculum to the current computer needs and uses of teachers. The findings of this study have implications for the course given at the Regional Computer Resource Center at Temple University. The results may have applications for other inservice and preservice computer training throughout the Commonwealth of Pennsylvania.

This study is a follow-up survey of the teachers who have taken either the elementary or secondary sections of the three-credit ITEC computer course offered through the Regional Computer Resource Center at Temple University (Education 554). The study was designed to elicit the participants' recommendations for future sessions of the course, to determine how the teachers are using computers in the classroom and what factors are influencing their computer use.

Definitions

The study will use the following definitions:

A. General Definitions

Applications: software "that can be applied to a specific task" (Kinzer, 1986, p. 56). "The most significant applications are word processing, numerical analysis, graphics, instrumentation, electronic processing, and ledger or spread sheet manipulation" (Wright & Forcier, 1985, p. 317)

Computer: "An electronic device that manipulates information presented as numeric symbolic code according to a list of precise instructions in order to perform simple operations such as input, manipulate, store and output information" (Wright & Forcier, 1985, p. 315).

Computer competencies: computer skills. Skills are defined as "the ability to perform tasks or get answers by carrying out processes with appropriate speed and accuracy" (Flake, McClintock & Turner, 1985, p. 393).

Hardware: "a term used to describe the physical equipment of a computer system" (Wright & Forcier, 1985, p. 316).

Inservice teachers: teachers currently teaching in the classroom.

Microcomputer: "a small, low-cost, stand-alone computer system" (Flake et al., 1985, p. 387).

Preservice teachers: undergraduate students in a college of education.

Program: "A sequence of statements describing actions a computer must perform to carry out a process" (Wright & Forcier, 1985, p. 318).

Software: computer programs including applications, operating systems and languages (NEA, 1983).

B. Definitions Specific to the Study

Computer course: a three-credit (45 hour) series of lessons at the graduate level designed to provide teachers with the computer skills needed for instruction as defined by the ITEC course syllabi (Appendix C). Two sections, one for elementary, the other for secondary school teachers are offered by the RCRCs. Appendix D contains the syllabi for the courses at Temple University.

Computer supported instruction: the use of the computer by the instructor or student to support the instructional process. For example: using word processing software to assist in the composition and editing of a paper.

Elementary school teachers: teachers of grades K - 8

ITEC: Information Technology Education for the Commonwealth. Program established by the Information Technology Education Act.

RCRC: Regional Computer Resource Center. Fourteen RCRCs where teachers can use computer equipment, preview computer software, and participate in computer workshops and courses have been established throughout the Commonwealth of Pennsylvania under the Information Technology Education Act.

Secondary school teachers: teachers of grades 7 - 12

C. Definitions of Computer Course Topics

Each item is related to the appropriate Elementary and/or Secondary course objective as set forth in the syllabi (Appendix D).

BASIC: Beginners' All Purpose Symbolic Instruction Code. "A high level programming language available with most

microcomputers and commonly used in personal and educational applications" (Flake et al., 1985, p. 378). (Elementary and Secondary objective #4)

Computer assisted instruction: "the use of drill and practice, tutorial, simulation and problem solving software" in the classroom (Flake et al., 1985, p.379). (Elementary and Secondary objective #3)

Computer managed instruction: "Use of the computer as a diagnostic, prescriptive and organizational tool to gather, store, manipulate, analyze, and report information relative to the student and to the curriculum" (Wright & Forcier, 1985, p. 315) (Elementary and Secondary objective #6)

Courseware: software and accompanying materials that make up a course of study (NEA, 1983). (Elementary and Secondary objective #2)

Courseware evaluation: "an evaluation of a [computer] program's educational content and value, technical features, ease of use, student interaction, record-keeping capability, and documentation, and specific information concerning its quality as a tutorial, simulation or other type of software" (Flake et al., 1985, p. 380). (Elementary and Secondary objective #2)

Data base: "an organized collection of related files of information stored and accessed electronically by computer" (Wright & Forcier, 1985, p. 315). (Elementary and Secondary objectives #3 and 6)

Desktop publishing: using computer software to plan, design and implement the layout of text and graphics for newsletters and other print materials (Hertzberg, 1987). (Elementary and Secondary objectives #3 and 6)

Drill and practice: a computer program whose function is mainly to develop skills through repetition (Flake et al., 1985). (Elementary and Secondary objectives #2 and 3)

Learning tool: also computer-supported instruction, "an application of the computer that enhances a person's ability, resulting in increased productivity" (Wright & Forcier, 1985, p. 317). (Elementary and Secondary objectives #3 and 6)

Logo: "A high level language that is based on the teachings of the Swiss psychologist Jean Piaget and emphasizes learning by discovery in a computer-based learning

environment" (Lockhard, Abrams & Many, 1987, p. 395). (Elementary objective #5)

Modem: "device that is needed for communicating via telephone lines with other computers" (Flake et al.,1985, p. 387). (Secondary objective #2 and 5)

Problem solving: "a process of doing rather than receiving, such as finding solutions to questions for which the answer is not obvious, finding ways to accomplish goals" (Flake et al., 1985, p. 390). (Elementary and Secondary objectives #3 and 8)

Programmed instruction: "verbal sequences, referred to as frames, [that] are arranged to lead the student from a state of no knowledge to skill in the subject matter". "The microcomputer.... is a current example of the Skinnerian concept of programmed instruction" (Bell-Gredler, 1986, pp. 99, 100). (Elementary and Secondary objective #7)

Programming: "The process of analyzing a problem and then planning and preparing a sequence of instructions for a computer to follow in order to solve that problem" (Wright & Forcier, 1985, p. 315). (Elementary and Secondary objective #8)

Programming language, also computer language: "a standard set of words, together with the rules governing their use, for communicating with a computer" (Flake et al., 1985, p. 390). (Elementary objectives #4, 5 and 8, Secondary objectives #4 and 8)

Simulation: a controlled representation of the real world used to "assist students in the acquisition of knowledge and skills through surrogate experiences" (Digital Equipment Corporation, 1983, p. 29). (Elementary and Secondary objectives #2 and 3)

Spread sheet: ledger sheet, "a worksheet accommodating a large number of interrelated numeric entries. On the computer it is often used to create projections or forecasts. When one entry is changed, the program is capable of computing all related entries" (Wright & Forcier, 1985, p. 317). (Elementary and Secondary objectives #2, 3 and 6)

SuperPILOT: enhanced version of PILOT (Programmed Inquiry Learning Or Teaching). A high-level language which allows "teachers to write text for the screen, develop graphics and special character sets, and permits the creation of music and sound without much difficulty" (Napier, 1986, p. 285). (Elementary and Secondary objective #8)

Tutorial: "educational software that instructs the student by engaging her in a dialogue related to the material being taught" (Brownell, 1987, p. 413). (Elementary and Secondary objectives #2 and 3)

Word processing: "the use of a device or computer program to edit, format, store, and display text" (Wright & Forcier, 1985, p. 320). (Elementary and Secondary objectives #2, 3 and 6)

Research Procedure

Selection of the Population

The population for the study was the teachers who had completed either the Elementary or Secondary sections of the three-credit graduate computer course at the Regional Computer Resource, Temple University (Education 554). Students from the first class in the summer of 1985 through the spring semester of 1987 were included as they had had time to use the content of the courses in the classroom.

Questionnaire Design

The questionnaire asked the subjects for their perceptions of the importance and usefulness of selected topics included in the Regional Computer Resource Center computer course and for recommendations for future courses (Research Questions, Section A). The subjects were also asked about their current use of computers in education (Research Questions, Section B) and the environmental factors influencing computer use (Research Questions, Section C). Demographic questions included the number of years as a classroom teacher, grade level and subject(s)

taught, age and sex (Research Questions, Section D). The questionnaire is included in Appendix E.

Questionnaire Development

The questionnaire was reviewed by a panel of experts involved in the computer education of teachers. The experts were Dr. Elton Robertson and Dr. Roger Gordon of Temple University, Dr. Kenneth Mechling, Director, ITEC Teacher Education Center, Clarion University and Mr. Ned Heeter, Program Evaluation Specialist, Pennsylvania Higher Education Assistance Agency. Revisions were made according to the recommendations of the panel.

The questionnaire was pilot tested during August of 1987 to establish criterion validity as recommended by Bailey (1982). The pilot-test subjects were eight teachers who had completed Educational Media 554, a course with a syllabus similar to Education 554. The respondents had at least one semester after taking the course to implement their computer skills in the classroom. The pilot subjects were asked to complete the proposed questionnaire and to make comments on individual items. The pilot subjects were also asked how much time was necessary to complete the questionnaire and if the directions and questions were clear (McMillan & Schumacher, 1984). Changes were made according to the pilot subjects' suggestions.

Data Collection

Data collection began October 1, 1987. Data collection in October and November is recommended by Orlich et al. (1975) as a period when teachers have the least pressure from other paperwork.

Two hundred eighty-nine questionnaires were mailed. A cover letter was included as the first page (Appendix E). Bailey (1982) states that questionnaires on the back of cover letters bring a higher response rate than those on a separate sheet (possibly reflecting a preference for a shorter version). One side of the questionnaire included the return address and a stamp. The subjects needed only close the pages with staple or tape before mailing. The ease of returning the questionnaire can have a positive effect on the response rate (Bailey, 1982).

A numerical code was placed on each questionnaire for identification and the respondents' names were checked on a master list as the replies were received. Two weeks after the first mailing a reminder letter (Appendix F) was sent to those subjects who had not responded. After another two weeks a second follow-up consisting of a letter (Appendix F) and duplicate questionnaire were mailed to those subjects that had not been checked on the master list (Bailey, 1982).

There were 154 replies to the mailings (54%). Four questionnaires were undeliverable and those names were removed from the population. Babbie (in Bailey, 1982) feels that a 50% return is adequate.

Data Analysis

Data was coded, tabulated and analyzed on a Macintosh SE using the statistical program StatView 512+. Data describing the respondents and their use of computers in education is presented as frequency distributions and/or tables of absolute values and percentages. Analysis of the subjects' recommendations and the relationships of the recommendations to the characteristics of the respondents were also analyzed. Comments and other non-codeable data were compiled, summarized and reported (Appendix G).

Limitations

1. The study was limited to teachers who had taken either the Elementary or Secondary sections of the three-credit computer course at the Regional Computer Resource, Temple University. The study was limited to the subjects' perceptions of the content of the course, their current use of computers in their classroom instruction and the factors influencing their computer use.

2. The study does not measure the subjects attitudes toward computers or cognitive gains from the course. Pre-

and post-tests to show attitude change and cognitive gain are given to course participants and analyzed by the ITEC program.

3. The phrase "computer literacy" is not used. As Hilgenfeld (1983), Diem (1982a) and Levin (1985) point out, the term now has many, sometimes conflicting, meanings. The study considers the computer competencies for inservice teachers and does not attempt defining computer literacy.

Delimitations

1. The study was restricted to subjects who have completed either the Elementary or Secondary sections of Education 554 at Temple University. Teachers who had "Withdrawn" from the course were not included as they might not be familiar with some of the topics and could not judge the time and importance given to topics presented at the end of the semester.

2. Teachers enrolled in Education 554 at the time of data collection were not included as they might not be familiar with some of the topics and could not judge the time and importance given to topics presented at the end of the semester. Currently enrolled teachers would not have the opportunity to implement all the competencies included in the course in the classroom.

3. Teachers who have had similar courses at other Regional Computer Resource Centers were not included.

4. The study does not include teachers who have only participated in Regional Computer Resource Center workshops.

Structure

The study is presented in five chapters. Chapter I contains the introduction, the purpose and the significance of the study, the research questions, definitions of the terms used in the study, limitations and delimitations. Chapter II reviews the relevant literature. Chapter III describes the procedures followed to implement the study, including selection of the population, survey instrument development and data collection. Chapter IV presents the data analysis and the findings. Chapter V presents an interpretation of the data, conclusions and recommendations.

Chapter II

REVIEW OF THE RELATED LITERATURE

The purpose of the study was three-fold:

1. to determine how teachers who have completed a 3-credit inservice computer course at the Regional Computer Resource Center at Temple University perceive the importance and usefulness of selected computer topics.

2. to describe how ITEC trained teachers are currently using computers in education.

3. to determine the relationship of demographic and environmental factors influencing the use of computers in the classroom by ITEC trained teachers.

The review of the related literature is divided into five sections: 1) the importance, growth and uses of computers in education; 2) the need for, effects of, and ways inservice computer courses are provided; 3) the content of inservice courses as recommended by experts and perceived by teachers; 4) current uses of computers in instruction and 5) demographic and environmental factors that appear to influence the use of computers in education. A summary concludes the chapter.

The review of the related literature was based on online searches of the ERIC and Dissertation Abstracts International data bases. The Education Index was searched on CD-ROM. The computer searches were supplemented by hand searches of the most recent journals. Bibliographies related to the field were also used as sources (Arsulich, 1982; Bruwelheide, 1982; Burkholder, 1985; Clay, 1982; Friel & Roberts, 1980; Hall, 1981; Martin, 1983; McLaughlin, 1987; Miller, 1981; Summers, 1985; Teacher Education and Media Project, 1964).

COMPUTERS IN EDUCATION

The Importance of Computers in Education

The use of technology in education has been recognized and recommended: both the National Committee on Excellence in Education (1983) and the Carnegie Forum on Education and the Economy (1986) look to educational technology in general, and computer technology in particular, to help solve the problems facing our educational system today.

The Commission on Instructional Technology stated "technology could bring about far more productive use of the teacher's and the student's time" (1970, p. 6). The Commission concluded that technology in education was not only effective but "the further one looks ahead, the more benefits technology seems to hold for education" (p. 27).

In 1970, when the Commission published its report, the use of computers in education was severely limited due to the expense of acquiring, leasing and operating large computers. Even so the Commission was warned "not to confuse the present reality of CAI with its potential" (p. 76).

More recently, the National Task Force on Educational Technology (1986) states "The computer is a device uniquely suited for education" (p. 60). The Task Force stresses the ease of manipulating large amounts of information and individualized instruction as major contributions of the computer to education. Bork (1984a) predicts that "within twenty years the computer will be the major delivery system at all levels and in practically all subject areas, replacing books and lectures" (p. 179).

The Growth of Computers in Education

The development of the microcomputer in the mid-1970s made more computer power available in a smaller space for less money. Reduced cost has been particularly significant for educators as it allowed many schools to begin to use computer technology (Baker, 1985; Brownell, 1987; Diem, 1982b). Rogers (1983) states "the historical objection to computer use [in education], the high cost of hardware, is no longer valid" (p. 1). "Computers are here to stay" (Milner, 1980, p. 544).

Schools have been swift to respond. "Even though education has a reputation for moving slowly when initiating changes, computer literacy is an area where education has progressed rapidly" (Owens, 1985, p. v). The enthusiasm for computers has been encouraged by pressure for immediate action from communities (Moskowitz & Birman, 1985) and from parents (Bork, 1984b; Jay, 1983; Komoski, 1984).

The number of computers in schools has been growing rapidly. Stasz et al (1984) reported a 230% increase in microcomputers in the schools between the fall of 1980 and the spring of 1982. In the fall of 1984 there were 630,000 microcomputers in the nation's schools (Hood, 1985). This means that 94.2% of U. S. public school districts were using computers for instruction, up from 41% in 1981 and 81.6% in 1983.

Between the spring of 1983 and spring 1985, the number of computers in use in elementary and secondary schools in the United States quadrupled from about 250,000 to over one million (Becker, 1986-1987). Becker found that three quarters of the schools which had not used computers in 1983 had begun to do so in 1985.

There was a 128% increase in the number of microcomputers in the schools of Maryland and an 18% increase across the nation between 1986 and 1987, with

predictions of increased spending for 1987/88 ("Educational Technology 1987", 1987).

The Uses of Computers in Education

A number of different terms and systems have been used to categorize the educational uses of computers (Sherwood, 1986). One classification divides teachers' uses of computers into three categories: teaching about computers, computer managed instruction, and computer assisted instruction (Sadowski, 1983).

Teaching about computers occurs when the computer, itself, is the object of instruction as in computer literacy or computer science classes. Computer managed instruction (CMI) is "a diagnostic, prescriptive and organizational tool" which relates a student's progress to the curriculum (Wright & Forcier, 1985, p. 315).

Computer assisted instruction (CAI) uses the computer to deliver instruction (Sadowski, 1983). CAI is frequently subdivided into drill and practice, tutorials, and simulations (Flake, et al., 1985; Sadowski, 1983; Sherwood, 1986). Drill and practice programs develop skills through repetition (Flake, et al., 1985). Tutorials are educational programs which instruct "the student by engaging her in a dialogue related to the material being taught" (Brownell, 1987, p. 413). Simulations are controlled representations

of the real world used to "assist students in the acquisition of knowledge and skills through surrogate experiences" where the actual experiences are either unavailable or undesirable (Digital Equipment Corporation, 1983, p. 29).

Other forms of computer assisted instruction include: instructional games and problem solving (Flake et al., 1985). The categories of CAI are not clear-cut and it is frequently difficult to label software (Lockhard, Abrams & Many, 1987).

Recently, more attention has been given to using the computer to support classroom instruction (Kearsley, 1987; Schiffman, 1986c; Watt & Watt, 1986). Teachers and students can increase productivity with the help of word processing, data bases, spread sheets, graphics, and desktop publishing programs.

Becker (1986-1987) reports that computer-using teachers are beginning "to believe that the best way to use computers at their school was as a tool to help students accomplish concrete tasks - tasks in writing, problem solving, data analysis and perhaps other areas" (p. 10). Moursund (1986) has been awarded a National Science Foundation grant to develop inservice programs for teachers and administrators focused on the use of computers as tools.

A summary of the educational uses of computers by Taylor (1980) describes three functions of the computer: tutor (the teaching function or computer assisted instruction), tool (word processing, etc. to support instruction) and tutee (directing, or programming the computer).

COMPUTER TRAINING FOR INSERVICE TEACHERS

The Need for Inservice Computer Training

> One of the ironies of life is that educators, those who are preparing people to live in the future, are the last segment of society to use new technologies. Teachers, frequently poorly informed or not informed at all, become bewildered by and disinterested in new technologies. (Beck, 1980, p. 5)

Many educators believe existing computers in schools are being under-utilized or used poorly and educational opportunities are being lost because teachers do not understand how computers can be used in educational settings (Beck, 1980; Luehrmann, 1985; Milner, 1980; Zuckermann, 1983). Teachers are given computers to use in their classrooms with minimal or no training in their use (Bork, 1985; Luehrmann, 1985; McCracken, 1985; National Task Force on Educational Technology, 1986).

The lack of computer-trained teachers has become a limiting factor in the use of computer technology in schools (Diem, 1982a). Watt considers "the growth of computer literacy among teachers and the gradual incorporation of computers into all subject areas should be of the highest priority" (in Levin, 1985, p. 204).

School administrators and parents now expect teachers to use the computer both to teach computer skills and to deliver instruction in other subject areas (Luehrmann, 1985). Sometimes teachers, even non-computer specialists, are expected to provide computer literacy classes for their students (Ferres, 1983). In a survey of elementary school teachers in Anchorage, 67% of the respondents said they were expected to use a computer regularly with their classes (Bychowski & Van Dusseldorp, 1984).

Secondary school principals feel that some computer science is valuable to any teacher (Dennis in Milner, 1980). Both elementary and secondary school principals in Iowa favored or strongly favored a requirement that all education majors complete at least one computer literacy/ computer-assisted instruction course (Nelson & Waack, 1985).

Computer competencies are becoming a factor in teacher selection. More than a third of the principals surveyed screened prospective teachers for microcomputer skills

(Nelson & Waack, 1985). School districts wishing to avoid the expenses of inservice training may hesitate hiring teachers without computer competencies (Podemski, 1981).

A 1987 survey of computer requirements for teacher certification shows 13 states and the District of Columbia require all students who expect to receive teaching degrees to take a computer course (Educational Technology 1987, 1987). All District of Columbia and Florida teachers have to prove computer literacy skills for recertification (Sandoval, 1984). New York is considering requiring a computer course for all teachers, while North Carolina has required computer competencies since 1985 ("Educational Technology 1987", 1987).

Teachers, themselves, recognize the need for computer training: 44% of 3,576 Minnesota secondary school teachers of mathematics, science, business education and computer science felt that they were inadequately prepared to make decisions about using computers in the classroom (Klassen et al., 1980). The National Education Association study (1983) of 1700 teachers nationwide reported that 63.2% of the respondents felt that teachers with computer skills would be in great demand and 62.5% were moderately or very interested in taking a computer course.

In 1982, Overdorf (1984) surveyed secondary school teachers in schools chosen for their computer activity. He found that 31.5% of the respondents felt their computer training to be less than adequate at the time and 56.6% expected their training to be inadequate in three years' time. The teachers felt that the value of microcomputer knowledge would increase over the next three years.

Teachers are taking the responsibility for their own computer training by working with user groups and attending workshops and university courses (DeVault & Harvey, 1985; Podemski, 1981; Ponte et al., 1986). State departments of Education report growing demand for inservice computer training ("Educational Technology 1987", 1987).

Some educators compare the excitement about using computers in education with short enthusiasms for instructional television and other technologies (Brody, 1987; Dickerson & Pritchard, 1981; Wagschal, 1984). They caution that unless teachers have training in the use of computers, the investment in computer hardware will be meaningless. The current position of computers in education is summarized by Zuckerman (1983):

> For many teachers who have not and will not be trained appropriately in using computers in the classroom, the computer became and will remain for

them an expensive electronic ditto or flash card set. (p. 123)

The Effects of Inservice Training

Inservice training in educational media

"The availability of educational media becomes irrelevant if teachers do not use such media" (Dunathan & Powers, 1979, p. 3). One of the major problems facing all educational technology is that its use in the classroom ultimately depends on the teacher who is often inadequately trained in its use (Commission on Instructional Technology, 1970). After compiling 60 years of research in the field of educational media, Wilkinson (1980) concluded that the effectiveness of any media was increased by teacher training in that media.

A number of studies have investigated the relationship of media use to teacher training in the use of the media. Stephens (1971) found that the highest ranking deterrent to the use of audiovisual materials was lack of faculty knowledge and training in the use of media. Preservice teachers who were exposed to more media in college used significantly more media as teachers than preservice teachers who had had little media experience (Smith, 1972). Wittich (1961) reported that inservice teachers made "constructive changes" in the day-to-day use of audiovisual

techniques after participating in an audiovisual training course (p. 57).

Secondary public school teachers with formal media training made use of media at significantly higher rates than teachers without such training (Media Utilization Project, 1971; Romano, 1977). Harris reported that teachers with audiovisual training used media twice as often as teachers without media training (in Vandermeer, Torkelson & Oxhandler, 1959).

Other studies have not shown a positive relationship between training and the use of media. Sibalwa (1983) found that formal course work did not, by itself, significantly affect a teacher's use of media, but, in combination with experience in using the media, it became a determining factor. Jones (1982) reported that there was, overall, no significant relationship between formal training in media and its use in the classroom. Training did, however, become a significant factor in the use of specific media: television, bulletin boards, globes and realia.

Inservice computer training

A number of studies have shown that computer training can lead to both cognitive gains and more positive attitudes towards computers (Gressard & Loyd, 1985; Kim, 1986; Lopez & Hymel, 1981; Masden & Sebastiani, 1987; Mechling, et al.,

1987; Thompson, 1985). Improved attitudes toward any media appear to result in both more frequent and more effective use of media (Colton & Noble, 1974). Negative teacher attitudes towards computers have resulted in sabotage of computers (Clement, 1981).

The literature review found different results from studies relating computer use of teachers to their training. Some studies show a positive relationship (Klassen, et al., 1980). The majority of the computer-using teachers in the National Education Association study (1983) had had some computer training. Winkler et al. (1986) found that the availability of inservice training was an important factor in predicting computer use in a national sample of school districts.

Phillips, Nachtigal and Hobbs (1986) determined that a significant increase in the number of teachers using computers in the classroom could be attributed to inservice training. Mechling, et al. (1987) state that teachers use computers with students significantly more often after participating in ITEC courses.

Several studies in which there was no relationship between computer training and subsequent classroom use attributed the results to lack of computer hardware. A 1979 survey of teachers who had taken a four week summer course

showed that almost none of the teachers had access to a computer at the time of the follow-up (Vockell, Rivers & Kozubal, 1982). Ponte et al. (1986) found that, six months after taking a computer course, only half the teachers were using computers even once a month. The non-users did not have access to computers.

The design of instruction may be the reason some computer courses do not lead to increased computer use (Carey & Gall, 1986-7; Cicchelli, Baecher & Nygren, 1984; Hannafin, Dalton & Hooper, 1987). University courses where the emphasis is on teaching about computer rather than with computers are ineffective for the classroom teacher (Hannafin, Dalton & Hooper, 1987; Stell, 1986). The teachers surveyed by Carey and Gall (1986-7) reported that they needed, but their training did not include, "teaching demonstrations, practice, feedback, and coaching components" (p. 53).

The length of the training appears to make an important difference. "Inservice education in computer use typically involves one or more half-day workshops which provide neither depth of understanding nor the insights to really understand the computer's potential in a functional sense" (Hannafin, Dalton & Hooper, 1987, p. 11). Cicchelli, Baecher and Nygren (1984) concluded that 9-12 hours of inservice computer training were not sufficient to

relieve the uncertainty and uneasiness that teachers feel about microcomputers. Roblyer and Castine (1987) decided that a two week summer course meeting 5 days a week for six hours a day "was not a sufficient period for those completely inexperienced in computer use to master the curriculum" (p. 67).

Winner (1982) considers the weekly schedule of 13 computer workshops an important factor in the success of an inservice training program. The teachers were able to assimilate the material over a period of time. Phillips, Nachtigal & Hobbs (1986) found that positive ratings of computer course topics increased with the number of inservice hours spent by the participants. Jay (1983) believes that the computer workshop is inadequate by itself and should be augmented by opportunities for in-depth study, consultations with computer experts and access to reference materials and resources.

Approaches to Inservice Computer Training

"Compared to any previous technologies introduced into the schools, computers require vastly more teacher training to be used effectively" (Lockhard, Abrams & Many, 1987, p. vii). Inservice teachers are often completely unfamiliar with computers which leads to anxiety, fear and hostility to the technology, a situation which is unlikely to occur when

inservice training is provided in other areas (Carrier, Glenn & Sales, 1985). Mastering a new teaching strategy requires more intensive training than improving existing skills (Joyce & Showers, 1980).

The needs and concerns of the inservice teacher are different from those of the preservice teacher (Rogers, 1983). Inservice teachers have less time, less adaptive mind sets and are more concerned about the relevance of their training to classroom teaching (Ganske & Hamamoto, 1984). Teachers who wish to learn about computers and integrate them into the classroom face serious time limitations (Allen, 1985).

The literature shows a wide variety of formats for inservice training from workshops to 45 hour university courses (Kull & Archambault, 1984; Martin & Heller, 1982). Tauber (1985) recommends a six hour workshop that starts with the basics of computer operation and includes word processing, spread sheets, drill and practice, using the computer in the classroom and the history and impact of computers. One or two day workshops (Gandy, 1987; Poirot & Muro, 1983) are frequently offered to inservice teachers.

Diem (1981) provided a one week summer course with staff development meetings and support from a programmer during the year. Lopez (1981) felt that an acceptable level

of teacher computer literacy was achieved with five 2-hour lectures supplemented with separate hours for lab work. Winner (1982) found that optional workshops once a week after school encouraged elementary teachers to incorporate computers into the curriculum. Trainor and Fregosi (1986) offered teachers a five-week, 15 hour course on software evaluation. Teachers completing the course received one recertification credit and/ or one graduate credit.

Spero (1982) allowed faculty who attended his inservice classes to take a computer home for the ten-week duration of the course. The success of the program was demonstrated by its long waiting list. McManus, Cannings and McCall (1985) recommend that teachers be allowed to take computers home overnight or on weekends.

Henderson (1978) suggests that the elementary school teacher take at least two courses, secondary school teachers two additional courses, while the computer science teacher will need additional courses.

Some school districts use members of their staff to provide computer education for their peers (May, 1984). Other districts employ outside consultants to provide training programs (Dickerson & Pritchard, 1981) or a computer specialist may be shared by several schools (Weible, Hobbs & Phillips, (1983).

The college or university course is a major source of instruction. "Virtually every teacher training institution in western civilization provides some form of computer preparation" (Hannafin, Dalton & Hooper, 1987, p. 11). The usual format is a three or four credit course although workshops, minicourses and summer institutes are also offered (Kull & Archambault, 1984).

Bork (1982) asserts that conventional methods of inservice teaching cannot adequately address the momentous number of teachers who should be trained to use the computer. He suggests a course for teachers conducted on computers that are easily available to them. The learner would be able to participate in an active learning experience at his/ her own pace; benefits commonly attributed to computer-based instruction.

Jay (1983) feels strongly that any inservice workshop or course is only a small part of a teacher's computer education. Without the support of on-going consultation and reference and resource materials a teacher will not be able to integrate the computer into instruction.

CONTENT FOR INSERVICE COMPUTER COURSES

There is no standard content for computer courses for teachers (Singer, 1984; Hilgenfeld, 1983; Geisert & Futrell,

1984). Hilgenfeld (1983) compared the content of existing courses with the opinions of computer-using teachers and Wentz (1985) compared expert recommendations with teachers' opinions. Both found significant differences. This section of the review of related literature considers both expert recommendations and teachers' perceptions of what should be included in inservice computer training.

Expert Recommendations

There is little agreement among the experts as to the content should be (Bruwelheide, 1982). Suggested computer competencies vary from the ability to select and use software (Hoth, 1985; Schiffman, 1986b) to the ability to design, develop and program instructional materials (Henderson, 1978). The International Conference on Education and New Information Technologies (1984) concluded

> the large variety in the length and content of existing courses indicates that the consensus, if not the understanding, is far from being reached across countries on what teachers are supposed to know or be able to assimilate, on the NIT [New Information Technologies] (p. 10).

A number of educators (Carrier, Glenn & Sales, 1985; Hoth, 1985; Milner, 1980; Rogers, 1983; Uhlig, 1983) recommend several courses to serve teachers with different needs. Rogers (1983) suggests five levels of computer

training: 1) for all teachers, 2) for those teachers who will teach computer science, 3) for teachers in different subject areas, 4) for computer literacy teachers and 5) for teacher/developers of computer-based materials.

A distinction is often made between the teachers who teach "about" computers and the teachers who teach "with" computers (Dennis, 1979; Sandoval, 1984; Sutphin, 1987; Winkler at al., 1986). The computer science or computer literacy teacher who uses the computer as the subject of instruction will need computer skills that are not necessary for the teacher who uses the computer as a tool for instruction in other subject areas. The present study is concerned with the computer competencies for the average classroom teacher rather than the computer specialist.

Some experts say programming is important to all teachers (Culp, 1986). Vockell et al., (1982) ran a four week course in the summer which included only three hours of lecture. The vast majority of the students' time was spent in writing and modifying programs. Bork (1985), however, maintains that few teachers need programming skills and Friedman (1983) suggests a distinction between teachers who do not need programming and those who wish to become more involved in creating and evaluating programs.

Carrier, et al. (1985) offer two computer courses for teachers: one for beginners, another for teachers with some previous computer experience. The first is an introductory course covering the operation of equipment, word processing, LOGO, using instructional programs and software evaluation. The second course includes computer lab management, and strategies for inservice training and requires the participant to design and implement a teaching unit incorporating the computer.

Schiffman (1986b) feels that classroom teachers only need to know the instructional capabilities of microcomputers, the software available in their area of interest and how to choose and use that software for maximum effectiveness. Hoth (1985) feels that very few teachers need to be able to program. She requires teachers to be able to:

> a) describe appropriate applications for microcomputers in instruction, for their students, b) operate a microcomputer and use a variety of software, c) teach students "hands-on" at the computer, d) teach appropriate care of microcomputers, e) describe some inappropriate uses of microcomputers, f) distinguish between computer-aided and computer-managed instruction, and

g) evaluate some software for instructional purposes" (p. 38).

The University of Minnesota (Carrier & Lambrecht, 1984) list of computer competencies for teachers includes:

a) knowledge of basis computer components and operations, b) knowledge of materials and projects related to computer education, c) knowledge of educational and personal uses of the computer, d) knowledge of individual differences as they relate to computer-assisted instruction, e) evaluating instructional software, f) ability to develop/ manage an environment in which computers are available for teaching/learning, g) knowledge of educational and societal implications of the 'information age', and h) ability to use authoring languages and to program.

The Association for Computing Machinery (Rogers, 1983) gives highest priority to: running computer programs, evaluating computer-based learning materials, knowing the characteristics of "styles of learning of using a computer to address major classes of objectives" (p. 4) and knowing sources of related materials. Word processing is 'medium priority', while programming is classified as an advanced experience only to be included when time permits.

Teachers' Perceptions

Successful inservice programs are based on the suggestions (King, Hayes & Newman, 1977) or the perceived needs of the participants (Marshall & Caldwell, 1984). Ganske and Hamamoto (1984) stress the importance of asking the participants to recommend the computer skills they feel should be included in a computer course.

As part of a national study of 1208 teachers (NEA, 1983) the respondents were asked to check which of 13 computer topics they were interested in learning more about. More than 50% indicated that they would like to learn about the instructional applications of computers, how to operate a computer, and how to write computer programs. The next most popular topics were the selection of hardware and software.

At least 85% of the elementary and secondary school teachers responding to a survey in Iowa (Jarchow & Hunter, 1983) agreed or strongly agreed that teachers should be able to describe the use of a computer, recognize computer hardware components, identify the major functions of a computer system, describe the uses of computers in society, interpret and use software packages and value the potential role of computers. More than half indicated they would like to learn how to program a computer.

Jarchow & Hunter report a number of significant differences in computer interests between grade levels and subject matter areas. Mathematics and science teachers were more interested in problem solving and less interested in word processing, tutorials and drill and practice. Teachers of humanities saw less need for problem solving or simulations but favored tutorials. Special education teachers felt that problem solving and drill and practice were more important than tutorials. Vocational education teachers had strong needs for applications (word processing, problem solving and simulations). Elementary teachers wanted to learn how to use drill and practice and tutorial programs. Secondary teachers were more interested in generating tests and using the computer to provide career counseling.

Stasz, Winkler, Shavelson, Robyn and Feibel (1984) asked teachers who were "nominated as 'successful' [computer] users in mathematics and science instruction" (p.3) to recommend content for inservice training. Six topics were identified: operation of a computer, selection and evaluation of software, the instructional uses of microcomputers, computer literacy, integrating computers into the curriculum and computer programming. The recommendations did not vary according to grade level or pattern of computer use.

Hilgenfeld's (1983) subjects were administrators and teachers identified as members of computer-user groups. The administrators' replies were analyzed separately from the teachers'. The subjects were asked how important 27 topics were to a computer course for teachers. At least two-thirds of the respondents perceived 15 computer topics or competencies as necessary in a teacher computer training program.

The topics the teachers felt should be included were: the availability and evaluation of instructional software, using computer-assisted and computer-managed instruction, determining the computer needs of a school and trouble shooting hardware, how to integrate computer materials into the existing curriculum, knowledge of the functions of computer-managed instructional systems, the applications of drill and practice, using simulations, evaluating courses that use computer materials, the use of instructional games, hands on experience with a variety of different computers, computer applications for instruction (word processing, record keeping, etc.), how computer programming fits into computer literacy and finally, how to teach problem solving using a computer.

In a separate question, Hilgenfeld's teachers ranked computer topics. The highest ranking were: a knowledge of computer assisted instruction, computer managed instruction,

software evaluation, a programming language and where to find instructional materials for the computer.

Hilgenfeld found that the administrators' responses were significantly different than those of the teachers. The two groups agreed on the importance of only on four topics: understanding computer-managed instruction, how to use drill and practice, using instructional games and how to evaluate software.

In a different study (Kim, 1986), secondary teachers ranked learning how to operate a computer and using computer programs prepared by others as the most important subjects for teacher training. Less highly recommended were knowing how to organize material for computer use, understanding the difference between hardware and software, evaluating software and examining new applications of computers in education. Least important to the respondents were topics that concerned the technical aspects of how a computer works and the history of computers. The respondents had been chosen to represent different subject areas. 67.4% said they had had some training in the use of computers.

Wentz (1985) asked universities, professors and learners, both inservice and preservice teachers, to recommend competencies for a preservice computer training course. The inservice teachers were chosen because they

were computer-users. Wentz defined a computer-using teacher as one who teaches about computers, uses a computer in the classroom or owns a computer. The subjects were asked to rate 37 computer competencies as essential, recommended or not recommended.

Thirteen competencies were recommended by all groups. Teachers should know: how to use common computer equipment, when it is appropriate to use computers in instruction, what computer materials exist in the teachers' subject areas, a variety of ways to use the computer as an instructional tool, how to integrate computers into the curriculum, how to use computer terminology, how to evaluate software, how to use tutorials, the capabilities and limitations of computers, the use of word processing, the impact of computers on society, the use of the computer as a classroom management tool, and ways to use word processing in the classroom.

Inservice teachers rated the knowledge of computer impact on society and using instructional games lower than professors or preservice teachers. The professors in the study recommended being able to assemble computer systems, using simulations, knowing sources of information about computers and knowing appropriate plans and arrangements for computer learning experiences significantly higher than either the pre- or inservice teachers. Preservice teachers

gave less value to word processing and the evaluation of software than either other group.

Ogletree (1984) evaluated a computer course for teachers in terms of the usefulness of the content and the organizational emphasis of the class. All participants considered the hands-on experiences and using relevant software useful. Hardware evaluation was rated least useful. The teachers indicated that not enough time had been spent on software evaluation while too much time was allotted to the history and theory of computers and programming.

In another study (Kane, Sheingold and Endreweit, 1983) teachers expressed the need for more hands on time, evaluation of software and plans for the use of the software in the classroom. The teachers also wanted to observe their students using the computer materials so that they, the teachers, could "better understand their student's learning styles and assess how the use of the machines could be individualized" (p.19).

Teachers completing an inservice computer course were asked where the emphasis of the course should be placed (Forman, 1981). In order of preference, the teachers requested using the computer as a teacher aid, reviewing and running commercially available software, computer care and

maintenance, BASIC, using an authoring system, interfacing the computer with video, assembling an Apple system and Pascal.

TEACHERS' USE OF COMPUTERS IN INSTRUCTION

The Number of Teachers Using Computers

Studies of the numbers of teachers using computers for instruction give a variety of results. The following studies are presented in chronological order.

Klassen, et al. (1980) analyzed the responses of 3,576 secondary school teachers in the areas of mathematics, science and business education. 50% said they had used the computer at some time for instructional purposes. 33% were still engaged in instructional computing.

Grossnickle et al. (1982) provided the faculty of a high school in a Chicago suburb with the opportunity to learn about the educational uses of computers. A follow-up study indicated that about one third of the respondents were using computers: 3 very often, 5 often, 14 seldom.

The National Education Association study (1983) polled a representative sample of teachers nationwide and found that 11.2% of the respondents had used computers for instruction at some time and 6.8% were current users. Of the current users, 45.3% used the computer daily.

Simpson (1983) found that 80% of the staff of an elementary district in Illinois was enthusiastic about using computers. Simpson believes the 20% who were not interested in computers are the typical hard core who would hold out against any innovation in the classroom. 78% of the elementary teachers said they could use a computer, 76% reported attending computer classes, 27% said they had written programs to use with students.

In a national survey, Smith & Ingersoll (1984) reported that 42% of all teachers were using microcomputers, at least occasionally. In a study of elementary school teachers in Anchorage, (Bychowski & Van Dusseldorp, 1984) 57% of the respondents said they used computers regularly.

Kim (1986) found that 58.4% of the Iowa school teachers surveyed used computers in the classroom; 28.9% used computers only outside of the classroom and 12.7% had never used a computer. Seidman (1986) studied the use of media by teachers in the Fort Worth area. He found that, while 15% used computers at least once a week, 72% of the teachers never used computers for instruction.

Becker (1986-1987) found that one forth of all U. S. teachers used computers "regularly" with students in the 1984-85 school year. More elementary teachers (37%) use computers than secondary teachers (15%).

How teachers are using computers

A number of studies have shown that the primary use of computers in the classroom is for drill and practice (Bartos & Souter, 1981; McCullough, 1983; Simpson, 1983). McCullough (1983) studying computer-using elementary school teachers in Virginia found that 75% of the computer use was drill and practice. Problem solving and programming were less popular with tutorials and simulations being used least.

Simpson (1983) analyzed 1,802 computer sessions in an elementary school and classified 53% as drill and practice, 23% as simulations, 10% as student- written programs, and 23% as "other". Bartos and Souter (1981) surveyed 144 school districts in 47 states and reported that of the three major divisions of computer-assisted instruction drill and practice was used most, followed by tutorials and finally simulations.

In direct contradiction to Bartos and Souter's findings, Klassen et al (1980) found most teachers used computers for simulations (41.3%), followed by: teaching terminal operations (38.6%), problem solving (37.2%), instructional games (37.2%), programming (36.6%). Judd (1981) reported that 75% of the Illinois teachers who had been identified as microcomputer users used the computer for teaching about computers, 72.4% for programming, 51.7% for

tutorials, 50% for drill and practice and 32.9% for simulations. Lower percentages reported using the computer to support instruction: generating tests (18.1%), or preparing worksheets (13.8%).

Becker (1985) relates the length of time a school has had a microcomputer to use: in both elementary and secondary schools computers are first used for drill and practice and later the emphasis shifts to programming. Becker suggests that teachers are disappointed with the available drill and practice programs and/or teachers find that teaching about computers is a better use for the computer resources as there are other ways to teach traditional subjects.

Computer use may be analyzed in terms of remediation, standard use and enrichment (Becker, 1986-1987). Elementary grades are more likely to use computers for enrichment with remediation representing one third or less of computer use. In high school, the computer becomes part of "regular" instruction, especially in the upper grades where students are frequently taught about computers (Becker, 1986-1987).

The use of computers also varies with the type of student. Moskowitz and Birman (1985) state that advanced and gifted students are more likely to be given access to computers, while low achievers, when given computer opportunities, tend to be restricted to drill and practice.

Bychowski and Van Dusseldorp (1984) found that computers were most likely to be used with either gifted or slow students, especially in math.

FACTORS INFLUENCING COMPUTER USE

The following section is a discussion of the various factors that are believed to influence teachers' use of computers in education. The discussion is divided into two main sections: demographic factors and environmental factors. Computer training for teachers, seen as a major factors by many educators (Diem, 1982a; Giannelli, 1985; Hannafin, Dalton & Hooper, 1987), has been considered in a previous section, The Effects of Inservice Training.

Demographic factors

Age and teaching experience

The influence of teachers' age and teaching experience on their use of computers are discussed together as the variables are closely related (Kim, 1986). Kim (1986) and Stenzel (1982) found no significant difference in attitudes toward computers between age groups or years of teaching experience. Both variables showed positive attitudes growing up to the age of 50 (Kim, 1986). The youngest and oldest teachers had less positive attitudes but the differences were not significant (Stenzel, 1982).

Gressard and Loyd (1985) hypothesized that older teachers, like older business executives, would have more negative attitudes towards computers than their younger counterparts. Their study of an inservice computer training course showed, however, that age was not a factor in the attitudes of teachers toward computers. Edwards (1979) found the computer-using teachers in his study had an average of 10 years teaching experience.

Phillips, Nachtigal & Hobbs (1986) found that satisfaction with computers and programming increased with age. Teachers with 5 years or less teaching experience were less likely to rate any computer topic positively (with the exception of word processing).

Gender

A number of articles have been published indication that women are less likely to look favorably on computers than men (Jackson & Yamanaka, 1985; Vermette, Orr & Hall, 1986). Anderson et al. (1979) were surprised to find that gender did not have a significant effect in predicting computer use. A possible explanation was that women "have less control over their teaching assignments...and were sometimes assigned to computer classes despite their lack of enthusiasm" (p. 246).

Stenzel's study (1982) of 369 Louisiana school teachers found that while women had more positive attitudes toward computers than men, the difference was not statistically significant. Kim's study (1986) of 291 secondary school teachers in Iowa had similar results.

Teacher training

Many teachers admit that lack of training prevents them from using computers (Grossnickle, et al., 1982). The relationship of computer training to computer use has been discussed in an earlier section (The Effects of Inservice Training).

Stenzel (1982) found there was a significant positive relationship between the educational degrees of the teachers and their attitudes toward computers. Kim (1986) reports a positive relationship between the number of college credits a teacher has in science, mathematics or business with computer attitudes and computer knowledge and a negative relationship with college credits in language arts and social studies.

Grade level/subject area taught

Stenzel (1982) did not find significant differences in attitudes towards computers due to grade level or subject areas taught. Kim's study (1986) of secondary school teachers did, however, find significant differences in both

computer knowledge and attitudes attributable to subject area. Mathematics and business teachers scored higher than science, language or social studies teachers.

A number of studies (Becker, 1986-1987; Grossnickle et al., 1982; Jarchow & Hunter, 1983; Simpson, 1983) have shown that grade level and/or subject matter influence the extent and type of computer use. Grossnickle found enthusiasm for computers across subject boundaries but only departments "traditionally" associated with computer use, science, mathematics, business and industrial arts, are actually using computers (p. 18).

Simpson (1983) found that 70% of the elementary teachers studied reported using mathematics software. Edwards (1979) found that 82.8% of the respondents (teachers (K-12) who had been selected for their computer experience) used the computer for mathematics. The next most frequent use (44.8%) was for teaching about computers.

Becker (1986-1987) noted that, while a quarter of all teachers use computers, further analysis shows more elementary (37%) than secondary (15%) users. Becker also reported that computer assisted instruction accounted for 50% and programming for 12% of the elementary use, while high schools reversed the percentages (programming, 50%; CAI, 16%). Elementary teachers used computers mainly for

mathematics with language arts a close second. High school teachers most frequently taught about computers.

Environmental factors

Availability of hardware

The availability of hardware has been given as a limiting factor in the instructional use of computers since the microcomputer made its way into the classroom (Edwards, 1979; Loop & Christensen, 1980). Anderson et al. (1979) found that slightly over half of the variance in teachers' adoption of computer technology could be explained by technological factors such as the availability of hardware.

Despite the growing numbers of computers in schools (Becker, 1985) the lack of hardware remains a significant barrier to computer use (Brody, 1987; McManus, Cannings & McCall, 1985; Ponte, et al., 1986). "The number of computers in the average school is so small that in the homes of children in a single classroom there are more computers than there are in place in the entire school" (DeVault & Harvey, 1985).

Aquino (1970) found that teachers' use of audiovisual materials depended as much on their accessibility as the quantity available. "Let me emphasize just one point: Availability means nothing; accessibility is everything!" (Taylor & DiPaolo on media use; 1978, p. 17). Access to the

computer is also an important factor in teacher utilization (Grossnickle, 1982; Loop & Christensen, 1980; Shavelson, et al., 1983). Seidel (1980) describes a Virginia high school in which the computer resided in the math teacher's closet, effectively limiting access to students or other teachers.

The number of computers and guaranteed access to them are the most significant factors in predicting teacher participation in computer training and subsequent use of microcomputers in instruction (Winkler, Stasz & Shavelson, 1986). Anderson et al (1979) found that the perception of availability was more important in determining computer use than actual availability.

Other problems with computer hardware that influence computer use are difficulties with computer deliveries, security and maintenance (McManus, Cannings & McCall, 1985). Hardware reliability is mentioned as a problem by Loop and Christensen (1980).

Quality and availability of software

When microcomputers were first introduced into the classroom there was little software available (Braun, 1977). "The doubling in the number of school-owned computers in the recent past occurred despite the fact that virtually no decent educational software existed for use with these machines" (Bork, 1984b, p. 240). Forman (1981) cites lack

of courseware as a major impediment to computer use. Frequently teachers had to create their own programs (Edwards, 1979). Now, as more commercial software becomes available, teachers are less likely to need to do their own programming (Friedman, 1983; Jay, 1983).

The poor quality of educational software has long discouraged the use of computers in the classrooms (Blaschke, 1979; Loop & Christensen, 1980). Some educators believe that the quality of software has improved due to increasing interest from both software manufacturers and text book publishers (Allen, 1985; Hannafin, Dalton & Hooper, 1987; Schiffman, 1986a); others feel that quality is still limiting classroom computer use (Baker, 1985; Bork, 1985; Hunter, 1983; Kloosterman, Ault & Harty, 1987).

Futrell and Geisert (1985) write "few programs on the market exist which, when put into use in the classrooms, are able to have the effect on student learning that is touted" (p. 13). Bell (1985) describes some software as "boring" and other courseware as "destructive to the learning process" (p. 36).

Other aspects of software that affect the use of computers in the classroom are: teacher knowledge of what programs are available in their subject area (Giannelli, 1985; Shavelson et al., 1983), the problems of requesting,

scheduling, and returning software (Baker, 1985), and cataloging (Kloosterman, Ault & Hardy, 1987).

Administrative support

School boards and central administrations can strongly influence the use of computers in instruction (Brody, 1987; Kane, Sheingold & Endreweit, 1983; Komoski, 1984; McManus, Cannings & McCall, 1985). Although most school principals favor the use of microcomputers, few are knowledgeable in this area (Shavelson et al, 1983). Yet the support of the principal is an important factor encouraging computer use (Moursund, 1986; Ponte at al., 1986; Winkler et al., 1986). The majority of computer-using teachers in the National Education Association study (1983) reported that they had administrative support.

The administrative style of a school principal makes a difference in the implementation of computer technology in a school (Hougen, 1984). Schools with principals who are Initiators (as opposed to Responders or Managers) have more teachers participating in staff development activities and more using computers in the classroom.

Various administrative policies are available to principals who wish to encourage the educational uses of computers. The funding of computer resources is a major factor (McManus, Cannings & McCall, 1985; Winkler et al,

1986). Not only does a school need hardware and software resources but teachers new to computing need a resource person or consultant (Grossnickle & Laird, 1981; Kane, Sheingold & Endreweit, 1983; Kloosterman, Ault & Harty, 1987; Winkler et al, 1986; Winkler & Stasz, 1985). Jay (1983) emphasizes training will not result in the classroom use of the computer unless further support in the form of consultations, further study and/ or reference and resource materials is provided.

Other administrative policies that affect computer use include salary credits, reimbursement for taking outside courses, release time for studying and/or curriculum development, new titles, higher salaries, guaranteed access to computers and being allowed to take computers home over weekends, vacations and summers (Winkler et al, 1986). Extra pay for computer-using teachers was found to be more effective in increasing computer use than traditional incentives such as recognition and release time (Winkler, et al., 1986).

Student interest

Many teachers have been encouraged to use computers in the classroom by interested students (Eisele, 1979; Foell, 1983). Diem (1982b) sees "students weaned on computers" as

a challenge and an opportunity for schools to integrate computer technology in to the curriculum (p. 21).

Other educators feel that students who are more experienced in the use of computers than the teachers, are the cause of teacher embarrassment and negative attitudes toward computers (Foell, 1983; Fontana & Ochoa, 1985; Quinsaat, 1981; Tauber, 1985).

Parental pressure

"Parents have demanded that schools make computers available to their youngsters" (Bork, 1984b, p. 240). Parents of school-age children are buying more computers each year than the schools (Komoski, 1884). In some school districts parents are making the decisions on computer policy, and donating the equipment (Moskowitz & Birman, 1985). Parents want to be involved in their children's computer experiences (Jay, 1983). While this pressure will vary from district to district, it is an important issue in educational computer use (McManus, Cannings & McCall, 1985).

Time

The factor of time is mentioned often in the literature (Giannelli, 1985; Grossnickle, et al., 1982; McManus, Cannings & McCall, 1985).

> Teachers are busy, and they are tired. The suggestion that they should learn a (probably

> complicated) new skill on their limited 'free' time, and put forth the effort to find resources, find quality software, keep up with new developments, and integrate computer applications into an already-full curriculum -- this makes them feel very tired indeed (Allen, 1985, p. 3).

Allen's protest is supported by Becker's research (1986-1987). Increases in preparation time, mostly attributable to computer use were reported by 25% middle grade teachers and 37% of the high school teachers.

Giannelli (1985) points out that teachers need time to keep up with new developments in the field and to find appropriate computer resources. Kane, Sheingold and Endreweit (1983) found that what teachers "wanted most was more time to use the machines, to develop their expertise, to renew available software and plan for its use in the classroom" (p. 19)

Release time seems to be an important consideration in all inservice training (Ainsworth, 1976). McManus, Cannings and McCall (1985) feel it is particularly important to computer inservice training and in implementing computer activities in the classroom.

Hannafin, Dalton & Hooper (1987) find the argument that teachers are too busy is misleading. They point out that it

is necessary to spend some time learning the new technology in order to benefit from its time saving aspects.

SUMMARY OF THE RELATED LITERATURE

The development of the microcomputer in the 1970s allowed many schools to acquire computers for use in instruction. Since then, the number of computers in schools has been growing rapidly. Still, only about a quarter of the nation's teachers are using computers at least partly because the classroom teacher lacks knowledge about computers.

Although teachers are frequently expected to use computers in instruction and several states have started to require teachers to have computer skills, many teachers feel inadequately prepared for using computers in the classroom. Effective use of computers by teachers requires training. As with other media, inservice training in computer operation can lead to increased use of computers in the classroom.

There is considerable variation in the content and format of computer courses offered to inservice teachers. Teachers, administrators and professors do not agree on the relative importance of specific computer topics. Successful inservice programs are often based on the perceptions of the teachers. Computer topics which teachers say should be

included in inservice courses range from how to operate a computer to computer programming.

Teachers are using computers mostly for drill and practice or teaching about computers. Elementary teachers emphasize computer assisted instruction; in high school the major use is to teach about computers.

Of the demographic factors considered, the number of years teaching, age and sex of the teacher are not predictors of computer use while previous training in computers and also in subjects such as mathematics and science have positive relationships with computer use. Grade level and subject matter taught also influence instructional computer use.

Environmental factors, such as the availability and accessibility of hardware, are critical factors in computer use. The quantity and quality of software is a continuing problem. Administrative support and pressure from students and parents has influenced computer use. Lack of time has frequently been mentioned as an impediment to educational computer use.

Various incentives to participate in inservice training and use computers in the classroom include release time for computer studies, free tuition, and guaranteed access to computers. The latter is possibly the most effective.

Chapter III

RESEARCH PROCEDURE

Chapter III is a detailed description of the methods and procedures used in the study. The major sections are the selection of the population, the design of the questionnaire, the development of the questionnaire including pilot testing, data collection and data analysis.

Selection of the Population

The population for the study consisted of the teachers who had completed either the Elementary or Secondary three-credit graduate computer courses at the Regional Computer Resource, Temple University (Education 554). Students from the first courses in the summer semester of 1985 through the spring semester of 1987 were chosen because they had had time to use the content of the courses in the classroom Teachers who withdrew during the semester were eliminated from the population as they might not be familiar with all the topics in the questionnaire.

Table 3.1 summarizes the population surveyed. Seven classes for elementary teachers were offered during the selected time period: one each in the summer of 1985, fall of 1985, summer of 1986, fall of 1986, spring of 1987 and

TABLE 3.1

Population Selection

Level	Semester	Registered	Withdrew	Surveyed
Elementary Courses				
	Summer 1985	19	0	19
	Fall 1985	28	0	28
	Spring 1986	28	2	26
	Spring 1986	29	10	19
	Summer 1986	25	1	24
	Fall 1986	30	0	30
	Spring 1987	29	6	23
Elementary Course Totals		188	19	169
Secondary Courses				
	Summer 1985	16	0	16
	Fall 1985	29	2	27
	Spring 1986	30	4	26
	Fall 1986	29	7	22
	Spring 1987	30	1	29
Secondary Course Totals		134	14	120
Totals for All Courses		322	33	289

and two in the spring of 1986. A total of 188 elementary teachers registered; nineteen subsequently withdrew. The final population of elementary teachers was 169. Five

classes for secondary teachers were offered: one in the summer of 1985, fall of 1985, summer of 1986, fall of 1986 and spring of 1987. A total of 134 secondary teachers registered; fourteen withdrew leaving 120 participants. The grand total of the population for the study was 289.

Questionnaire Design

The questionnaire (Appendix E) was designed to provide answers to the research questions listed in Chapter I. Part I of the questionnaire asked demographic questions (Research questions 18 to 24). The questions included the number of years of teaching experience, the sex, age and educational background of the respondent. The teachers were asked to specify the type of school, public, private or parochial, where they teach and the year of their teacher certification. Additional questions included the grade level, and subject area taught. The respondents were also asked which semester they had taken the Regional Computer Resource Center course at Temple and what, if any, computer instruction they had received before taking the course.

Part II of the questionnaire asked about the teachers' current use of computers (Research questions 6 through 13) and the factors influencing that use (Research questions 14 through 17). Teachers were asked the number and brands of computers available both to themselves and to their

students. The respondents were also asked to rate specific uses of computers as daily, weekly, monthly, not now, maybe later or not now, unlikely ever. The specific uses included using computers with students (drill and practice, tutorials, simulation, word processing, etc.) and questions on using the computer to support or manage instruction or for administrative tasks.

The last questions of Part II of the questionnaire were designed to assess the environmental factors influencing computer use (Research questions 14 through 17). Subjects were asked to rank the influence of administrative support, equipment availability, software quality and availability, faculty and student interest in computers and their own computer knowledge to their computer use. An open-ended question gave the respondents an opportunity to add factors they felt were important.

Part III of the questionnaire listed competencies included in the Regional Computer Resource Center's courses (see Appendix D) and asked the subjects to indicate their perceptions of the importance and usefulness of these topics (Research questions 1 through 5). The scale for the responses ranged from essential, important, good, for another course to don't bother. The subjects were also asked to make recommendations for future courses.

The questionnaire consisted of two standard sheets (8.5" x 11") of paper stapled together in the middle to form a booklet. The cover letter was the first page of the booklet (see Appendix E). Bailey (1982) states that questionnaires on the back of cover letters bring a higher response rate than those on a separate sheet (possibly reflecting a preference for a shorter version).

The cover letter was written according to guidelines in Orlich et al. (1975), Bailey (1982), and McMillan & Schumacher (1984). The letter established the credibility of the study by including the name of the investigator and the endorsing organizations. The letter also explained the purpose of the study, the importance of the subject's response, and how to mail the questionnaire. The subject was thanked for cooperating.

The back of the questionnaire had the return address and was already stamped. The subject needed only close the pages with tape or a staple before mailing. The ease of returning the questionnaire can have a positive effect on the response rate (Bailey, 1982).

The envelope in which the survey was mailed had two self-sticking labels, one with the return address of the Regional Computer Resource Center, the other with the name and address of the subject. A study by Cookingham (1985)

indicated that using typed labels as opposed to typing addresses directly on to envelopes did not result in a significant difference in response rates.

Questionnaire Development

The first draft of the questionnaire was written after inspecting similar questionnaires (Hilgenfeld, 1983; NEA, 1983) and reviewing the content of the Elementary and Secondary courses at the Regional Computer Resource Center at Temple University (see Appendix D). Texts on research techniques (Bailey, 1982; McMillan & Schumacher, 1984; Orlich et al., 1975) were consulted.

The questionnaire was reviewed by a panel of experts involved in the computer education of teachers. The experts were Dr. Elton Robertson and Dr. Roger Gordon of Temple University, Dr. Kenneth Mechling, Director, ITEC Teacher Education Center, Clarion University and Mr. Ned Heeter, Program Evaluation Specialist, Pennsylvania Higher Education Assistance Agency. Changes were made according to the recommendations of the panel: three questions were added; one on the use of desktop publishing, a second on the advanced degrees of the respondent, and the third asked the brand names of the computers available to the teachers. The question on "other computer activities" was expanded to

include the acquisition of computer hardware and development of programs with a computer component.

The questionnaire was pilot tested during August of 1987 to establish criterion validity as recommended by Bailey (1982). The pilot-test subjects were eight teachers who had completed Educational Media 554, a course with a syllabus similar to Education 554. The respondents had at least one semester after taking the course to implement their computer skills in the classroom. The pilot subjects were asked to complete the proposed questionnaire and to make comments on individual items. The pilot subjects were also asked how much time they needed to complete the questionnaire and if the directions and questions were clear (McMillan & Schumacher, 1984).

Four of the pilot-test subjects said they had completed the questionnaire in 10 minutes. Other responses were 20 minutes, 30 minutes, one hour and no reply. The respondent who spent an hour had written extensively on the open-ended questions, first in pencil and over that in ink. Changes made as a result of the pilot testing were: 1) the correction of a typographical error, 2) a clarification of the directions for answering one question and 3) a change in the spacing of questions on one page to give more room for the answers to open-ended questions.

An important part of the pilot test was to demonstrate the practicality of the questionnaire format. The pilot test indicated that the format of the questionnaire was successful. All the pilot test questionnaires that were mailed (one was returned by hand) were received in good condition. The respondents indicated that the directions for returning the form were clear and easy to follow.

Data Collection

Data collection began October 1, 1987. The months of October and November are recommended for educational surveys by Orlich et al. (1975). These are the months when teachers have the least pressure from other paperwork. No effort was made to mail the questionnaire or the follow-up letters according to the day of the week (Jackson & Schuyler, 1984).

An inconspicuous code was placed on each questionnaire for identification. The code was used only to identify non-respondents for the mailing of follow-up letters; it was not used in connection with the information collected from the respondents in any way. As the completed questionnaires were received the corresponding respondents' names were checked on a master list.

Ten envelopes from the first mailing were returned by the post office for incorrect addresses. Six new addresses were obtained and questionnaires were re-mailed accordingly.

Four names were removed from the sample (Bailey, 1982) as it was not possible to determine new addresses. The final number of subjects in the population was 285.

On October 18 a reminder letter (Appendix F) was sent to those subjects who had not responded. Bailey (1982, p. 174) recommends that the first follow-up letter be sent "when the response to the initial mailing has nearly ceased (one to three weeks)". The letter followed the guidelines of Jackson and Schuyler (1984) whose studies have indicated that business like follow-up letters are more successful than "cute" ones and that cover letters on colored letterhead stationary do not result in significantly greater return rates than letters with all black print.

A second follow-up consisting of a letter (see Appendix F) and duplicate questionnaire was mailed November 5, 1987 to those subjects that had not been checked on the master list as respondents (Bailey, 1982). There were 154 replies to the questionnaires (54%).

While the highest response rate possible is best for the validity of any study, Bailey (1982) points out that there is evidence that response rates are declining and many more studies end with 10% to 20% than 90% response. Tollefson et al. (1984) say that rates between 20% and 50% are common. The days of high response rates to surveys are

over because people have become hostile to surveys, resenting the computer-generated phone calls, salesmen pretending to be researchers and an overload of survey instruments (Deutsch, 1987).

It has been suggested that the response rate depends on the subjects' attitudes to surveys in general and an attempt should be made to give preservice teachers a positive attitude so that follow-up studies will have respectable rates (Lindsay, 1985). Babbie (quoted in Bailey, 1982) feels that a 50% return is adequate.

Data Analysis

Data was coded, tabulated and analyzed on a Macintosh SE using the StatView 512+ statistical program. Data describing the respondents and their use of computers in education is presented as frequency distributions and/or tables of absolute values and percentages. Analysis of the subjects' recommendations and the relationships of the recommendations to the characteristics of the respondents were also analyzed. Comments and other non-codeable data were compiled, summarized and reported (Appendix G).

The results and findings from the survey are presented in Chapter IV.

Chapter IV

RESEARCH FINDINGS and DISCUSSION

This study was designed to analyze and review the perceptions and applications of computer education by teachers who have completed an inservice course offered by the Regional Computer Resource Center at Temple University.

The purpose of the study was threefold:

1. to determine how teachers who have completed a 3-credit inservice computer course at the Regional Computer Resource Center at Temple University perceive the importance and usefulness of selected computer topics.

2. to describe how ITEC trained teachers are currently using computers in education.

3. to determine the relationship of demographic and environmental factors influencing the use of computers in the classroom by ITEC trained teachers.

This chapter presents the findings from the 154 questionnaires returned. The four major sections of the chapter are based on the four groups of research questions as proposed in Chapter I: A) teachers' perceptions of the course content, B) teachers' instructional computer use, C)

environmental factors and computer use, and D) demographic factors and computer use. A summary concludes the chapter.

A. TEACHERS' PERCEPTIONS OF THE COURSE CONTENT

Research Question 1: Which course topics were most useful/important in using computers for instruction? (Questionnaire questions: III, 1 - 23)

Teachers were asked to indicate the importance and or usefulness of twenty-two topics included in the Regional Computer Resource Center courses. Three of the topics were considered to be essential or important by more than 75% of the respondents (Table 4.1). These three were: Loading and running an existing computer program (89%), Using a word processing program (81.2%) and Identifying and using the three major types of computer assisted instruction (78%). An additional five topics were rated as essential or important by more than two/thirds of the respondents: Using computer assisted instruction in your subject area (74.7%), Identifying the parts of a computer and discussing their function (73.4%), Teaching students about computers (70.1%), Selecting and evaluating computer hardware (69.6%), and Selecting and evaluating computer programs and accompanying aids (68.9%).

TABLE 4.1
Perceptions of Course Content

Topic	Essential	Important	Good	Don't bother	Other course	No answer
1. Identifying the parts of a computer and discussimg their function	65 42.2%	48 31.2%	34 22.1%	2 1.3%	2 1.3%	3 1.9%
2. Loading and runnıng an existing computer program	111 72.1%	26 16.9%	13 8.4%	0 0.0%	2 1.3%	2 1.3%
3. Selecting and evaluating computer hardware	37 24.1%	70 45.5%	25 16.2%	12 7.8%	7 4.5%	3 1.9%
4. Identifying and usıng the three major types of computer assisted instructıon: drill and practice, tutorials and simulations	46 29.9%	74 48.1%	25 16.2%	3 1.9%	2 1.3%	4 2.6%
5. Using computer assisted instructıon in your subject area	42 27.3%	73 47.4%	32 20.8%	3 1.9%	2 1.3%	4 2.6%
6. Selecting and evaluatıng computer programs and accompanying aids	46 29.9%	60 39.0%	37 24.1%	7 4.5%	1 0.6%	3 1.9%
7. Writing programs in BASIC	39 25.3%	40 26.0%	43 27.9%	19 12.4%	10 6.5%	3 1.9%
8. Writing programs in Logo	14 9.1%	46 29.9%	43 27.9%	35 22.7%	12 7.8%	4 2.6%

continued

TABLE 4.1 continued
Perceptions of Course Content

Topic	Essential	Important	Good	Other course	Don't bother	No answer
9. Writing programs in SuperPILOT	6 3.9%	29 18.8%	42 27.3%	33 21.4%	23 15.0%	21 13.6%
10. Designing a computer assisted instruction lesson	37 24.0%	48 31.2%	46 29.9%	14 9.1%	6 3.9%	3 1.9%
11. Programming a computer assisted instruction lesson	38 24.7%	43 27.9%	44 28.6%	18 11.7%	8 5.2%	3 1.3%
12. Adapting an existing program to a specific use	31 20.1%	61 39.6%	48 31.2%	6 3.9%	4 2.6%	4 2.6%
13. Using a word processing program	87 56.5%	38 24.7%	21 13.6%	4 2.6%	2 1.3%	2 1.3%
14. Using a spread sheet	43 27.9%	55 35.7%	38 24.7%	12 7.8%	4 2.6%	2 1.3%
15. Using a databased management program	41 26.6%	50 32.5%	39 25.3%	15 9.8%	2 1.3%	7 4.5%
16. Using a graphics program	26 16.9%	64 41.6%	47 30.5%	11 7.1%	4 2.6%	2 1.3%

continued

TABLE 4.1 continued
Perceptions of Course Content

Topic	Essential	Important	Good	Don't bother	Other course	No answer
17.Using a modem to communicate between computers	14 9.1%	39 25.3%	49 31.8%	35 22.7%	9 5.9%	8 5.2%
18. Using computer managed instruction	25 16.3%	62 40.3%	51 33.1%	5 3.2%	4 2.6%	7 4.5%
19. Teaching students about computers	59 38.3%	49 31.8%	31 20.2%	10 6.5%	2 1.3%	3 1.9%
20. The history of computers	9 5.9%	37 24.0%	62 40.3%	29 18.8%	15 9.7%	2 1.3%
21. Current and future uses of computers and their impact on society	34 22.1%	45 29.2%	46 29.9%	22 14.3%	5 3.2%	2 1.3%
22. Computer ethics and legalities	25 16.3%	52 33.8%	47 30.5%	22 14.3%	5 3.2%	3 1.9%

When the responses are analyzed by mean (1 = essential, 5 = don't bother), the results are similar (Table 4.2). Five topics had a mean less than 2 (i.e. were most essential): Loading and running an existing computer program, Using a word processing program, Identifying the parts of a computer and discussing their functions, Identifying and using the three major types of computer assisted instruction, and Teaching students about computers.

Eight of the ten highest ranked topics are related to using existing software, either for computer assisted instruction or computer supported instruction. The other two are: Teaching students about computers and Selecting and evaluating computer hardware.

Sixteen (17.6%) respondents added comments that indicated satisfaction with the course. Six (6.6%) praised the staff of the Regional Computer Resource Center (Table 4.4).

Research Question 2: Which course topics were least useful/important in using computers for instruction? (Questionnaire questions: III, 1 - 22)

Four topics were rated as essential or important by less than 40% of the respondents (Table 4.1). They were: Writing programs in Logo (39%), Using a modem (34.4%), The

TABLE 4.2

Course Topics Ranked by Means
(1 = essential, 5 = don't bother)

Topic	Mean
Loading and running an existing computer program.	1.39
Using a word processing program.	1.66
Identifying the parts of a computer and discussing their functions	1.86
Identifying and using the three major types of computer assisted instruction: drill and practice, tutorials and simulations.	1.94
Teaching students about computers.	1.99
Using computer assisted instruction in your subject area.	2.01
Selecting and evaluating computer programs and accompanying aids.	2.05
Using a spread sheet.	2.20
Selecting and evaluating computer hardware.	2.22
Using a databased management program.	2.23
Adapting an existing program to a specific use.	2.27
Using computer managed instruction.	2.33
Using graphics programs.	2.36
Designing a computer assisted instruction lesson.	2.36

continued

* 1 = essential, 2 = important, 3 = good, 4 = for another course, 5 = don't bother

TABLE 4.2 continued

Course Topics Ranked by Means

Topic	Mean
Programming a computer assisted instruction lesson.	2.44
Current and future uses of computers and their impact on society.	2.47
Writing programs in BASIC.	2.48
Computer ethics and legalities.	2.54
Writing programs in Logo.	2.90
Using a modem to communicate between computers.	2.90
The history of computers.	3.03
Writing programs in SuperPILOT.	3.29

* 1 = essential, 2 = important, 3 = good, 4 = for another course, 5 = don't bother

history of computers (29.9%) and Writing programs in SuperPILOT (22.7%). Since Logo is only taught in the Elementary sections of the course and modems are only discussed in the Secondary sections (see Syllabi, Appendix D), the opinions of the teachers who received instruction in these two areas are analyzed separately (Table 4.3). Logo is rated essential or important by 41.4% of the Elementary teachers and using modems is so rated by 51.7% of the Secondary teachers.

TABLE 4.3
Elementary and Secondary Teachers' Perceptions
of Logo and Modem Topics

Topic	Essential	Important	Good	Other course	Don't bother	No answer
8. Writing programs in Logo*						
Elementary	12	26	34	13	1	6
Elementary mean: 2.42	13.1%	28.3%	37.0%	14.1%	0.2%	6.5%
Secondary	2	13	15	22	8	2
Secondary mean: 3.24	3.2%	21.0%	24.2%	35.5%	12.9%	3.2%
17. Using a modem to communicate between computers**						
Elementary	8	20	27	25	10	2
Elementary mean: 3.03	8.7%	21.7%	29.3%	27.2%	10.9%	2.2%
Secondary	6	26	16	10	2	2
Secondary mean: 2.52	9.7%	42.0%	25.8%	16.1%	3.2%	3.2%

* Not in secondary syllabus ** Not in elementary syllabus

Two topics had means greater than 3 indicating that the respondents felt the topics could be dropped from the existing course: The history of computers and Programming in SuperPILOT (Table 4.2). Topics with means greater than 2.5 included: Computer ethics and legalities, Writing programs in Logo and Using modems. The Logo mean for Elementary teachers is 2.42; the modem mean for secondary teachers is 2.52 (Table 4.3).

All of the topics which include programming were included in the ten topics with the highest means (i.e. least essential). Not only programming in BASIC, Logo, and SuperPILOT but also designing and programming a computer assisted instruction lesson were in this category. Logo and using modems remain among the least important topics even when only the teachers who studied these topics are consulted.

Research Question 3: What topics should have been included but were missing? (Questionnaire question: III, 23)

The only topic which was suggested for the course that is not currently included in the curriculum was grant writing (Table 4.5). Respondents also identified several areas currently included in the courses which should receive more emphasis. A need for more hands-on experience was mentioned by eleven (12.1%) respondents (Table 4.4). More

emphasis on integrating computer activities into the classroom was mentioned by eight (8.8%) respondents (Table 4.5). Other suggestions included more programming, more word processing, more work with data bases and spread sheets, and more experience with existing software.

Research Question 4: What topics should have been eliminated? (Questionnaire questions: III, 1 - 23)

Six course topics received a don't bother rating from over 5% of the respondents (Table 4.1). The six topics were: Writing programs in SuperPilot (15%), The history of computers (9.7%), Writing programs in Logo (7.8%), Writing

TABLE 4.4

General Comments on Existing Course

General Comments	Number	Percent*
Liked course	16	17.6
Too much material, too little time	20	22.0
Needs more hands-on	11	12.1
Compliments to staff	6	6.6
Other	11	12.1

* based on 91 replies to Questionnaire question III, 23

TABLE 4.5

Specific Recommendations for Existing Course*

Topics	Recommendation			
	More	Include	Less	Other Course
Programming	2 2.2%	3 3.3%	10 11.0%	3 3.3%
Word processing	4 4.4%	2 2.2%		1 1.1%
Data base	5 5.5%	1 1.1%		
Spread sheet	2 2.2%			
Software	4 4.4%			
Integration of computer into classroom	8 8.8%			
Other	8** 8.8%	9*** 9.9%	3**** 3.3%	

* based on 91 replies to Questionnaire question III, 23

** adapting existing programs (1), Logo (1), designing software (1), CMI (1), printers (1), utilities (1), modems (2)

*** ethics (1), history and future of computers (1), abstracts of computer related articles (2), graphics (1), Compuserve (1), electronic mail (1), writing grants (1), networking (1)

**** adapting existing programs (1) graphics (2)

programs in BASIC (6.5%), Using a modem (5.9%), and Programming a computer assisted instruction lesson (5.2%). Programming in Logo and using a modem do not fall into this category if only the responses of Elementary and Secondary teachers are considered, respectively (Table 4.3).

Ten (11%) respondents specifically commented that there was too much emphasis on programming in the existing course (Table 4.5). Twenty (22%) of the comments indicated that too much material was included in the course for the amount of time available (Table 4.4).

Research Question 5: What topics are recommended for another course? (Questionnaire questions: III, 1 - 23)

Eight topics included in the existing course were recommended for another course by at least 10% of the respondents (Table 4.1). Writing programs in Logo (22.7%), and Using a modem (22.7%) were most frequently recommended for another course. Other existing course topics suggested for another course included: Writing programs in SuperPILOT (21.4%), The history of computers (18.9%), Current and future uses of the computer (14.3%), Computer ethics and legalities (14.3%), Writing programs in BASIC (12.4%), and Programming a computer assisted instruction lesson (11.7%).

Table 4.6 presents the respondents' comments on the possible content of another course. Five subjects, reflecting the position that the existing course contains too much material (Table 4.4), suggested splitting the present course into two courses. Twenty-five respondents (27.5%) recommended a second, advanced course (Table 4.6).

Programming (10 comments, 11%) was the most frequently mentioned topic for an advanced course (Table 4.6). Spread sheets (6 comments, 6.6%) and data bases (5 comments, 5.5%) were also mentioned. Integrating sound and video with the computer was mentioned by one respondent.

B. TEACHERS' INSTRUCTIONAL COMPUTER USE

Research Question 6: Are computers available to the teacher? Where? How many? (Questionnaire question: II, 1)

Computers appear to be available to most teachers (83.8%) at their schools (Table 4.7). One or two computers were available to 17.6% of the respondents and 31.8% indicated that more than 10 computers were available to them at school. Eleven percent of the respondents indicated there were no computers available to them at school.

The availability of computers outside of school is much less: 52% of the respondents indicated they did not have access to a computer outside of school, 40.2% reported some

TABLE 4.6

Suggestions for Another Course

General Comments	Number	Percent*
Existing course should be split into two	5	5.5
Would like advanced course	25	27.5

Topics Suggested for Advanced Course

Topic	Number	Comments
Topics of Intro course in detail	3 3.3%	
Programming	10 11.0%	includes: BASIC (2), Logo (3), SuperPILOT (3), Pascal COBOL (1)
Word processing	2 2.2%	includes: Appleworks (1)
Data base	5 5.5%	
Spread sheet	6 6.6%	includes: Lotus 1-2-3 (1)
Other	14 15.4%	interfacing (1), legalities (1), computer resources (1), "Print Shop" (1), "Newsroom (1), mainframes (1), non-educational uses (1), modem (1), animation (1), IBM-PC (1), new hardware/software (2), sound & video capabilities (1), classroom uses (2)

* based on 91 replies to Questionnaire question III, 23

TABLE 4.7

Computers Available to Teachers

Number of computers	In School N	In School Percent	Outside of School N	Outside of School Percent
1	19	12.4	50	32.6
2	8	5.2	5	3.2
3-5	20	13.0	5	3.2
6-10	21	13.6	1	0.6
11-20	28	18.2		
> 20	21	13.6	1	0.6
No # given	12	7.8		
Number of teachers with computer(s):				
Available	129	83.8	62	40.2
Not available	17	11.0	80	52.0
No answer	8	5.2	12	7.8
Totals	154	100.0	154	100.0

computer availability and 7.8% gave no answer. Just under one third of the teachers (32.5%) had one computer available outside of school. A few teachers (7.6%) had access to more than one computer.

Research Question 7: Are computers available to the teacher's students? Where? How many? (Questionnaire question: II, 2)

Over one third of the respondents (36.3%) had one or more computers available to students in their own classroom (Table 4.8). The greatest number (18.9%) had only one computer in their classroom. Computers were available to students elsewhere in the school according to 77.9% of the respondents. More than 65% reported that more than 6 computers were available to students in the school (Table 4.8).

TABLE 4.8

Computers Available to Students

Number of computers	In Classroom N	In Classroom Percent	In School N	In School Percent
1	29	18.9	4	2.6
2	6	3.9	4	2.6
3-5	8	5.2	12	7.8
6-10	3	1.9	10	13.0
11-20	5	3.2	27	17.5
> 20	5	3.2	35	22.7
No # given			18	11.7
Number of teachers with computer(s):				
available to students	56	36.3	120	77.9
Not available to students	88	57.2	20	13.0
No answer	10	6.5	14	9.1
Totals	154	100.0	154	100.0

Research Question 8: What brands of computers are available in the schools? (Questionnaire question: II, 3)

Apple II computers are the most prevalent (71.4%) in the respondent's schools (Table 4.9). Tandy computers are found in 14.2% of the schools with IBM (9.3%) and Commodore (4.3%) well behind. Macintosh computers were reported by 2.9% of the respondents.

TABLE 4.9

Brands of Available Computers*

Brand	Number	Percent**
Apple II & compatible	100	71.4
Tandy***	20	14.3
IBM & compatible	13	9.3
Commodore	6	4.3
Macintosh	4	2.9
Other****	4	2.9
No answer	26	18.6

* Based on 140 replies indicating computer availability
** Exceeds 100% as multiple answers are included
*** includes all models
**** includes Texas Instruments (2), Hewlett Packard (2)

Research Question 9: Does the teacher use the computer for computer managed instruction and/or administration? If so, how often? (Questionnaire questions: II, 18 - 19)

Over one quarter of the teachers (26.6%) are currently using computer managed instruction (Table 4.10). Less than 2% of the respondents are using the computer for this purpose daily. The percentage of respondents using the computer for administrative purposes is slightly higher (32.5%); 6.5% are daily users. Roughly 40% of the respondents felt that they might be using the computer for both activities at a later date.

TABLE 4.10

Use of Computers
to Manage Instruction and/or Administration

Use	Daily	Weekly	Monthly	Maybe later	Unlikely ever	No* answer
CMI	3 1.9%	20 13.0%	18 11.7%	64 41.6%	9 5.8%	40 26.0%
Administration	10 6.5%	16 10.4%	24 15.6%	61 39.6%	6 3.9%	37 24.0%

* includes respondents without available computer(s) who were asked to skip this question

Research Question 10: Does the teacher use the computer for computer supported instruction? If so, how often? (Questionnaire questions: II, 14 - 17)

Table 4.11 shows the respondents' use of the computer for computer supported instruction. One half of the respondents use word processing. Fifteen percent use word processing daily. At least one quarter of the respondents use databases, spread sheets and computer graphics at this time, usually weekly or monthly. Over 40% of the respondents are considering using these applications in the future.

TABLE 4.11

Use of Computers to Support Instruction

Use	Daily	Weekly	Monthly	Maybe later	Unlikely ever	No* answer
Word processing	23 15.0%	29 18.8%	25 16.2%	38 24.7%	4 2.6%	35 22.7%
Database	5 3.2%	18 11.7%	19 12.4%	66 42.9%	9 5.8%	37 24.0%
Spread sheet	3 1.9%	21 13.6%	21 13.6%	65 42.3%	8 5.2%	36 23.4%
Graphics	3 1.9%	20 13.0%	18 11.7%	67 43.5%	9 5.9%	37 24.0%

* includes respondents without available computer(s) who were asked to skip this question

Research Question 11: Does the teacher use computer assisted and/or computer supported instruction with students? If so, how often? (Questionnaire questions: II, 4 - 11)

Table 4.12 shows the respondents' use of the computer assisted instruction with students. Drill and practice (39.6%) and tutorials (37%) are the most common uses. Simulations are used by 27.9% of the respondents. In all three categories of computer assisted instruction, the most common frequency of use was weekly.

The use of computer supported instruction with students is primarily divided between computer graphics (27.9%) and word processing (26.6%). The frequency of use is weekly or monthly. Data bases (11.7%), desktop publishing (10.3%) and spread sheets (9.7%) are much less used. A relatively high percentage of teachers (24.1%) indicated that they were unlikely ever to use spread sheets with students and 20.1% thought that the use of data bases was unlikely with students.

Research Question 12: Does the teacher teach about computers? (Questionnaire question: II, 12)

A total of 41.5% of the respondents reported that they teach students about computers at least monthly (Table 4.13). Eleven percent teach about computers daily, an additional 22.7% expect that they may be teaching about

TABLE 4.12

Computer Use with Students

Use	Daily	Weekly	Monthly	Maybe later	Unlikely ever	No* answer
Drill & practice	14 9.1%	35 22.7%	12 7.8%	40 26.0%	16 10.4%	37 24.0%
Tutorials	6 3.9%	38 24.7%	13 8.4%	51 33.1%	10 6.5%	36 23.4%
Simulations	4 2.6%	21 13.6%	18 11.7%	58 37.7%	12 7.8%	41 26.6%
Word processing	9 5.8%	16 10.4%	16 10.4%	54 35.1%	20 13.0%	39 25.3%
Database	4 2.6%	9 5.9%	5 3.2%	65 42.2%	31 20.1%	40 26.0%
Spread sheet	4 2.6%	5 3.2%	6 3.9%	63 40.9%	37 24.1%	39 25.3%
Graphics	6 3.9%	20 13.0%	17 11.0%	58 37.7%	16 10.4%	37 24.0%
Desktop publishing	1 0.6%	4 2.6%	11 7.1%	70 45.5%	24 15.6%	44 28.6%

* includes respondents without available computer(s) who were asked to skip this question

TABLE 4.13

Teaching About Computers

Use	Daily	Weekly	Monthly	Maybe later	Unlikely ever	No* answer
Teaching about computers	17 11.0%	37 24.0%	10 6.5%	35 22.7%	13 8.5%	42 27.3%

* includes respondents without available computer(s) who were asked to skip this question

computers in the future.

Summarizing all uses of the computer (Table 4.14), 28.6% of the respondents are using the computer daily, 31.2% at least weekly and 5.2% at least monthly for a total of 65% computer users. Only one respondent did not anticipate some future use of the computer in instruction.

The largest percentage of respondents are using the computer for computer supported instruction (55.2%). This is also the area of most frequent daily use (18.2%). Over half of the respondents (51.3%) are using computers with students, usually weekly (30.5%). Teaching about computers is reported by 41.5% and computer managed instruction or administrative uses are reported by 32.2% of the respondents.

TABLE 4.14

Summary: Frequency of Computer Use

Use	Daily	Weekly	Monthly	Maybe later	Unlikely ever	No* answer
All uses	44	48	8	20	1	33
	28.6%	31.2%	5.2%	13.0%	0.6%	21.4%
CMI/Administration						
	11	30	24	51	2	36
	7.1%	19.5%	15.6%	33.1%	1.3%	23.4%
Support Instruction						
	28	35	22	32	3	34
	18.2%	22.7%	14.3%	20.8%	1.9%	22.1%
With Students						
	19	47	13	31	8	36
	12.3%	30.5%	8.5%	20.1%	5.2%	23.4%
Teaching about computers						
	17	37	10	35	13	42
	11.0%	24.0%	6.5%	22.7%	8.5%	27.3%

* includes respondents without available computer(s) who were asked to skip this question

Research Question 13: Are computers used for remedial or standard instruction or for enrichment? (Questionnaire question: II, 13)

There is no indication that the respondents are using computers particularly for remediation, standard instruction or enrichment (Table 4.15). The means for each category are 30.4, 33.9 and 32.0 respectively.

TABLE 4.15

Instructional Use of Computers:
Remediation, Standard Instruction, Enrichment

% of Use	Remedial	Standard	Enrichment
0	23 28.4%	20 24.7%	16 19.8%
1-20	16 19.8%	11 13.5%	17 21.0%
21-40	14 17.3%	19 23.5%	20 24.7%
41-60	17 21.0%	20 24.7%	19 23.4%
61-80	6 7.4%	3 3.7%	6 7.4%
81-100	5 6.1%	8 9.9%	3 3.7%
Means	30.4	33.9	32.0

* based on 81 replies to Questionnaire question II, 13.

C. ENVIRONMENTAL FACTORS AND COMPUTER USE

Research Question 14: Has the teacher's instructional computer use increased, diminished or remained constant since taking the course? (Questionnaire question: II, 20)

A total of 63.6% of the respondents reported increased computer use after taking a course at the Regional Computer Resource Center (Table 4.16). Only three respondents (1.9%) indicated that their current computer use was less than

before; two of these added that they had changed schools since taking the course and now had less access to computers. Some teachers (11.7%) reported that their computer use had remained the same.

TABLE 4.16

Computer Use Since RCRC Course

Use	Number	Percent
Alot less*	3	1.9
Less	0	0.0
About the same	18	11.7
More	67	43.5
Alot more	31	20.1
No answer	35	22.8
Totals	154	100.0

* two respondents explained that they had changed schools and now have more limited access to computers

Research Question 15: What other computer-related activities has the teacher become involved with since taking the course? Has the teacher taken other courses or workshops? Has the teacher written grant proposals involving computers? Has the teacher initiated or participated in computer projects in the classroom or school? (Questionnaire question: II, 24)

A majority (58.5%) of the respondents have participated in computer activities since taking the Regional Computer Resource Center at Temple University (Table 4.17). The most common activity was participation in additional courses or workshops (55.7%). Hardware acquisition was mentioned by 27.8% of the respondents. Programming was reported by 6.7% of the respondents.

Research Question 16: What is the relationship between environmental factors such as the availability of hardware and software, the quality of software, administrative or faculty support, student interest or teacher's confidence and the teacher's use of computers in instruction? (Questionnaire questions: II, 1 - 2, 4 - 12, 14 - 19, 21 - 23)

Tables 4.18 through 4.21 address research question 16. Tables 4.18 and 4.19 present the means of the respondents' rankings of factors encouraging and discouraging computer use. Table 4.20 summarizes comments made by the respondents concerning factors that influence their computer use. Table 4.21 summarizes contingency tables showing the relationship of computer use to computer availability.

Student interest was the most encouraging factor (Table 4.18) and the least discouraging factor (Table 4.19)

TABLE 4.17

Teachers' Computer-Related Activities
Since RCRC Course

Activities	Number	Percent
Yes	90	58.5
No	47	30.5
No answer	17	11.0
Totals	154	100.0

Type of Activity	Number	Percent*
Courses/workshops	51	55.7
Acquisition of hardware	25	27.8
Use computer to support instruction	15	16.7
Acquisition/evaluation of software	13	14.4
Teach about computers	10	11.1
Develop programs involving computers	7	7.8
Programming	6	6.7
Teach with computers	6	6.7
Grant proposals	5	5.6
Other**	4	4.4

* based on 90 respondents, total exceeds 100% as multiple answers were allowed (See Appendix G2)

** use RCRC as a resource (3), borrow computer from school to take home (1)

influencing computer use. One respondent remarked that using computers with her special-needs pre-schoolers was difficult (Table 4.20 & Appendix G3).

The second most encouraging factor was the respondents' knowledge about computers (Table 4.18). Knowledge about computer ranked fifth as a discouraging factor (Table 4.19).

The respondents ranked availability of hardware as the third most encouraging factor (Table 4.18) and the second most discouraging factor (Table 4.19) influencing the use of computers for instruction. Hardware availability received more comments (34.3%) than any other factor (Table 4.20). Seven comments indicated that the availability of computers was encouraging their use. Most comments (27) indicated hardware availability was discouraging use. (2 comments were not clearly encouraging or discouraging.) Four respondents remarked that although computers were available in the school, they were reserved for the computer teacher. Related comments concerned computers that are not available due to locked rooms, broken equipment etc. (For full text of comments, see Appendix G3).

Contingency tables were used to analyze the relationship of hardware availability and computer use (Table 4.21) (Nie, et al. 1975). Each respondent was classified by the number of computers available to the

TABLE 4.18

Means of Factors Encouraging Computer Use*
(1 = most encouraging, 7 = least encouraging)

Factor	Mean
Student interest	2.99
Knowledge of computers	3.03
Available hardware	3.35
Available software	3.92
Quality of software	4.26
Administrative support	4.80
Faculty support	5.52

* based on 65 answers to Questionnaire question II, 21a

teacher and the students, at school, outside of school, and in the classroom (questionnaire questions II, 1 - 2). The use categories not now, maybe later and not now, unlikely ever were combined as no use for the contingency tables, leaving four categories: daily, weekly, monthly and no use. The respondents were categorized by their most frequent use overall and within four sub-uses: administration/computer managed instruction, computer supported instruction, using computers with students and teaching students about computers (questionnaire questions II, 4 - 12, and 14 - 19).

TABLE 4.19

Means of Factors Discouraging Computer Use*
(1 = most discouraging, 7 = least discouraging)

Factor	Mean
Available software	2.98
Available hardware	3.06
Quality of software	3.54
Administrative support	4.14
Knowledge of computers	4.27
Faculty support	4.43
Student interest	5.29

* based on 51 answers to Questionnaire question II, 21b

Five relationships are significant to at least $p < .005$ (Tables 4.21 & 4.22). When a computer is available in the classroom, teachers are more likely to use the computer with students than when a computer is not in the classroom. This relationship applies to the total use of computers, using computers with students, and teaching about computers. Teachers are more likely to use a computer for computer managed instruction and/or administration and for computer supported instruction if a computer is available to them outside of school.

TABLE 4.20

Comments on Factors Influencing Computer Use

Type of Comment	Total	Percent*	Encouraging	Discouraging	Unclear
No factor other than those listed**	16	15.2			
Hardware	36	34.3	7	27***	2
Time	11	10.5		11	
Curriculum requirements	8	7.6	4	4	
Software	8	7.6	1	6	1
Administrative support	8	7.6	7	1	
Faculty support	7	6.7	3	2	2
Students	5	4.8	3	2	
Teaching about computers	5	4.8	5		
Scheduling	5	4.8		5	
Need for aides	4	3.8		4	
Security problems	4	3.8		4	
Funding	4	3.8	1	3	
Other****	8	7.6		7	1

* based on 105 respondents, total exceeds 100% as multiple answers were allowed. (See Appendix G3)

** availability of hardware, availability/quality of software, support of administration, faculty and students, knowledge of computers

*** four respondents said all computers were reserved for computer teacher

**** discouraging: current position (4), other teacher teaches computer (3); comment on parents (1)

TABLE 4.21

Relationship Between Computer Use and Availability*

Use**/Computer Availability	DF	X^2	p
Teacher at school	24	32.64	.1118
Teacher outside of school	18	25.07	.1230
Students in classroom	21	47.81	.0007***
Students in school	24	15.75	.8970
Use for Administration and/or CMI/ Computer Availability			
Teacher at school	24	24.46	.4357
Teacher outside of school	18	57.58	.0001****
Use to Support Instruction/ Computer Availability			
Teacher at school	24	18.79	.7633
Teacher outside of school	18	37.33	.0048***
Using Computers with Students/Computer Availability			
Students in classroom	21	55.61	.0001****
Students in school	24	32.95	.1051
Teaching About Computers/ Computer Availability			
Students in classroom	21	43.25	.0029***
Students in school	24	16.86	.8446

* contingency tables based on 121 replies to Questions II, 1, 2, 4 - 19

** use categories: daily, weekly, monthly, no use

*** $p < .005$

**** $p < .0001$

TABLE 4.22

Computer Use and Availability:
Significant Contingency Tables

Overall Computer Use / Computer Available to Student in Classroom

# computers	daily	weekly	monthly	no use	totals:
1	7 (10.55)*	20 (11.50)	1 (1.92)	1 (5.03)	29
2	5 (2.18)	1 (2.38)	0 (0.40)	0 (1.04)	6
3 - 5	4 (2.91)	1 (3.17)	1 (0 53)	2 (1.39)	8
6 - 10	2 (1.09)	1 (1.19)	0 (0.20)	0 (0.52)	3
11 - 20	5 (1 82)	0 (1.98)	0 (0.33)	0 (0.87)	5
> 20	4 (1.82)	0 (1.98)	0 (0.33)	1 (0.87)	5
No # given	14 (22.55)	25 (24.60)	6 (4.10)	17 (10.76)	62
No answer	3 (1.09)	0 (1.19)	0 (0.20)	0 (0.52)	3
Totals:	44	48	8	21	121

$X^2 = 47.81$ $p = .0007$

continued

(based on 121 responses to Questionnaire questions II, 1, 2, 4 - 19)
* expected values

TABLE 4.22 continued

Computer Use and Availability:
Significant Contingency Tables

Use for Administration and/or CMI / Computer Available Outside of School

# computers	daily	weekly	monthly	no use	totals:
1	3 (3.92)*	15 (10.68)	13 (8.54)	11 (18.86)	42
2	3 (0.37)	1 (1.02)	0 (0.81)	0 (1.80)	4
3 - 5	2 (0 47)	2 (1.27)	0 (1.02)	1 (2.25)	5
6 - 10	0 (0 09)	0 (0.25)	0 (0.20)	1 (0.45)	1
> 20	1 (0.09)	0 (0.25)	0 (0.20)	0 (0.45)	1
No # given	2 (5.69)	10 (15.51)	11 (12.41)	38 (27.40)	61
No answer	0 (0.37)	2 (1.02)	0 (0.81)	2 (1.80)	4
Totals:	11	30	24	53	118

X2 = 57.58 p = .0001

continued

(based on 118 reponses to Questionnaire questions II, 1, 2, 4 - 19)
* expected values

TABLE 4.22 continued

Computer Use and Availability:
Significant Contingency Tables

Use to Support Instruction / Computer Available Outside of School

# computers	daily	weekly	monthly	no use	totals:
1	15 (10.03)*	15 (12.54)	6 (7 88)	7 (12.54)	43
2	3 (0.93)	1 (1.17)	0 (0.73)	0 (1.17)	4
3 - 5	3 (1.17)	1 (1.46)	0 (0.92)	1 (1.46)	5
6 - 10	0 (0 23)	0 (0.29)	0 (0 18)	1 (0.29)	1
> 20	1 (0.23)	0 (0.29)	0 (0.18)	0 (0 29)	1
No # given	6 (14.47)	15 (18.08)	15 (11.37)	26 (18.08)	62
No answer	0 (0.93)	3 (1.17)	1 (0.73)	0 (1.17)	4
Totals.	28	35	22	35	120

$X^2 = 37.33$ $p = .0048$

continued

(based on 120 reponses to Questionnaire questions II, 1, 2, 4 - 19)
* expected values

TABLE 4.22 continued

Computer Use and Availability:
Significant Contingency Tables

Using Computer with Students / Computer Available in Classroom

# computers	daily	weekly	monthly	no use	totals:
1	4 (4.67)*	21 (11.55)	0 (3.19)	4 (9.58)	29
2	3 (0.97)	0 (2.39)	1 (0.66)	2 (1.98)	6
3 - 5	2 (1.29)	2 (3.19)	2 (0.88)	2 (2 64)	8
6 - 10	0 (0.48)	1 (1.19)	1 (0.33)	1 (0.99)	3
11 - 20	3 (0.81)	0 (1 99)	1 (0.55)	1 (1.65)	5
> 20	2 (0.81)	2 (1.99)	0 (0.55)	1 (1.65)	5
No # given	3 (9.66)	21 (23.90)	8 (6.61)	28 (19.83)	60
No answer	2 (0.32)	0 (0.80)	0 (0.22)	0 (0.66)	2
Totals:	19	47	13	39	118

$X^2 = 55.61$ $p = .0001$

continued

(based on 118 reponses to Questionnaire questions II, 1, 2, 4 - 19)

* expected values

TABLE 4.22 continued

Computer Use and Availability:
Significant Contingency Tables

Teaching About Computers / Computer Available in Classroom

# computers	daily	weekly	monthly	no use	totals:
1	1 (4.25)*	12 (9.25)	4 (2.50)	11 (12.00)	28
2	2 (0.91)	2 (1.98)	1 (0.54)	1 (2.57)	6
3 - 5	1 (1.21)	2 (2.64)	0 (0.71)	5 (3.43)	8
	1 (0.46)	0 (0.99)	0 (0.27)	2 (1.29)	3
11 - 20	4 (0.76)	0 (1.65)	1 (0.45)	0 (2.14)	5
> 20	3 (0.76)	1 (1.65)	0 (0.45)	1 (2.14)	5
No # given	4 (8.35)	19 (18.17)	4 (4.91)	28 (23.57)	55
No answer	1 (0.30)	1 (0.66)	0 (0.18)	0 (0.86)	2
Totals:	17	37	10	48	112

$X^2 = 43.25$ $p = .0029$

(based on 112 reponses to Questionnaire questions II, 1, 2, 4 - 19)
* expected values

The availability of software was ranked as the most discouraging factor (Table 4.19). The majority of the respondents' comments about software indicated it was a discouraging factor in computer use (Table 4.20). The quality of software is neither strongly encouraging (Table 4.18) nor strongly discouraging (Table 4.19) in influencing computer use.

Administrative and faculty support is not encouraging (Table 4.18) nor particularly discouraging (Table 4.19). Seven of eight comments (Table 4.20) indicated that administrators are an encouraging factor. Comments on faculty support were mixed: "A new computer teacher at our school is encouraging me to make use of the computer..." to "Our faculty does not like computers and are not encouraging" (Table 4.20 and Appendix G3).

Other factors discouraging computer use mentioned by respondents (Table 4.20) include time, scheduling, security for the computers and software, the need for classroom aides while using computers and funding. Curriculum requirements both encouraged and discouraged computer use. Teaching about computers encouraged computer use.

Research Question 17: Have any environmental factors influencing computer use changed since the teacher took the course? (Questionnaire questions: I, 5 & II, 22)

Thirty-four respondents (22.1%) had changed schools (Table 4.23) since taking the course at the Regional Computer Resource Center. The most frequent comment (49.1%) on changes indicated that the respondents' knowledge about computers had increased; a factor that had a positive influence on their use of computers for instruction (Table 4.24). Equal numbers (22.8%) of the comments indicated that changes in attitudes toward computers and the acquisition of hardware were encouraging the use of computers.

Other factors that have changed included increased software availability, administration and faculty support, student interest and funding. For five respondents the change is that they are now teaching about computers.

TABLE 4.23

Number of Respondents Who Have Changed Schools

Change	Number	Percent
Yes	34	22.1
No	118	76.6
No answer	2	1.3
Totals	154	100.0

TABLE 4.24

Comments on Factors Influencing Computer Use
That Have Changed Since RCRC Course

Type of Change	Number	Percent*	Encouraging	Discouraging
Increased knowledge about computers	28	49.1	28	
More positive attitude toward computers	13	22.8	13	
Availability of hardware	13	22.8	11	2
Availability/quality of software	7	12.4	7	
Now teaching about computers	5	8.8	5	
Administration/faculty	7	12.4	5	2
Student interest	4	7.0	4	
Funding	4	7.0	3	1
Other**	2	3.5	1	1

* based on 57 respondents, total exceeds 100% as multiple answers were allowed (See Appendix G4)
** use computer to support instruction (1), less access to computer class (1)

D. DEMOGRAPHIC FACTORS AND COMPUTER USE

Research Question 18: What are the teacher's age and sex? How long has the teacher been teaching? (Questionnaire questions: I, 1, 6, 7)

Age: More than 16% of the respondents were over 50 years old (Table 4.25). Seventy-four percent were thirty-five or older. Eleven percent of the respondents were less than 30 and fewer than 14% were between 30 and 34 years of age.

TABLE 4.25

Age of Respondents

Years	Number	Percent
20-24	1	.6
25-29	16	10.4
30-34	21	13.7
35-39	34	22.1
40-44	30	19.5
45-49	25	16.2
50>	25	16.2
No answer	2	1.3
Totals	154	100.0

Sex: Almost four times as many females (78.6%) responded to the survey as males (20.1%) (Table 4.26). This reflects the enrollment in the Regional Computer Resource Center courses, as represented by the population surveyed, which was approximately 79% female.

TABLE 4.26

Gender of Respondents

Sex	Number	Percent
Male	31	20.1
Female	121	78.6
No answer	2	1.3
Totals	154	100.0

Teaching experience: Almost half (46.1%) of the respondents have had 11 to 20 years teaching experience (Table 4.27). Approximately one third (33.8%) had 10 years experience or less. The mean length of teaching experience was 12.7 years.

TABLE 4.27

Length of Respondents' Teaching Experience

Years	Number	Percent
1-5	22	14.3
6-10	30	19.5
11-15	40	26.0
16-20	31	20.1
21-25	15	9.8
26-30	4	2.6
31-35	3	1.9
No answer	9	5.8
Totals	154	100.0
Mean	12.7 years	

Research Question 19: What year did the teacher receive a Bachelor's degree? What year and from what state was the teacher certified to teach? (Questionnaire question: I, 8)

More (46.8%) of the respondents had received their Bachelor's degree between 1970 and 1979 than in any other 10 year period (Table 4.28). The twenty years from 1965 - 1984 accounted for 77.4% of the Bachelor's degrees. Only 18.8% of the respondents received their Bachelor's degrees in the 1980s.

TABLE 4.28

Year of Respondents' Bachelor's Degree,
Year and State of Certification

Date	Bachelor's		Certification	
	Number	Percent	Number	Percent
1945-49	1	0.6		
1950-54	3	1.9	2	1.3
1955-59	8	5.2	3	1.9
1960-64	14	9.1	9	5.9
1965-69	23	15.0	19	12.4
1970-74	42	27.3	35	22.7
1975-79	30	19.5	33	21.4
1980-84	24	15.6	25	16.2
1985-87	5	3.2	14	9.1
No answer*	4	2.6	14	9.1
Totals	154	100.00	154	100.0

State	Number	Percent
Pennsylvania	134	87.0
New Jersey	2	1.3
New York	3	2.0
Other	5	3.2
No answer**	10	6.5
Totals	154	100.0

* includes teachers in private and parochial schools where certification is not required

** some respondents gave state but not date of certification

The dates of teacher certification parallel those of the BA. More (44.1%) of the respondents were certified between 1970 and 1979 than in any other 10 year period (Table 4.28). The twenty years from 1965 - 1984 accounted for 72.7% of the certifications. Approximately one quarter of the respondents (25.3%) were certified in the 1980s. Almost all respondents (87%) have been certified by the State of Pennsylvania (Table 4.28).

Research Question 20: Does the teachers have any advanced degrees? (Questionnaire question: I, 8)

More than half (63.3%) of the respondents have advanced degrees (Table 4.29). A total of 11.1% have degrees beyond a single master's degree: doctorate, master's plus 30 or more than one master's. The majority (51.9%) have master's or master's equivalency degrees.

Research Question 21: What grade level and subject area does the teacher teach? (Questionnaire questions: I, 2 - 3)

Respondents were asked what grade level and subject area(s) they taught. Over half (51.3%) of the respondents teach at the elementary level (Table 4.30). Elementary is also the single most represented subject area (33.8%) (Table 4.31). Seven elementary sections of the Regional Computer Resource Center course were offered, compared to five

TABLE 4.29

Respondents' Advanced Degrees

Advanced Degree(s)	Number	Percent
Doctorate	2	1.3
Master's + 30	12	7.8
Two Master's	3	2.0
Master's	75	48.7
Master's Equiv.	5	3.2
S.A. Teacher's Cert.	1	0.6
With Advanced Degree	98	63.6
No Advanced Degree	56	36.4
Totals	154	100.0

TABLE 4.30

Grade Level Respondents Teach

Level	Number	Percent
K-8	79	51.3
7-12	54	35.1
Both	9	5.9
Other	11	7.1
No answer	1	0.6
Totals	154	100.0

TABLE 4.31

Subject Areas Respondents Teach

Subject	Number*	Percent*
Elementary (K-8)	52	33.8
Mathematics	34	22.1
Science	31	20.1
Special Education	28	18.2
English	18	11.7
Social Studies	13	8.4
Languages	12	7.8
Physical Education	10	6.5
Business Education	8	5.2
Computer Science	7	4.6
Reading	7	4.6
Vocational Education	4	2.6
Other**	13	8.4

* exceeds 154 respondents and 100% as multiple answers are included

** includes Art (1), Music (1), Cosmetology (1), Shop (1), Health (2), Career Development (1), Religion (1), Home Economics (3) and Supervisory Positions (2)

secondary sections during the period covered by the survey.

Math (22.1%), Science (20.1%) and Special Education (20.1%) teachers are the next largest groups. Respondents indicated that they represented 21 different subject areas (Table 4.31).

Research Question 22: In what type of school, public, private or parochial, does the teacher work? (Questionnaire question: I, 4)

By far the greatest number of respondents (77.9%) teach in public schools (Table 4.32). Parochial schools account for 15.6% and 5.2% of the respondents teach in private schools.

TABLE 4.32

Respondents' School Type

Type	Number	Percent
Public	120	77.9
Private	8	5.2
Parochial	24	15.6
No answer	2	1.3
Totals	154	100.0

Research Question 23: What computer training had the respondents had before taking the Regional Computer Resource Center course? (Questionnaire question: I, 9)

Most participants (64.9%) in the Regional Computer Resource Center courses have had no previous computer training (Table 4.33). Approximately one third of the respondents (35.1%) had some training. Most (14.9%) had a single workshop or very short course of 15 hours or less. Two respondents had extensive previous computer training experience (more than 90 hours) but these experiences had been limited to non-educational aspects of computer use such as programming in several languages and data processing.

Research Question 24: In which semester was the teacher enrolled in the course? (Questionnaire question: I, 10)

The individual sessions of the Regional Computer Resource Center courses were all represented by the respondents (Table 4.34). Those taking the elementary course represent almost 60% of the total which can be explained by the fact that seven elementary courses and only five secondary courses were offered during the period covered by the survey.

TABLE 4.33

Respondents' Previous Computer Training

Hours of Training	Number	Percent
1-15	23	14.9
16-30	9	5.9
31-45	7	4.6
46-60	4	2.6
61-75	1	0.6
76-90	2	1.3
>90*	2	1.3
# of hours not given	6	3.9
Total with training	54	35.1
No training	100	64.9
Totals	154	100.0

* respondent remarks: all data processing (1), all programming (1).

Table 4.34

Semester of Enrollment

Level	Semester	Number	Percent
Elementary Courses			
	Summer 1985	13	8.4
	Fall 1985	16	10.4
	Spring 1986	15	9.7
	Spring 1986	7	4.5
	Summer 1986	14	9.1
	Fall 1986	15	9.7
	Spring 1987	12	7.8
Elementary Course Totals		92	59.6
Secondary Courses			
	Summer 1985	8	5.2
	Fall 1985	10	6.5
	Spring 1986	14	9.1
	Fall 1986	9	5.8
	Spring 1987	21	13.6
Secondary Course Totals		62	40.4
Total of All Courses		154	100.0

Research Question 25: Is there a relationship between demographic factors and the teachers use of computers in instruction? (Questionnaire questions: I, 1 - 10 & II, 4 - 12, 14 - 19)

Contingency tables were used to investigate possible relationships between demographic factors and the respondents' use of computers for instruction. Respondents were classified as daily, weekly or monthly users and non-users according to their most frequent computer use reported in questionnaire questions II 4 - 12, and 14 - 19. The demographic factors were determined by the responses to questionnaire questions I, 1 -10.

Table 4.35 shows that there is no significant relationship between computer use and age, sex, teaching experience, date of receiving Bachelor's degree or teaching certification, state of certification, advanced degrees, type of school in which the respondent teaches, previous computer training or semester in which the respondent was enrolled in the Regional Computer Resource Center course.

Table 4.35

Relationship of Demographic Factors and Computer Use*

Use**/	DF	X^2	p
Age	21	21.74	.1410
Sex	6	8.97	.1795
Teaching Experience	18	7.71	.9827
Year of BA	21	21.13	.4511
Year of Certification	21	26.05	.2046
State of Certification	12	8.97	.7052
Advanced Degrees	3	3.52	.3181
Type of School	9	13.51	.1410
Previous computer training	3	3.18	.3641
Semester enrolled	15	24.14	.0627

* based on 121 replies to Questionnaire questions I, 1, 4 - 10 & II, 4 - 19
** use categories: daily, weekly, monthly, no use

Table 4.36 presents a summary of contingency tables showing the relationship of computer use to grade level and subject matter taught. There are three significant relationships presented in this table (also see Table 4.37). The first two relationships are similar: elementary teachers, as determined by either grade level or subject

Table 4.36

Relationship of Grade Level and
Subject Area Taught to Computer Use*

Use**/	DF	X^2	p
Grade Level	3	8.05	.0450***
Subject areas:			
Elementary (K-8)	3	14.09	.0028****
Mathematics	3	1.55	.6698
Science	3	2.23	.5254
Special Education	3	.61	.8930
English	3	4.59	.2043
Social Studies	3	2.82	.4201
Languages	3	.55	.9070
Physical Education	3	1.35	.7181
Business Education	3	2.76	.4307
Computer Science	3	7.96	.0468***
Reading	3	3.75	.2895
Vocational Education	3	2.91	.4051
Other	3	1.67	.6437

* contingency tables based on 121 replies to Questionnaire questions I, 2, 3 & II, 4 - 12, 14 - 19
** use categories: daily, weekly, monthly, no use
*** $p < .05$
**** $p < .005$

TABLE 4.37

Computer Use, Grade Level and Subject Area:
Significant Contingency Tables

Computer Use / Grade Level Taught**

	daily	weekly	monthly	no use	totals:
Elementary	17 (21.74)*	26 (22.77)	2 (4.14)	14 (10.35)	59
Secondary	25 (20.26)	18 (21.23)	6 (3.86)	6 (9.65)	55
Totals:	42	44	8	20	114

$X^2 = 8.05$ $p = .0450$

**respondents reporting teaching both elementary and secondary omitted

Computer Use / Subject Area: Elementary (K - 8)

	daily	weekly	monthly	no use	totals:
Elementary	8 (14 18)*	17 (15.47)	1 (2.58)	13 (6.77)	39
Other	36 (29.82)	31 (32.53)	7 (5.42)	8 (14.23)	82
Totals:	44	48	8	21	121

$X^2 = 14.09$ $p = .0028$

Computer Use / Subject Area: Computer Science

	daily	weekly	monthly	no use	totals:
Computer Science	6 (2.55)*	1 (2.78)	0 (0.46)	0 (1.21)	7
Other	38 (41.45)	47 (45.22)	8 (7.54)	21 (19.79)	114
Totals:	44	48	8	21	121

$X^2 = 7.96$ $p = .0468$

* expected values

area taught, are using computers less than secondary teachers or teachers of other subject areas. The third relationship shows that more computer science teachers are using computers than would have been statistically expected.

E. SUMMARY

Chapter IV has presented the research findings of the study in four sections: teachers' perceptions of the content of the courses at the Regional Computer Resource Center at Temple University, the teachers' instructional use of computers and the environmental and demographic factors that influence computer use.

Most of the findings are presented in tables of descriptive statistics. The relationship of computer use to computer availability and to demographic factors was analyzed by contingency tables. The text of the respondents' comments to open-ended questions is included in Appendix G.

The conclusions that may be drawn from the data are discussed in Chapter V.

Chapter V

CONCLUSIONS AND RECOMMENDATIONS

This chapter presents a summary of the research, conclusions based on the findings presented in Chapter IV, recommendations based on the conclusions, and recommendations for further research.

The Problem and the Procedure

As the number of computers in classrooms grow, teachers are being asked to use the computers in the delivery of instruction, to teach their students about computers (Luehrmann, 1985) and to use computers to help with administrative tasks. Computer skills are becoming a criteria in teacher selection (Nelson & Waack, 1985).

Despite the urgency to train teachers in computer skills (Bork, 1982; Levin, 1985) and the tremendous numbers to be trained (Rogers, 1983), "there is no consensus among experts regarding the minimum competencies required by teachers to implement computer technology in the classroom" (Bruwelheide, 1982, p. 29). Ganske and Hamamoto stress the importance of "gathering information about the outcomes of [computer] training from the teachers who participate" (1984, p. 112).

This study was designed to analyze and review the perceptions and applications of computer education by teachers who have completed an inservice course offered by the Regional Computer Resource Center at Temple University.

The purpose of the study was threefold:

1. to determine how teachers who have completed a 3-credit inservice computer course at the Regional Computer Resource Center at Temple University perceive the importance and usefulness of selected computer topics.

2. to describe how ITEC trained teachers are currently using computers in education.

3. to determine the relationship of demographic and environmental factors influencing the use of computers in the classroom by ITEC trained teachers.

The population for the study was the teachers who had completed either the Elementary or Secondary sections of the three-credit graduate computer course at the Regional Computer Resource, Temple University (Education 554). Students from the initiation of the courses in the summer of 1985 through the spring semester of 1987 were included as they had had time to implement the content of the courses in the classroom.

After the questionnaire was reviewed by a panel of experts involved in the computer education of teachers and pilot tested by teachers who had taken a similar course, it was mailed to 289 subjects. Two follow-up mailings were sent to non-respondents. The findings in Chapter IV and the conclusions, below, are based on 154 replies to the mailings.

Conclusions

A. Teachers' Perceptions of the Course Content

Research Question 1: Which course topics were most useful/important in using computers for instruction?

Of the twenty-two course topics listed in the questionnaire (Table 4.1), the three most important in the perceptions of the teachers were: Loading and running an existing program, Using a word processing program and Identifying and using the three major types of computer assisted instruction (drill and practice, tutorials and simulations). The ten topics with the lowest means (i.e. most important) included the three major computer supported instructional applications (word processing, spread sheets and data bases) and topics which concerned using existing software with students (Table 4.2).

Conclusion: Teachers perceive basic instruction in loading and running existing computer programs, and using existing software with students or for the support of instruction as the most useful/important topics covered by the Regional Computer Resource Center course.

Research Question 2: Which course topics were least useful/important in using computers for instruction?

Four topics were rated as essential or important by less than 40% of the respondents (Table 4.1). They were: Writing programs in Logo (39%), Using a modem (34.4%), The history of computers (29.9%) and Writing programs in SuperPILOT (22.7%).

All the topics which included programming were among the ten considered least important (Table 4.2). Other topics in this category were: The history of computers, Computer ethics and legalities, and Using modems. Logo and using modems were among the least important even when only the teachers who studied these topics were consulted (Table 4.3).

Conclusion: Teachers perceive all programming as unimportant for the existing course. Teachers do not perceive the history of computers and the ethics and legalities of using computers as important topics for this course. Including Logo for elementary teachers and the use

of modems for secondary teachers is not important to the teachers.

Research Question 3: What topics should have been included but were missing?

The only topic which was suggested for the course that is not currently included in the curriculum was grant writing (Table 4.5).

Respondents suggested a number of areas which should be emphasized. These included more hands-on experience, more activities showing how to integrate computer activities into the classroom, and more work with computer supported instruction applications (Tables 4.4 and 4.5).

Conclusion: No important topics are missing from the course syllabi. Teachers perceive a need for more hands-on computer experiences and more emphasis on using computer assisted and computer supported instruction.

Research Question 4: What topics should have been eliminated?

Twenty-two percent of the comments about the existing course (Table 4.4) indicated that there was too much material in the course for the time available. Ten comments indicated that programming should be given less emphasis.

Six course topics received a don't bother rating from over 5% of the respondents (Table 4.1). The six topics were: Writing programs in SuperPilot (15%), The history of computers (9.7%), Writing programs in Logo (7.8%), Writing programs in BASIC (6.5%), Using a modem (5.9%), and Programming a computer assisted instruction lesson (5.2%).

Conclusion: Programming in SuperPILOT should be eliminated. Programming, in general, should be less important to the course content.

Research Question 5: What topics are recommended for another course?

Topics recommended for another course by at least 10% of the respondents (Table 4.1) included: programming in Logo (22.7%), in SuperPILOT (21.4%) and BASIC (12.4%), and Using a modem (22.7%), The history (18.9%) and Current and future uses of the computer (14.3%), Computer ethics and legalities (14.3%), and Programming a computer assisted instruction lesson (11.7%).

Respondents suggestions for another course (Table 4.6) included splitting the content of the present course into two courses and offering an advanced course. Programming was the most frequently mentioned topic for an advanced course (Table 4.6). Spread sheets, data bases and the

integration of computers with other media were also mentioned as course topics.

Conclusion: Respondents would like a second course that would supplement the existing course or focus on programming. The new course might also include the history and future of computers, the ethics and legalities of using computers, and integrating computers with other media.

B. Teachers' Instructional Computer Use

Research Question 6: Are computers available to the teacher? Where? How many?

Most respondents (83.8%) reported that at least one computer was available for their use in school (Table 4.7). Fewer respondents (40.2%) had a computer available outside of school.

Conclusion: Most of the respondents have at least one computer available to them. Some teachers have a computer available outside of school.

Research Question 7: Are computers available to the teacher's students? Where? How many?

Over one third of the respondents (36.3%) had one or more computers available to students in their own classroom (Table 4.8). The greatest number (18.9%) had a single

computer in their classroom. Computers were available to students elsewhere in the school according to 77.9% of the respondents. More than 65% reported more than 6 computers available to students in the school (Table 4.8)

Conclusion: Computers are available for student use in more than three quarters of the schools, but only slightly more than one third of the respondents have computers for student use in their classroom.

Research Question 8: What brands of computers are available in the schools?

Apple II computers are the most common (70.9%) in the respondents' schools (Table 4.9). The next most frequent brand is Tandy (14.2%).

Conclusion: The computer most likely to be found in the respondents' schools is the Apple II.

Research Question 9: Does the teacher use the computer for computer managed instruction and/or administration? If so, how often?

Over one quarter of the teachers (26.6%) are currently using computer managed instruction (Table 4.10). Less than 2% of the respondents are using the computer for this purpose daily. The percentage of respondents using the computer for administrative purposes is slightly higher

(32.5%); 6.5% are daily users. Roughly 40% of the respondents felt that they might be using the computer for both activities at a later date.

Conclusion: Less than one third of the respondents are using computers for management of instruction or administration at this time.

Research Question 10: Does the teacher use the computer for computer supported instruction? If so, how often?

One half of the respondents use word processing (Table 4.11). Fifteen percent use word processing daily. At least one quarter of the respondents use databases, spread sheets and computer graphics at this time; over 40% are considering future uses of these applications.

A summary of all computer uses (Table 4.14) shows that computer supported instruction has the highest percentage of users both on a daily (18.2%) and regular basis (55.2%).

Conclusion: More teachers use computers to support instruction than for any other instructional purpose. Word processing is the most popular form of computer supported instruction. Data bases, spread sheets and graphic programs are used by more than one quarter of the respondents.

Research Question 11: Does the teacher use computer assisted and/or computer supported instruction with students? If so, how often?

A summary of computer use (Table 4.14) shows that 51.3% of the respondents are using computers with students in some fashion. The major uses of computer supported instruction with students are computer graphics (27.9%) and word processing (26.6%).

Drill and practice (39.6%) and tutorials (37%) are the most common uses of computer assisted instruction (Table 4.12). Simulations are used by 27.9% of the respondents. In all three categories of computer assisted instruction, the most common frequency of use was weekly.

Conclusion: More than half of the respondents are using computers with students on a regular basis. Drill and practice programs are the most frequently used form of computer assisted instruction. Teachers use word processing and computer graphics more often with students than other types of computer assisted instruction.

Research Question 12: Does the teacher teach about computers?

A total of 41.5% of the respondents reported that they teach students about computers at least monthly (Table

4.13). Eleven percent teach about computers daily, an additional 22.7% expect that they may be teaching about computers in the future.

Conclusion: A large group of the respondents are teaching students about computers. This group is likely to grow in the future.

Research Question 13: Are computers used for remedial or standard instruction or for enrichment?

There is no indication that the respondents are using computers primarily for standard instruction, remediation or enrichment (Table 4.15).

Conclusion: The respondents are using computers equally for standard instruction, remedial instruction and enrichment.

C. Environmental Factors and Computer Use

Research Question 14: Has the teacher's instructional computer use increased, diminished or remained constant since taking the course?

A total of 63.6% of the respondents reported increased computer use since taking the Regional Computer Resource Course at Temple University (Table 4.16).

Conclusion: The respondents' computer use has increased since taking the Regional Computer Resource Center course.

Research Question 15: What other computer-related activities has the teacher become involved with since taking the course? Has the teacher taken other courses or workshops? Has the teacher written grant proposals involving computers? Has the teacher initiated or participated in computer projects in the classroom or school?

A majority (58.5%) of the respondents have participated in computer activities since taking the Regional Computer Resource Center at Temple University (Table 4.17). The most common activity was participation in additional courses or workshops (55.7%). Selection of hardware was reported by 27.8%, and programming by 6.7% of the respondents.

Conclusion: A majority of respondents have participated in some computer-related activity, usually an another course or workshop, since taking the Regional Computer Resource Center course. Few respondents have used programming skills since taking the course.

Research Question 16: What is the relationship between environmental factors such as the availability of hardware and software, the quality of software, administrative or faculty support, student interest or teacher's confidence in

using computers and teacher's use of computers in instruction?

The respondents considered student interest to be the most encouraging (Table 4.18) factor. The teachers' confidence in using computers was ranked second most important as an encouraging factor (Table 4.18).

The respondents ranked availability of hardware as the third most encouraging factor influencing the use of computers for instruction (Table 4.18) and also as the second most discouraging factor (Table 4.19). When a computer is available in the classroom, teachers are more likely to use the computer with students than when a computer is not in the classroom (Tables 4.21 and 4.22). Teachers are more likely to use a computer for computer managed instruction and/or administration and for computer supported instruction if a computer is available to them outside of school (Tables 4.21 and 4.22).

The availability of software was ranked the most discouraging factor influencing computer use (Table 4.19). Other factors discouraging computer use (Table 4.20) include time, scheduling, security, need for aides while using computers and funding.

Teaching about computers encouraged computer use.

Respondents' comments stressed the importance of administrative support on computer use (Table 4.20).

Conclusion: Hardware availability and accessibility have a strong effect on computer use. A computer in the classroom encourages computer use with students. Access to a computer outside of school encourages computer use for computer managed, and supported instruction and administrative tasks. Lack of software is discouraging computer use. Student interest in computers, teachers' confidence in using computers and administrative support are also positive influences.

Research Question 17: Have any environmental factors influencing computer use changed since the teacher took the course?

Thirty-four (22.1%) respondents had changed schools since taking the course at the Regional Computer Resource Center (Table 4.23). The largest number of comments about changes since the course concerned the increased knowledge about computers, a more positive attitude toward computers, and the improved availability of hardware (Table 4.24).

Conclusion: Teachers' knowledge about and attitude toward computers have improved since taking the Regional Computer Resource Center course. There is increased availability of hardware.

D. Demographic Factors and Computer Use

Research Question 18: What are the teacher's age, and sex? How long has the teacher been teaching?

Seventy-four percent of the respondents were thirty-five or older (Table 4.25). Almost four times as many females (78.6%) responded to the survey as males (20.1%) (Table 4.26). Almost half (46.1%) of the respondents have had 11 to 20 years teaching experience (Table 4.27). The mean length of teaching experience was 12.7 years.

Conclusion: The teachers taking the Regional Computer Resource Center courses are typically females over thirty-five with approximately 13 years of teaching experience.

Research Question 19: What year did the teacher receive a Bachelor's Degree? What year and from what state was the teacher certified to teach?

Only 18.8% of the respondents received their Bachelor's degree in the 1980s (Table 4.28). The ten years from 1970 - 1979 accounted for almost half (46.8%) of the Bachelor's degrees. The same years accounted for the most (44.1%) Teacher Certifications (Table 4.28). Almost all respondents

(87%) had received certification from the Commonwealth of Pennsylvania.

Conclusion: The teachers taking the Regional Computer Resource Center courses received their Bachelor's degrees before 1980, their dates of certification parallel those for Bachelor's degrees, and most were certified to teach in the Commonwealth of Pennsylvania.

Research Question 20: Does the teacher have any advanced degrees?

More than half (63.3%) of the respondents have advanced degrees (Table 4.29). The majority (51.9%) have master's or master's equivalency degrees.

Conclusion: Teachers taking the Regional Computer Resource Center courses are likely to have at least a Master's degree.

Research Question 21: What grade level and subject area does the teacher teach?

Over half (51.3%) of the respondents teach at the elementary level (Table 4.30). Elementary is also the single most represented subject area (33.8%) (Table 4.31). (The population of this study is composed of participants in seven elementary and five secondary sections.) Math (22.1%), Science (20.1%) and Special Education (20.1%)

teachers are the next largest groups. Twenty-one different subjects were mentioned by the respondents (Table 4.31).

Conclusion: The Regional Computer Resource Center is serving teachers at all grade levels and a wide variety of subject areas. The teachers taking the Regional Computer Resource Center courses are more likely to be elementary teachers than any other level or subject area.

Research Question 22: In what type of school, public, private or parochial, does the teacher work?

By far the greatest number of respondents (77.9%) teach in public schools (Table 4.32). Parochial schools account for 15.6% and and private schools for 5.2% of the respondents.

Conclusion: Most of the respondents taking the Regional Computer Resource courses teach in public schools.

Research Question 23: What computer training had the teacher had before taking the Regional Computer Resource Center course?

Most participants (64.9%) in the Regional Computer Resource Center courses have had no previous computer training (Table 4.33). Approximately one third of the respondents (35.1%) had some training, usually a single workshop or very short course of 15 hours or less.

Conclusion: The majority of the participants in the Regional Computer Resource Center courses have had little or no previous computer training.

Research Question 24: In which semester was the teacher enrolled in the course?

The individual sessions of the Regional Computer Resource Center courses were all represented by the respondents (Table 4.34).

Conclusion: Respondents came from all the sections of the Regional Computer Resource Center courses included in the study.

Research Question 25: Is there a relationship between demographic factors and teachers' use of computers in instruction?

No significant relationship was found between computer use and age, sex, teaching experience, date of receiving Bachelor's degree or teaching certification, state of certification, advanced degrees, type of school in which the respondent teaches, previous computer training or semester in which the respondent was enrolled in the Regional Computer Resource Center course (Table 4.35).

Contingency tables indicate that fewer elementary teachers are using computers than secondary teachers (Tables

4.36 and 4.37). More computer science teachers are using computers than would have been expected if their subject area had not involved computers.

Conclusion: Fewer elementary teachers are using computers than secondary teachers. More computer science teachers are using computers than teachers of other subject areas. No other demographic factors are related to computer use.

Summary of Conclusions

Based on the population studied:

A. Teachers' Perceptions of the Course Content

Teacher perceptions indicate:

1. Loading and running existing computer programs, and using existing software are the most useful/important topics covered by the Regional Computer Resource Center course.

2. Hands-on computer experiences and using computer assisted and computer supported instruction are important to the course.

3. Programming is unimportant to this course.

4. Logo and using modems are not important topics for this course.

5. The history of computers and the ethics and legalities of using computers are not important topics.

6. A second course, concentrating on programming, would be welcome.

B. Teachers' Instructional Computer Use

Analysis of responses show that:

7. At least one computer is available to most teachers and students.

8. The most commonly available computer is the Apple II.

9. The most frequent use of computers is computer supported instruction: particularly word processing.

10. More than half the respondents are using computers with students, usually drill and practice and tutorials.

11. More than 40% of the respondents currently teach students about computers.

C. Environmental Factors and Computer Use

Responses about environmental factors and computer use indicate:

12. The availability and accessibility of hardware are major factors.

13. Student interest, teachers' confidence and administrative support are influential in increasing computer use.

14. A computer in the classroom encourages the use of a computer with students.

15. A computer outside of school encourages the use of computer supported instruction.

16. Based on comments made on the survey instrument, the Regional Computer Resource Center course has improved teachers' attitudes toward computers, and increased their knowledge about computers, their participation in other computer activities, and their use of computers for instruction.

D. Demographic Factors and Computer Use

Responses about demographic factors and computer use indicate:

17. A typical respondent is female, over thirty-five with a Master's degree and 13 years teaching experience. She is certified by the Commonwealth of Pennsylvania, and has had no experience with computers before taking the Regional Computer Resource Center course. Based on contingency tables, none of these demographic factors are related to frequency of computer use.

18. Elementary teachers (K-8) are using computers less than secondary teachers (7-12).

Recommendations

Based on the population studied, the following recommendations are presented:

A. The Existing Course

1. The emphasis of the existing course should be on making the teacher comfortable with the computer. It should include computer basics such as loading and running existing software.

2. Hands-on the computer time with the supervision of the instructor and assistants should be maximized.

3. The uses of computer assisted instruction (drill and practice, tutorials and simulations) using existing software should be stressed. Teachers should complete a

project which explores the integration of existing software into a lesson plan.

4. Proficiency at word processing should be continued as a requirement.

5. Short projects in the use of spread sheets and databases should be required of all teachers.

6. Programming should be limited to an understanding of simple commands and writing short programs.

7. Minimal time should be spent on the history of computers, and the ethics and legalities of computer use.

8. Logo and modem course requirements should be reviewed. Presenting these topics as optional workshops should be considered.

9. The course should continue to be taught on the Apple II.

B. A Second Course

10. A second course should be offered, targeted for those who have completed the first course or who have a familiarity with computers.

11. The second course should concentrate on designing and programming an original computer assisted instruction

program integrated with other media for a particular curricular area .

C. Factors Increasing Computer Use

12. Encourage administrative support of computer use for instruction: provide workshops or courses for administrators that include both potential uses of computers and related problems, such as security and maintenance.

13. Encourage administrators and teachers to acquire hardware and software, particularly for individual classrooms.

Recommendations for Further Research

The following recommendations for further research are made as a result of this study:

1. Replicate this study using the teachers who have attended other Regional Computer Resource Center courses.

2. Repeat the study with teachers who have participated in inservice computer courses in other states.

3. Initiate a study to compare the results of inservice training provided in a university course format (like the Regional Computer Resource Center course) and workshops held in the teachers' schools.

4. Develop a study to follow teachers who have taken similar computer courses as undergraduates.

5. Repeat this study with the same population in three to five years.

6. Compare the perceptions of school administrators with those of classroom teachers on the factors influencing the use of computers in instruction.

7. Compare the demographic information on the respondents of this study to that of the teaching population of the area to discover groups of teachers who are not participating in the program.

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Appendix A:

Information Technology Education Act

Commonwealth of Pennsylvania

No 1984-145

AN ACT

HB 1898

Establishing within the Pennsylvania Higher Education Assistance Agency Regional Computer Resource Centers and Regional Computer Resource Center boards.

The General Assembly of the Commonwealth of Pennsylvania hereby enacts as follows:

Section 1. Short title.

This act shall be known and may be cited as the Information Technology Education Act.

Section 2. Purpose.

The General Assembly finds and declares as follows:

(1) It is in the best interest of the Commonwealth to improve and strengthen computer education in its elementary and secondary schools by:

(i) Coordinating the activities of the Regional Computer Resource Centers with the existing Science Teachers Education Program administered by the Pennsylvania Higher Education Assistance Agency

(ii) Encouraging orderly planning for the use of microcomputers and for the application of microcomputers to the instructional programs of elementary and secondary schools.

(iii) Improving teacher training in computer education

(iv) Encouraging the acquisition of computer hardware.

(v) Assisting in the acquisition of appropriate computer software.

(2) All areas of the Commonwealth shall have available a Regional Computer Resource Center to assist school districts in developing the computer skills of their students and teachers and to ensure availability of computer equipment, training and programs

(3) There shall be at least eight centers throughout the Commonwealth, each of which shall be established at sites reflecting considerations of demography.

(4) Funding shall be made available to the centers from the Pennsylvania Higher Education Assistance Agency

(5) The initial priority of this act shall be to equalize the development of computer skills of students and teachers among the school districts.

(6) This program is designed as a four-year program.

Section 3. Definitions.

The following words and phrases when used in this act shall have the meanings given to them in this section unless the context clearly indicates otherwise:

"Agency." The Pennsylvania Higher Education Assistance Agency.

"Center." A Regional Computer Resource Center.

"Department " The Department of Education of the Commonwealth.

"Intermediate unit." An intermediate unit as defined by the act of March 10, 1949 (P L.30, No.14), known as the Public School Code of 1949

Section 4. Responsibility of Pennsylvania Higher Education Assistance Agency.

(a) Establish centers.—The Pennsylvania Higher Education Assistance Agency shall establish not less than eight Regional Computer Resource Centers throughout the Commonwealth at sites based on demography

(b) Grant supervision.—The agency shall be responsible for reviewing school district grant proposals submitted by Regional Computer Resource Centers.

(c) Power to make grants.—The Higher Education Assistance Agency shall make grants to school districts. Those grants shall reflect at least one of the following:

(1) The aid ratio as defined in the Public School Code of 1949

(2) School district enrollment.

Each school district applying shall be required to supply the balance of the funding necessary for its program. The balance may be supplied in cash or in kind.

Section 5. Regional Computer Resource Centers

(a) Purpose.—The purposes of each Regional Computer Resource Center are to increase teacher expertise relating to computer information technology and to assist local school districts within the region to acquire, utilize and upgrade computer hardware and software. To this end, it will.

(1) Provide teacher training.

(2) Help design computer oriented curricula.

(3) Assist with the evaluation of software.

(4) Review and evaluate proposals for upgrading computer and computer oriented instruction.

(5) Coordinate purchase of computer hardware and software.

(6) Loan computer hardware and software to nonpublic school students.

Regional Computer Resource Centers may contract with intermediate units to provide the above services.

(b) Regional Computer Resource Center Board.—

(1) The Board of Directors of the Pennsylvania Higher Education Assistance Agency shall appoint five persons to be members of each Regional Computer Resource Center Board of Directors. The persons appointed shall represent five broad areas: computer technology, teacher education, computer education, elementary education and secondary education. No less than two members of the Regional Computer Resource Center Board shall be classroom teachers or building principals.

(2) It shall be the duty of the regional board to receive grant applications from school districts. Such applications shall include plans for upgrading computer education through two related and coordinated actions: teacher training and computer hardware and software acquisition and utilization.

(3) Grant applications from school districts for teacher training in computer education, computer hardware acquisition and computer software acquisition shall be received by the regional board. After reviewing applications, the regional board shall forward each application with their comments to the Pennsylvania Higher Education Assistance Agency.

Section 6. Loan of computer hardware and software to nonpublic school students.

The Director of the Pennsylvania Higher Education Assistance Agency through the Regional Computer Resource Centers shall have the power and duty to purchase computer hardware and software and, upon individual request, to loan them to all children residing in the Commonwealth who are enrolled in grades kindergarten through 12 of a nonpublic school. The annual allocation for this purchase shall not exceed 20% of the appropriated funds used for the purchase of computer hardware and software from the total appropriation. Such computer hardware and software shall be loaned free to such children.

Section 7. Regulations.

The Board of Directors of the Pennsylvania Higher Education Assistance Agency shall have the power and its duty shall be to adopt such regulations as may be necessary to implement this act.

Section 8. Sunset provision.

The program created under this act shall expire four years from the effective date of this act.

Section 9. Effective date

This act shall take effect in 30 days.

APPROVED—The 9th day of July, A. D 1984.

DICK THORNBURGH

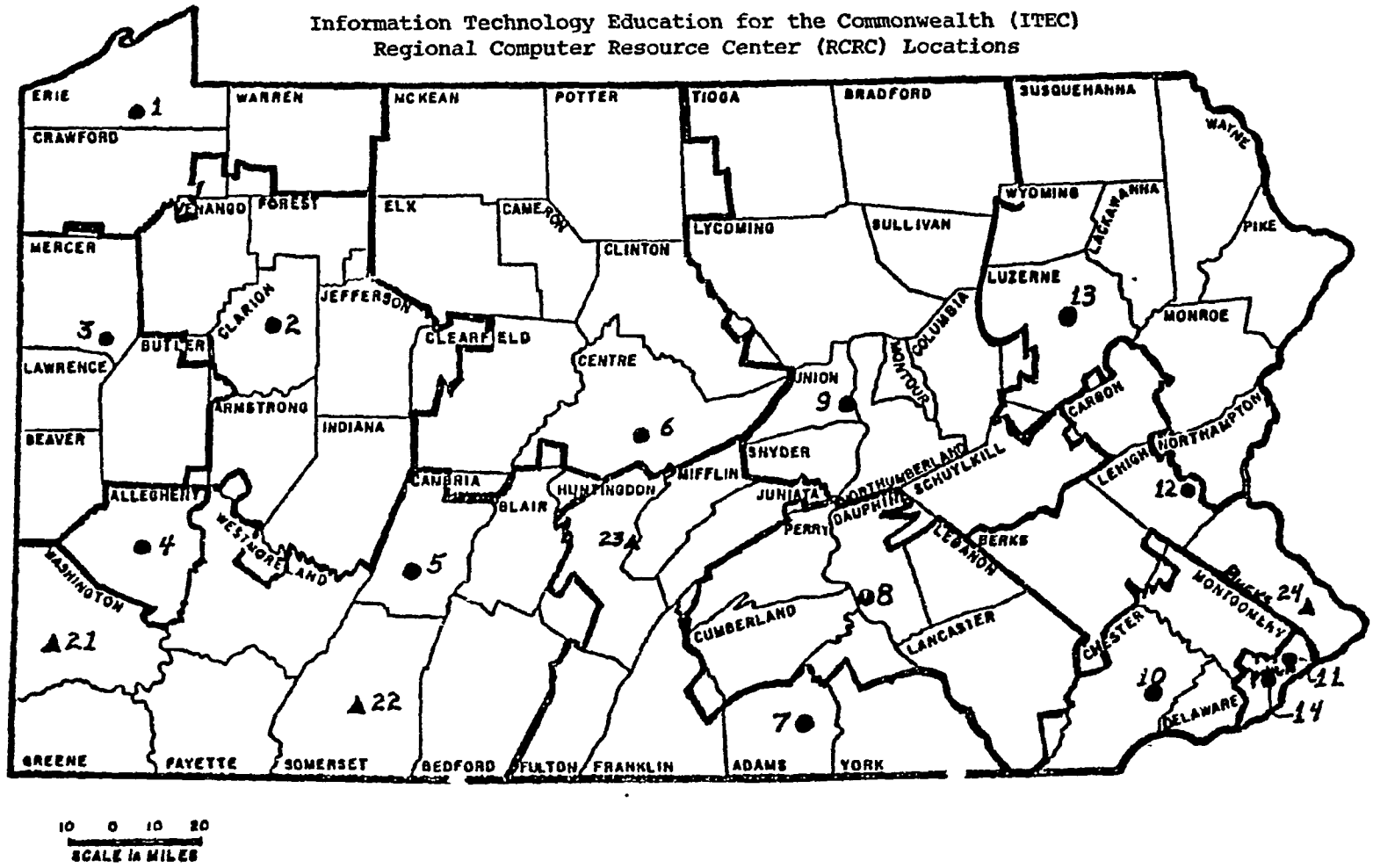
from Laws of the General Assembly of the Commonwealth of Pennsylvania passed at the session of 1984. Harrisburg, PA. v. 1, pp. 676-678

Appendix B:

Map and Names of
Regional Computer Resource Centers

Information Technology Education for the Commonwealth (ITEC)
Regional Computer Resource Center (RCRC) Locations

03/20/87



Regional Computer Resource Centers

1. Northwest Tri-County IU
2. Clarion University of PA
3. Midwestern IU
4. University of Pittsburgh
5. University of Pittsburgh-Johnstown
6. Penn State University
7. Lincoln IU
8. Harrisburg Area Community College
9. Central Susquehanna IU
10. West Chester University
11. Philadelphia College of Textiles & Science
12. Lehigh University
13. Wilkes College
14. Temple University

Outreach Sites

21. Washington & Jefferson College
22. Somerset
23. Tuscarora IU
24. Bucks County Community College

Appendix C:

ITEC Syllabi

1. Elementary Course
2. Secondary Course

ELEMENTARY COURSE SYLLABUS

INFORMATION TECHNOLOGY EDUCATION FOR THE COMMONWEALTH
(ITEC)
TEACHER EDUCATION CENTER at CLARION UNIVERSITY
Supported by
PENNSYLVANIA HIGHER EDUCATION ASSISTANCE AGENCY

Course Description

This three-credit graduate-level course will provide elementary school teachers with computer literacy, programming skills, and experiences with exemplary courseware and software. The course is specifically designed for the elementary teacher who is a computer novice.

Elementary teachers will learn to operate and program microcomputers, while developing skills needed for teaching their students to use microcomputers for classroom applications. The course will also prepare teachers to evaluate courseware and software appropriate for use in the elementary school curriculum.

Participants will be taught the structure of the most common microcomputer programming language used today--BASIC--and will be able to write programs. An introduction to the LOGO language and word processing will be included.

Elementary teachers will examine, interact with, and evaluate educational software utilized in the elementary curriculum.

Objectives

At the conclusion of this course, participating elementary school teachers will be able to:

1. Evaluate, select, and recommend for purchase, microcomputer courseware, software, and hardware to meet their classroom, laboratory, and management needs.

2. Use microcomputers and appropriate courseware in their classrooms and laboratories to teach concepts and processes.

3. Demonstrate familiarity with the BASIC language.

4. Demonstrate familiarity with the LOGO language.

5. Use microcomputers with appropriate software for the management of their classroom.

Suggested Activities to Support Course Objectives

1. Evaluate, select, and recommend for purchase, microcomputer courseware, software, and hardware to meet their classroom, laboratory, and management needs.

   A. Identify and apply criteria for the selection and use of software and courseware.

      1) Discuss criteria for evaluation
      2) Individual or small group evaluations
      3) Customizing the instructional resource
      4) Prepare a purchase order (or)
      5) Prepare a letter of justification to update equipment
      6) Prepare a list of available courseware, software, and hardware resources such as IU's, Microsoft, EPIE, etc.
      7) Prepare a grant application

   B. Recognize appropriate physical microcomputer learning environment.

      1) Design a layout of microcomputers for a classroom and laboratory
      2) OSHA Documents

2. Use microcomputers and appropriate courseware in their classrooms and laboratories to teach concepts and processes.

   A. Recognize application of microprocessor technology to data processing, control, gaming, simulations.

      1) VCR "Adventure of the Mind Series Data Processing/Control/Design"
      2) Articles from newspaper, discussion in class
      3) Computer Literacy Charts
      4) Software review and evaluation
      5) Courseware review and evaluation

   B. Develop guidelines and implement strategies for computer applications in the elementary school classroom and laboratory.

      1) Write a plan of action giving scope and sequence for implementation in a subject area.

3. Demonstrate familiarity with the BASIC language.

   A. Demonstrate entry level competence in the BASIC language, its dialects, and comparisons.

1) Demonstrate good programming techniques
2) Programming topics

a) operating system commands
b) input/output operations
c) data types
d) branching and looping
e) operators
f) subroutines and functions
g) graphics commands where appropriate

4. Demonstrate familiarity with the LOGO language.

A. Commands--FD, BK, LT, RT, PU, PD, DRAW, ND REPEAT

B. Procedures

5. Use microcomputers with appropriate software for management.

A. Utilize and promote software applications for classroom management.

1) Access professional literature and bibliographies relative to microprocessor use and resources
2) Use the word processor to prepare a document. For example, a summary of current issues, a bibliography, or a computer library
3) Utilize grade book, database, spread sheet

Additional activities which may be used to support the course objectives may include, but is not limited to the following:

- Recognize changes in microprocessor technology: past-present-future
- Construct and compare configurations applicable to their classroom setting including specifications, vendors, and costs
- Identify software for classroom use
- Select participation in an advanced programming project
- Utilize program (i.e., roll book, grades, inventory, statistics, diagnostic profiles, data base management, evaluations, tests, etc.) for classroom managemnt
- Insure system security methods to maintain integrity of records
- Recognize limitations of warranties for hardware, courseware, or software
- Demonstrate knowledge of licensure agreements and ramifications
- Utilize utility programs for the facilitation, remediation, and rectification of software

- Identify public/private sources of funds for hardware/ software/courseware purchase use
- "Trouble-shoot" system configuration when problems develop
- Exchange software--join or establish a users group to access benefits relative to software/hardware/professional development
- Demonstrate and/or participate in networking

Evaluation

Participants in the ITEC course for elementary teachers will be evaluated in their progress toward course goals using short-term and long-term evaluation techniques. The short-term evaluation will be conducted by each course instructor. Long-term evaluation will be conducted by the Teacher Education Center at Clarion University.

Short-Term Evaluation

* A "Survey of Microcomputer Use Inventory" will be administered as a pretest-post-test to determine change in microcomputer utilization.

* An objective test will be administered as a pretest-post-test to determine participant change in knowledge and application of information related to microcomputers and their use in elementary schools.

* The ITEC Attitude Scale will be administered as a pretest-post-test to determine participant change in attitude toward microcomputer use.

Long-Term Evaluation

* The ITEC Teacher Education Center (Clarion University) will survey participants to determine actual use of microcomputers software/courseware in their classrooms and laboratories.

SECONDARY COURSE SYLLABUS

INFORMATION TECHNOLOGY EDUCATION for the COMMONWEALTH
(ITEC)
TEACHER EDUCATION CENTER at CLARION UNIVERSITY
Supported by
PENNSYLVANIA HIGHER EDUCATION ASSISTANCE AGENCY

COURSE DESCRIPTION

This three-credit graduate-level course will provide secondary school teachers with computer literacy, programming skills, and experiences with exemplary courseware and software. The course is specifically designed for the secondary teacher who is a computer novice.

Secondary teachers will learn to operate and program microcomputers, while developing skills needed for teaching their students to use microcomputers for classroom applications. The course will also prepare teachers to evaluate courseware and software appropriate for use in the secondary school curriculum.

OBJECTIVES

Participating secondary school teachers should be able to:

1. Evaluate, select, and recommend for purchase, microcomputer courseware, software, and hardware to meet their classroom, laboratory, and management needs.

2. Use microcomputers and appropriate courseware in their classrooms and laboratories to teach concepts and processes.

3. Use microcomputers with appropriate software for the management of their classroom.

4. Demonstrate entry level competence in the BASIC language.

5. Use and/or recommend for purchase, various communications resources useful for integrating microcomputer technology in curricula.

6. Recognize philosophical, ethical, and legal implications for microcomputer use in secondary school courses and society in general.

SUGGESTED ACTIVITIES TO SUPPORT COURSE OBJECTIVES

1. Evaluate, select, and recommend for purchase, microcomputer courseware, software, and hardware to meet their instructional, laboratory, and management needs.

   1A. Identify and apply criteria for the selection and use of software and courseware.

   a. Discuss criteria for evaluation
   b. Individual or small group evaluations
   c. Customizing the instructional resource
   d. Prepare a purchase order (or)
   e. Prepare a letter of justification to update equipment
   f. Prepare a list of available courseware, software, and hardware resources such as IU's, Microsoft, EPIE, etc.
   g. Prepare a grant application

   1B. Recognize appropriate physical microcomputer learning environment.

   a. Design a layout of microcomputers for a classroom and laboratory
   b. OSHA Documents

2. Use microcomputers and appropriate courseware in their classrooms and laboratories to teach concepts and processes.

   2A. Recognize application of microprocessor technology to data processing, control, gaming, simulations.

   a. VCR "Adventure of the Mind Series: Data Processing/Control/Design"
   b. Articles from newspapers, discussion in class
   c. Computer Literacy Charts
   d. Software Review and evaluation
   e. Courseware Review and evaluation

   2B. Develop guidelines and implement strategies for computer applications in the secondary school classroom and laboratory.

   a. Write a plan of action giving scope and sequence for implementation in a subject area.

Additional activities which may be used to support the course objectives may include but is not limited to the following:

- Recognize changes in microprocessor technology: past-present-future.
- Construct and compare configurations applicable to their classroom setting including specifications, vendors and costs.
- Recognize capabilities and applications of graphics, and sound synthesis in instructional programs.
- Identify sources of software.
- Select participation in an advanced programming project.
- Utilize program (i.e., roll book, grades, inventory, statistics, diagnostic profiles, data base management, evaluations, tests, etc.,) for classroom management.
- Identify system security methods to maintain integrity of records.
- Recognize limitations of warranties for hardware, courseware, or software.
- Demonstrate knowledge of licensure agreements and ramifications.
- Utilize utility programs for the facilitation, remediation, and rectification of software.
- Interface hardware with peripherals.
- Identify public/private sources of funds for hardware/software/courseware purchase/use.
- "Trouble-shoot" system configuration when problems develop.
- Exchange software or courseware--join or establish a users group to access benefits relative to software/hardware/courseware/professional development.
- Participate in network to communicate with other users regarding sources.

EVALUATION

Participants in the ITEC course for secondary teachers will be evaluated in their progress toward course goals using short-term and long-term evaluation techniques. The short-term evaluation will be conducted by each course instructor. Long-term evaluation will be conducted by the Teacher Education Center at Clarion University.

Short-Term Evaluation

* A "Survey of Microcomputer Use Inventory" will be administered as a pretest-posttest to determine change in microcomputer utilization.

* An objective test will be administered as a pretest-posttest to determine participant change in knowledge and application of information related to microcomputers and their use in secondary schools.

* The ITEC Attitude Scale will be administered as a pretest-posttest to determine participant change in attitude toward microcomputer use.

Long-Term Evaluation

* The ITEC Teacher Education Center (Clarion University) will survey participants to determine actual use of microcomputers software/courseware in their classrooms and laboratories.

Appendix D:

Syllabi of Education 554

Regional Computer Resource Center,

College of Education, Temple University

1. Elementary Course
2. Secondary Course

EDUCATION 554

CHARACTERISTICS OF COMPUTER BASED INSTRUCTION FOR ELEMENTARY TEACHERS

OBJECTIVES

By the end of the course students will be able to:

1. Discuss the historical background of the development of computers, computer-based instruction, and the steps that made possible the current potential and use of microcomputers in educational settings.

2. Evaluate, select, and recommend for purchase microcomputer courseware, software, and hardware to meet the needs of the classroom, laboratory, and management.

3. Use microcomputers and appropriate courseware in their classrooms and laboratories to teach concepts and processes.

4. Demonstrate familiarity with the BASIC computer language.

5. Demonstrate familiarity with the LOGO computer language.

6. Use microcomputers with appropriate software for the management of their classrooms.

7. Apply basic procedural and psychological principals to design and develop a programmed instruction sequence using linear, branching, and combination formats.

8. Translate programmed instruction sequence into computer language for presentation by Computer Assisted Instructional methods, utilizing fully the unique capabilities of such a system.

9. Recognize philosophical, ehtical, and legal implications for microcomputer use in elementary school courses and in society in general.

READINGS

Wright, Edward B. and Richard C Forcier. The Computer: A Tool for the Teacher. Wadsworth Publishing Co., Belmont, Ca., 1985.

Digital Equipment Corporation. Introduction to Computer-Based Education. Marlborough, Ma., 1983.

MicroSIFT. Evaluator's Guide for Microcomputer-Based Instructional Packages. International Council for Computers in Education, Eugene, Oregon, 1984.

COURSE REQUIREMENTS

In addition to class participation and final exam, the following projects are required of each student:

Project 1 - Abstracts

Abstract four articles and/or research reports on CBI, CAI, or CMI. The articles may be from any resources available to the student, other than class handouts and texts. Each abstract should not be longer than one page, single spaced, and typed using a word processing program. Each abstract must contain information in the following four areas:

1. Bibliographic Information
   Author, Title, Source.

2. Procedures or Description
   A summary of what the article is about.

3. Findings
   A summary of results or conclusions.

4. Implications
   Your personal discussion of the implications of the article - relate it to your field.

Project 2 - Software Evaluations

Evaluate five off-the-shelf CAI programs which relate to the student's subject specialty. An evaluation form will be supplied and explained during the course.

Project 3 - Programmed Instruction Sequence

Establish a set of not more than four objectives, written in behavioral form, which define the content for a short lesson of the student's choice. Based upon the objectives, the student will develop, on paper, a programmed instruction sequence designed to reach that lesson. Both linear and branching techniques should be used in the design of the program. The program should be field tested by at least three individuals before being turned in for grading.

Project 4 - Computer Assisted Instruction Sequence

Adapt the instructional sequence developed in Project 3 for presentation by interactive Computer Assisted Instruction. It involves modification of the program to utilize the capabilities of the computer, translation into computer language, and input into a computer. Any of several computers may be selected for presentation, depending upon program requirements and student access to equipment. The program should be field tested again.

Project 5 - LOGO

Prepare at least 5 short procedures using the LOGO language, and save them onto disk. At least 3 of the procedures must include other (nested) procedures within them.

Project 6 - Select ONE project from those listed below:

A. Computer Managed Instruction
Modify an existing testing sequence designed to determine an individual's present state of learning. The subject matter is selected by the program designer. In the project, a sequence of 10 questions is to be presented to the student by the computer, and, based upon the student's response, assignments will be given to the student for off-line completion. Provision has been made for student preference as to print or non-print assignments. Output for the teacher is provided to document the student's progress.

B. Data base management
Using a commercially available filing system program (such as PFS:File or Appleworks), design a filing system to support an educational need. The student will specify appropriate fields, field sizes, and record format, as well as entering complete data for AT LEAST 20 records. The student will also demonstrate search & sort and printing techniques.

C. Electronic Spreadsheet
Using a commercially produced spreadsheet program (such as MagiCalc or Appleworks), create an electronic grade book or a budget sheet in which the appropriate rows and columns compute values automatically according to designer-specified formulas. The spreadsheet must have at least 20 rows of 5 columns each, and butilizes 5 formulas. All rows and columns will be labeled appropriately.

D. Graphics
Using a program such as EBS, produce a series of lecture support slides or thermographic transparency masters. There must be a minimum of 8 transparencies in the series. At least 1 of the transparencies must be a chart or graph produced through the use of a program such as Visiplot. Titles or borders may be added using EBS. If slides are done, they should make appropriate use of color; if transparency master are produced, they must be in black/white.

EDUCATION 554

CHARACTERISTICS OF COMPUTER BASED INSTRUCTION
FOR SECONDARY TEACHERS

OBJECTIVES

By the end of the course students will be able to:

1. Discuss the historical background of the development of computers, computer-based instruction, and the steps that made possible the current potential and use of microcomputers in educational settings.

2. Evaluate, select, and recommend for purchase microcomputer courseware, software, and hardware to meet the needs of the classroom, laboratory, and management.

3. Use microcomputers and appropriate courseware in their classrooms and laboratories to teach concepts and processes.

4. Demonstrate familiarity with the BASIC computer language.

5. Use and/or recommend for purchase various communications resources useful for integrating microcomputer technology into the curricula.

6. Use microcomputers with appropriate software for the management of their classrooms.

7. Apply basic procedural and psychological principals to design and develop a programmed instruction sequence using linear, branching, and combination formats.

8. Translate programmed instruction sequence into computer language for presentation by Computer Assisted Instructional methods, utilizing fully the unique capabilities of such a system.

9. Recognize philosophical, ehtical, and legal implications for microcomputer use in elementary school courses and in society in general.

READINGS

Wright, Edward B. and Richard C Forcier. The Computer: A Tool for the Teacher. Wadsworth Publishing Co., Belmont, Ca., 1985.

Digital Equipment Corporation. Introduction to Computer-Based Education. Marlborough, Ma., 1983.

MicroSIFT. Evaluator's Guide for Microcomputer-Based Instructional Packages. International Council for Computers in Education, Eugene, Oregon, 1984.

COURSE REQUIREMENTS

In addition to class participation and final exam, the following projects are required of each student:

Project 1 - Abstracts

Abstract four articles and/or research reports on CBI, CAI, or CMI. The articles may be from any resources available to the student, other than class handouts and texts. Each abstract should not be longer than one page, single spaced, and typed using a word processing program. Each abstract must contain information in the following four areas:

1. Bibliographic Information
   Author, Title, Source.

2. Procedures or Description
   A summary of what the article is about.

3. Findings
   A summary of results or conclusions.

4. Implications
   Your personal discussion of the implications of the article - relate it to your field.

Project 2 - Programmed Instruction Sequence

Establish a set of not more than four objectives, written in behavioral form, which define the content for a short lesson of the student's choice. Based upon the objectives, the student will develop, on paper, a programmed instruction sequence designed to reach that lesson. Both linear and branching techniques should be used in the design of the program. The program should be field tested by at least three individuals before being turned in for grading.

Project 3 - Computer Assisted Instruction Sequence

Adapt the instructional sequence developed in Project 3 for presentation by interactive Computer Assisted Instruction. It involves modification of the program to utilize the capabilities of the computer, translation into computer language, and input into a computer. Any of several computers may be selected for presentation, depending upon program requirements and student access to equipment. The program should be field tested again.

Project 4 - Software Evaluations

Evaluate five off-the-shelf CAI programs which relate to the student's subject specialty. An evaluation form will be supplied and explained during the course.

Project 5 - Computer Managed Instruction/Computer Supported Instruction:

Select ONE project from those listed below:

A. Computer Managed Instruction
Modify an existing testing sequence designed to determine an individual's present state of learning. The subject matter is selected by the program designer. In the project, a sequence of 10 questions is to be presented to the student by the computer, and, based upon the student's response, assignments will be given to the student for off-line completion. Provision has been made for student preference as to print or non-print assignments. Output for the teacher is provided to document the student's progress.

B. Data base management
Using a commercially available filing system program (such as PFS:File or Appleworks), design a filing system to support an educational need. The student will specify appropriate fields, field sizes, and record format, as well as entering complete data for AT LEAST 20 records. The student will also demonstrate search & sort and printing techniques.

C. Electronic Spreadsheet
Using a commercially produced spreadsheet program (such as MagiCalc or Appleworks), create an electronic grade book or a budget sheet in which the appropriate rows and columns compute values automatically according to designer-specified formulas. The spreadsheet must have at least 20 rows of 5 columns each, and butilizes 5 formulas. All rows and columns will be labeled appropriately.

D. Graphics
Using a program such as EBS, produce a series of lecture support slides or thermographic transparency masters. There must be a minimum of 8 transparencies in the series. At least 1 of the transparencies must be a chart or graph produced through the use of a program such as Visiplot. Titles or borders may be added using EBS. If slides are done, they should make appropriate use of color; if transparency master are produced, they must be in black/white.

Project 6 - Communications

Successfully log on to a remote computer information service, download and save information onto a disk. The student will then load the file into a word processing program, eliminate extraneous information, and prepare a printed document of the information downloaded from the information service.

Appendix E:

Questionnaire with Cover Letter

Regional Computer Resource Center
College of Education
Temple University
Philadelphia, PA 19122

October 1, 1987

Dear RCRC Graduate,

This fall, the Regional Computer Resource Center is starting its fourth year of operations! We are proud of the work of the Center and the accomplishments of its graduates.

It is not enough, however, to be satisfied with what has happened. Now, as we look ahead, we are asking for your help. By completing the attached questionnaire you can influence future sessions of the course you took and other courses presently in the planning stage.

The follow-up study is endorsed by the Information Technology Education for the Commonwealth program (ITEC), and the Pennsylvania Higher Education Assistance Agency (PHEAA) and is being conducted by M. B. Chambers through the Educational Media Program at Temple University.

Please fill in the survey, it should take about 10 minutes. Then staple or tape it closed and mail. Your prompt response (within a week) will be most helpful.

Many thanks for your assistance with this project.

Sincerely,

Margaret B. Chambers
Project Coordinator

Dr. Elton Robertson, Director
Regional Computer Resource Center, Temple University

Dr. Kenneth Mechling, Director
ITEC Teacher Education Center
Clarion University

Ned Heeter, Program Evaluation Specialist
Pennsylvania Higher Education
Assistance Agency

Follow-up Study of
Regional Computer Resource Center Course Participants

Please (circle) the most accurate answer or fill in the blank.

SECTION I: YOU and YOUR SCHOOL

1. **How many years have you taught in the classroom?**

2. **What grade level do you teach?** K-8 7-12 both other? ____

3. **What subject area(s) do you teach?**

a) Elementary (K-8)	d) Math	g) Physical Education
b) Languages	e) Science	h) Special Education
c) Social Studies	f) English	i) Other? _____

4. **What type of school do you teach in?** public private parochial

5. **Have you changed schools since taking the RCRC course?** Yes No

6. **Your age?** 20-24 25-29 30-34 35-39 40-44 45-49 50>

7. **Your sex?** M F

8. **What year did you receive your Bachelor's degree?** 19____

   What year did you receive teaching certification? 19____

   From which state?

   What advanced degrees do you have?

9. **Did you have any instruction in computer skills before taking the RCRC course?** Yes No

   If YES, please briefly describe the instruction (workshop, in math course, etc.) and the approximate number of hours of class time devoted to computer activities.

   type of instruction: hours _____

10. **When did you take the RCRC course?**

Spring _____	Summer _____	Fall _____
1985 _____	1986 _____	1987 _____

SECTION II: YOUR USE OF COMPUTERS NOW

A. Computer availability

1. **How many computers are available to you?**

   at your school? outside of school?

2. **How many computers are available to your students?**

   in your classroom? in your school?

If no computers are available to you, please skip to Question 24 on page 4>

3. **What brand(s) of computers are available to you and your students?**

B. Using computers with students

4. **Do you use drill and practice programs with students?**

   daily weekly monthly not now, maybe later not now, unlikely ever

5. **Do you use tutorial programs with students?**

   daily weekly monthly not now, maybe later not now, unlikely ever

6. **Do you use simulation programs with students?**

   daily weekly monthly not now, maybe later not now, unlikely ever

7. **Do you use word processing with students?**

   daily weekly monthly not now, maybe later not now, unlikely ever

8. **Do you use databases with students?**

   daily weekly monthly not now, maybe later not now, unlikely ever

9. **Do you use spread sheets with students?**

   daily weekly monthly not now, maybe later not now, unlikely ever

10. **Do you use graphics programs with students?**

    daily weekly monthly not now, maybe later not now, unlikely ever

11. Do you use desktop publishing with your students?

daily | weekly | monthly | not now, maybe later | not now, unlikely ever

12. Do you teach students about computers?

daily | weekly | monthly | not now, maybe later | not now, unlikely ever

13. Please estimate the percentages of time your students use the computer for:

_____ remediation
_____ standard instruction
_____ enrichment
100%

C. Using computers to support or manage instruction

14. Do you use word processing?

daily | weekly | monthly | not now, maybe later | not now, unlikely ever

15. Do you use spreadsheets?

daily | weekly | monthly | not now, maybe later | not now, unlikely ever

16. Do you use a database?

daily | weekly | monthly | not now, maybe later | not now, unlikely ever

17. Do you use graphics programs?

daily | weekly | monthly | not now, maybe later | not now, unlikely ever

18. Do you use computer managed instruction?

daily | weekly | monthly | not now, maybe later | not now, unlikely ever

19. Do you use computers for administrative purposes?

daily | weekly | monthly | not now, maybe later | not now, unlikely ever

D. Factors influencing your computer activities

20. Since taking the RCRC course, do you use computers more or less?

alot less | less | about the same | more | lots more

21. Please rank the following items according to their importance in <u>encouraging</u> or <u>discouraging</u> you to use computers for instruction.

Encouraging (1 = most encouraging; 7 = least encouraging)	**Discouraging** (1 = most discouraging; 7 = least discouraging)
..... available hardware	..... available hardware
____ available software	____ available software
____ quality of software	____ quality of software
..... administrative support	..... administrative support
..... faculty support	..... faculty support
____ student interest	____ student interest
____ knowledge of computers	____ lack of computer knowledge

22. Have any of the factors in Question 21, above changed since you took the RCRC course? Please explain.

23. Is there some other factor in your school that is influencing your use of computers for instruction? Please explain.

24. What other computer-related activities have you participated in since taking the RCRC course? (the acquisition of computer hardware, development of new programs involving computers, workshops, courses, funded or unfunded grant proposals, writing programs, etc...)

SECTION III: YOUR COMPUTER COURSE EXPERIENCE

Below are competencies included in the Regional Computer Resource Center courses. Please circle the phrase that you feel best describes the importance and/or usefulness of including the competency in the course.

1. Identifying the parts of a computer and discussing their functions.

essential important good for another course don't bother

2. Loading and running an existing computer program.

essential important good for another course don't bother

3. Selecting and evaluating computer hardware.

essential important good for another course don't bother

4. Identifying and using the three major types of computer assisted instruction: drill and practice, tutorials and simulations.

essential important good for another course don't bother

5. Using computer assisted instruction in your subject area.

essential important good for another course don't bother

6. Selecting and evaluating computer programs and accompanying aids.

essential important good for another course don't bother

7. Writing programs in BASIC.

essential important good for another course don't bother

8. Writing programs in Logo.

essential important good for another course don't bother

9. Writing programs in SuperPILOT.

essential important good for another course don't bother

10. Designing a computer assisted instruction lesson.

essential important good for another course don't bother

11. Programming a computer assisted instruction lesson.

essential important good for another course don't bother

12. Adapting an existing program to a specific use.

essential important good for another course don't bother

13. **Using a word processing program.**

essential important good for another course don't bother

14. **Using a spread sheet.**

essential important good for another course don't bother

15. **Using a databased management program.**

essential important good for another course don't bother

16. **Using graphics programs.**

essential important good for another course don't bother

17. **Using a modem to communicate between computers.**

essential important good for another course don't bother

18. **Using computer managed instruction.**

essential important good for another course don't bother

19. **Teaching students about computers.**

essential important good for another course don't bother

20. **The history of computers.**

essential important good for another course don't bother

21. **Current and future uses of computers and their impact on society.**

essential important good for another course don't bother

22. **Computer ethics and legalities.**

essential important good for another course don't bother

23. **Please add advice for future courses: what you liked, what was missing, what should be in an advanced course.....**

Seal the questionnaire with a staple or piece of tape and mail.

Thank you very much!

Ritter 306-308
College of Education
Temple University
Philadelphia, PA 19122

Regional Computer Resource Center
Ritter 306-308
College of Education
Temple University
Philadelphia, PA 19122

seal here
with staple or tape

Appendix F:

Follow-up Letters:

First Follow-up Letter

Second Follow-up Letter

TEMPLE UNIVERSITY
A Commonwealth University

College of Education

Ritter Hall 003-00
Philadelphia, Pennsylvania 19122

Department of Curriculum, Instruction and Technology in Education (CITE)

Educational Media
Elementary Education
Secondary Education
Vocational, Adult and Continuing Education

Regional Computer Resource Center
October 15, 1987

Dear RCRC Participant:

Last week we sent you a questionnaire about your perceptions of the computer course you took at the Regional Computer Resource Center at Temple University. This is just a reminder to ask your help in completing and returning the questionnaire.

If you have already sent the questionnaire back, thank you very much. If not, remember that your reply is important to help us plan future courses. Please complete and mail the form in the next day or two.

Thank you for your cooperation.

Sincerely,

Margaret B. Chambers

Margaret Chambers
Project Coordinator

Dr. Elton Robertson, Director
Regional Computer Resource Center
Temple University

Dr. Kenneth Mechling
Director
ITEC Teacher Training Center
Clarion University

Ned Heeter
Program Evaluation Specialist
Pennsylvania Higher Education
Assistance Agency

TEMPLE UNIVERSITY
A Commonwealth University

College of Education

Ritter Hall 003-00
Philadelphia, Pennsylvania 19122

Department of Curriculum, Instruction and Technology in Education (CITE)

Educational Media
Elementary Education
Secondary Education
Vocational, Adult and Continuing Education

Regional Computer Resource Center
October 29, 1987

Dear Computer Course Participant:

Your opinion is important!

Three weeks ago, we sent you a questionnaire about the computer course you took at the Regional Computer Resource Center at Temple University. A high percentage of responses is essential if the survey can be useful in planning the curricula for Education 554 and other courses at the Center.

If you have already replied, our sincere thanks. If you have not sent in your questionnaire, another is enclosed. Please do not delay in completing and mailing it. Your help makes a difference.

Thank you for your cooperation,

Sincerely,

Margaret B. Chambers

Margaret Chambers
Project Coordinator

Dr. Elton Robertson, Director
Regional Computer Resource Center
Temple Univerasity

Dr. Kenneth Mechling
Director
ITEC Teacher Training Center
Clarion University

Ned Heeter
Program Evaluation Specialist
Pennsylvania Higher Education Assistance Agency

Appendix G:

Respondents' Comments

1. RCRC Course at Temple University
2. Computer Activities Since Taking the RCRC Course
3. Factors Influencing Computer Use
4. Changes Since Taking the RCRC Course

Appendix G

RESPONDENTS' COMMENTS

1. RCRC Course at Temple University

"I learned all that I know about computers from this course. I now own an Apple IIc and I and the family use it faithfully. My typewriter has become obsolete. Keep offering these courses to educators."

"The course was great!"

"The personnel at the RCRC were always friendly and helpful. The instructor quite knowledgeable and organized- more info on grants to acquire microcomputers for classrooms and schools."

"I think using word processing, a data base and learning about integrating commercial software into different subject areas is important."

"Good intensive course. There should have been an immediate follow-up course for those students who were excited about continuing their computer experiences."

"The course was very informative and I have told several members of the faculty to take it."

"I would have liked more instruction on how to make up programs for children such as: tutorial programs, drill and practice programs, simulation programs. Thanks to you and your help!"

"Instructor, Director and grad assistants were all very helpful. For advanced courses I'd like extensive use of word proc[essing], Database, spread sheet."

"More on word processing"

"Would like additional TIME on machine to complete my work and practice."

"I would not change the basic course but would like additional courses giving more time to Logo, SuperPILOT, spread sheets, data base and graphics."

"Continue to have follow-up workshops which provide in depth practice and usage of competencies learned in the course. I enjoyed the course and am constantly telling people about it."

"I attended the first class, Summer '85. Too much, too fast. Too many requirements."

"All levels of competence in students made it difficult for instructor. I'd like a follow-up course. Thanks"

"I would have liked to see a modem work. More experience with spread sheets and data base."

"I think writing programs are obsolete, there is enough software available. You only need to learn how to write programs if you are going to become a programmer."

"More information on databases, spread sheets - how to build them. Information on using modems; use of Compuserve, electronic mail, etc."

"More practice and instruction using SuperPilot to create useful and interesting programs."

"Review of specific software designed for classroom use. Where to obtain such software for review."

"I think more hands on. It was difficult to listen to lectures and then take information discussed and apply it to computers."

"Use of computers in various subject areas, a course when new equipment arrives on the market or once a year to try new programs that have been produced." Emphasized the importance of including ethics and legalities of computer use in the course.

"I think there should be two courses. I felt that too much was crammed into one course. I felt this caused a bombardment of information which became confusing and sometimes frustrating."

"The course I had was so intense - we were required to learn and understand many new ideas. We really did not get to know one because we went right into the next idea. If I did not have previous instruction, I would not have enjoyed the class. Please could you get another [advanced] course for teachers after the first one."

"Too much information for one course"

"The introductory course tried to do too much. Probably learning to use existing materials, software, would be handled in one course, while writing programs, particularly writing CAI lesson was too involved to do a really good thorough job. Word processing should be for another course so it can be handled in depth."

"I loved the course. Although I had a background in computers before taking the course. Later I heard from many people that they felt it was too hard. I thing [sic] perhaps the programming overwellmed [sic] them. Maybe you could save it for another class, or split one into two."

"Locations in other areas than Phila. To far to travel for those coming from surrounding counties"

"I feel the course was very well designed and sufficient for my purposes. We did not have the opportunity to network due to technical problems. I feel that would have been valuable."

"More time could have been spent on data base/spread sheet- how to adapt their use for classroom."

"I found after attending all sessions assigned, there wasn't sufficient time to complete all assignments. I still do not feel competent operating the Apple computer and selected software."

"Since I've taken your course I have changed from masonry to discipline. The knowledge I've gained was very useful to me. I regret that I was not able to teach with computers."

"Programming for teachers that do not require hours of preparation"

"Less time on writing a program since there are so many programs already available. More time on how to adapt the computer to a regular classroom environment."

"More time of available programs and computer managed instructions."

"I enjoyed the course as it was."

"I was very impressed with the course. I thought the programming in BASIC & SuperPILOT should be dropped. I think LOGO should have more time in the Elementary course."

"The RCRC course was much too hard for a beginner like me. It almost turned me off to computers, but I was angry that something challenged me that much. I decided to master the field because the course made me feel like an idiot. There was too much, too fast for a beginner. I switched to Beaver and was happy."

"Database has become quite useful."

"Teachers don't have time to do these things [programming in BASIC, SuperPilot and Logo, adapting existing programs, designing and programming CAI]."

"I enjoyed the class very much. But I feel like I just touched bases in so many areas. I would like to learn more about using other languages and expand its use in classroom situations. I want more."

"Perhaps it would be good to have a course that show one how to use existing programs, how to change them to suit your needs, and how to form your own programs. This with emphasis on little else."

"More detailed programming instruction"

"A future course should include exposure to SuperPILOT, Logo, some Pascal or Cobol or Lotus 1-2-3. More exposure to software like "Print Shop" and "Newsroom" as a part of the coursework assignments."

"More time to gain mastery. Course is excellent but crammed full. Are two courses possible? You've probably discussed this ad nauseum but it was my impression that so much was attempted it was difficult to give the needed time to develop competence."

"Would like to see more time devoted to word processing and data base. I would like the programming aspect as a separate course."

"Advanced courses- touch on "mainframes" etc. as well as computers used in other than educational settings."

"Computer course specifically for Special Ed. population"

"English teachers who teach the SAT classes should be allowed to do their computer work in the mathematics subject area."

"Designing & programming a computer assisted instruction in BASIC was too strenuous for beginners - also not practical. Critiquing articles and using word processing to write summaries was excellent."

"Running software, problems in running software, availability of software, following (or interpreting) the directions of software, variations of software or how to adapt for different courses."

"It was an excellent course. The course should have been at least two weeks longer."

"Good activities... use less on graphics"

"1) not enough time, 2) teaching staff was excellent"

"A review of the most recent programs. Some look into new computer technologies. Sound and video capabilities."

"Could you divide people up more? Maybe Bus., Eng., Math as one group (advanced course) or perhaps the advanced course could spend more time on data base & spread sheets & their use. Less graphics in intro course."

"There should be more time in class to have hands-on experience in the areas demonstrated in class."

"Recent extension of first course- not enough time in one course to be totally prepared to work independently"

"I learned a lot in the course. I could have done better in the course if I had a computer to practice on. I don't teach computer course because I don't have a computer in my room. I would like to have the next course after the one I finished."

"Recent 'Periodical Research Reports' on uses and effectiveness of Computer Tech, was most influential in motivating me to integrate computers into <u>every</u> subject area."

"1. More emphasis on 'one' program at a time; teach it thoroughly (ex: Appleworks or Magic Window). 2. Advance course- should be the use of the modem. 3. I liked the concept of teaching computer use to teachers."

"Advanced courses should further investigate how the average, non-programming teacher can benefit from computer use: stressing the ease of legal compliance- accurate and justifiable records; authoring languages and their ease. Ways to contact knowledgeable people/programmers for problem solving."

"There should be more hands on keys (step-by-step) following the instructor. Some participants obviously had previous experience leaving us novices way behind."

"I could have benefited with more instruction using a spread sheet and data based management program."

"Worth a brief mention: [identifying and using 3 types of CAI, history and future of computers]. Not as much BASIC."

Graphics are "fun".

"I would be very interested in an advanced course dealing with BASIC and graphics."

"I liked the projects we had to complete. I wish we had more time to adapt existing programs for specific use in particular instructional areas. Also, I wish we had more [?] to use a modem to communicate between computers."

"More hands on, than lecturing"

"The teaching of simple programming techniques was very helpful so that I could design instruction & review programs appropriate for my students & the material being taught. Word processing, which I knew before I entered the course, is absolutely essential for every teacher to learn."

"More lab time!!! I enjoyed and profited from the whole course outline. I was impressed with the organization of the teacher."

"Advanced BASIC, Pascal, same ITEC course in separate, more detailed course- ie Part I & Part II."

"This course was very interesting and I enjoyed working in the computer classroom. If chance is given I would like to join the advance course. It will be better if information about the IBM PC is added in the course"

"I am currently employed as a classroom teacher. This means of course, that I am already overworked. This is possibly the situation of most people taking this course. Consequently I feel there were too many assignments handed out."

"Pascal, spread sheet, data base, more information about Logo."

"I enjoyed being exposed to so many aspects of computer use but I felt rushed. There was not enough time to absorb it all."

"Some type of follow-up course should be offered"

"I liked the availability of the RCRC and knowledge and availability of the staff. Courses should be set up to teach teachers (or a resource person at a school) how to integrate computers into and with existing curriculum. It is not a case of either-or but ALSO!"

"The course was so rushed you hardly had time to practice (practice makes perfect). We had only 1 or 2 times during class time to work on the computers. One discussion is not enough to learn how to work something. My grade was an A, but I came to lab almost every night after work and on Saturdays. Too much was crammed into the course."

"I learned a lot from writing my own program, time consuming but beneficial. We rushed through the review of courseware. I took this course the first year it was developed and I'm sure by now the course has improved. It is a very worthwhile basic course in computers. I highly recommend this course to people who want an introduction to computers"

"I think each student should be at a computer- NOT SHARE. I found I watched my partner who had had experience & was adept & I'm <u>still</u> fumbling and need to take the course again. Lack of use of what I learned has negated a lot so I need to start all over again."

"Interfacing!!"

"I enjoyed becoming at least vaguely familiar with the various facts of computer ed. Future courses should spend more time now in each area so teachers, like myself, could become more proficient in the use of the computer."

"More programming. Learning varying friendly responses. Integration of Graphics and Animation."

"More time in practical classroom application with hands on experience. Ex. loading programs and how to use them. Where to get programs. Basic Computer instruction in word processing and data base with competency"

"The course was well prepared and the instruction was 'super'. In my opinion the program was well designed."

"Less reading- more hands on time."

"I work with severely handicapped students and I would like to learn about adaptations for the physically and/or mentally impaired."

"The time that the course was offered. Temple needs a program for teachers. The instructor was very good. I learned a great deal."

"Programming is not necessary. I think more time should be spent on adapting the available software for use in each persons subject area. More use of printers & utility software to assist teachers."

"Appleworks- advanced word processing, S.S. & D.B"

"The course was most enriching, stimulating and challenging. Thank you"

Appendix G

RESPONDENTS' COMMENTS

2. Computer Activities Since Taking the RCRC Course

"Purchased my own II+, involved my own children in using all kinds of software..began to put word lists from the reading series + parental newsletters on disk for ready + repeated access."

"Applied for School District In-Service computer courses"

"Workshop attendance. Computer loan for use during vacations to keep up on skills"

"Writing programs by Scholastic, Prentice Hall and others"

"I was a member of a funded grant to retrain teachers to teach computer. This series of 4 courses was given at Temple,called Secondary Retraining for Computer Science Program. I received As & Bs."

"Implemented computer use in the classroom. I used it for extra-curricular activities."

"Purchase printer & second disk drive - workshop on software for generating individualized programs -use of RCRC and RCRC/PRISE to review programs before purchasing- use of desktop publishing to generate parent handbook and school literature."

"I keep my grades on computer. My student class lists, tests, exams, instructions task sheets are on a word processor."

"I have used computers in my previous school for staff development."

"The development of [2] IBM compatible room[s] with 24 computers, 3 with color monitors, 1 scanner, light pen, bar code reader and the new, yet to be released, OS2 operating system, 3 1/2" disk, trackstar, 20 meg hard card."

"I haven't taken any more [courses] even though I have tried. The courses are always filled before I am allowed to register." [None]

"2 additional courses: LOGO and BASIC. Developed curriculum for a computer literacy course - grades 3-5. No computers as yet."

"1) acquisition of new computers for library. 2) develop program for grades K-8. 3) Instruct workshop for volunteers in computer room. 4) review and purchase of software."

"School inservice word processing course"

"Summer course for a week at Phila. Textile"

"Acquisition of computer hardware. Use of RCRC in compiling book for Middle States evaluation."

"We've purchased 2 new computers. I've solely purchased the software for own lab. I've taken another 3 credit graduate course, this time in LOGO, a few computer related workshops. I've also been giving inservices for teachers in my school as well as parent training."

"Inservices: Math/Sciences Consortium Bucks County"

"Acquisition of dedicated phone line, modem and contract with GEMNET (Global Educational Motivators Network) for access to electronic mail, and information services."

"The acquisition of a computer."

"State funded course in Pascal at College of Textiles and Science"

"Buying hardware, software"

"Word processing work at university."

"N. Science teachers Computer Camp- Summer of 1987. Using computers for creative writing- Grant 85-86."

"I have used my computer at home to prepare projects for my class and the school writing program."

Purchase hardware, workshops, develop new programs involving computers.

"Helping in the acquisition of computer hardware and software. Helping faculty to start using the computer in the classroom. Workshops. Manage instruction to adults at night classes (2 a week) Computer Literacy."

"I developed a program that contains a file on all suspended students."

"Acquired more hardware, written programs"

"Developed new programs"

"Received computer through district grant."

"Computer courses as part of my Master's degree in Comp[uter] Ed."

"Workshops on usage of various software introduced by RCRC course."

"Writing programs, purchase of hardware, workshops, courses, proposals. Since taking the RCRC course, I have been appointed to the position of Computer Coordinator in the Elementary Schools."

"I now have my Master's degree in computer Education. I am completely in charge of computer instruction where I teach. I teach 19 different computer classes a week. I purchase, plan."

"Acquisition, workshops, technology expos, database-students"

"Acquired my own computer. I use it for my own purposes in classes I am taking- plus some small areas in teaching in my own classroom."

"Computer workshop on Appleworks"

"Workshops"

"Rite-merit workshop"

"Asked to evaluate software."

"I have written a few short programs for my classes (computers & math). I have also ordered a variety of hardware and software. Lastly, I am teaching an aide for the computer room."

"Enrolled in a master program in computer science"

"Purchased a computer, [?]of software & I do everything on the computer. I'd be lost without it."

"Acquisition of Apple IIe for my classroom"

"In-service workshop on use of IBM computer."

"Workshop preparatory for IBM's Writing to Read program which should be ready for use with my students within the month or (next month- as these things go)."

"I am responsible to try to implement the computer curriculum in my school, while still fulfilling my responsibilities as the 4th grade teacher, as well as ordering software, etc."

"workshop at Regional Resource Center -King of Prussia- Individualized help at same center to help with using data base."

"Workshop course on computer software for Career Guidance"

"I requested a grade change to work in a computer assisted program, but the school was not chosen for a computer. I am currently working on my Master's degree in Computer Education."

"1) The acquisition of computer hardware. 2) The purchase of software. 3) Hoping to take a few more workshops. 4) Trying to develop some new programs of my own."

"Computer workshop"

"With only the RCRC introduction to BASIC, I was able to pass a course in advanced BASIC- also advanced Logo and Pascal - I am prepared to take the exam for teacher of computer ed."

"Diocesan Computer Literacy Course- nothing new but it did reinforce the basics for me."

"Computer workshops, computer class at Community College of Phila. grant proposal."

"Teaching students to write programs in BASIC"

"Workshops"

"I enrolled in a Logo inservice course."

"Writing several spread sheets for personal use. Using word processing for constructing quizzes, tests, etc"

"Helped old school choose IBM over Leading Edge. Signed up for Bus. Ed. workshop (TV) on desktop publishing"

"Just writing letters to parents on the computer."

"RCRC College of Textiles + Science Appleworkers [sic], Data Base"

"Unfunded grant proposals"

"I have already made use of my home computer and understand more of its functions."

"Workshops held by school system"

"Have completed 9 credit hours in the Masters in Comp. Ed at Textile, enrolled in another now. Working with Sp. Ed teacher to teach her the use of a software package on an Apple IIgs."

"Purchased Apple IIc for home"

"Selection of software for school"

"Workshops"

"Computer Club using graphics- very basic literacy for students. Word processing & printing, computer course in advanced Logo with school district & planning to do word processing with children as soon as we get computers."

"In-service Learning to Logo. Fall of 1987"

"Writing programs"

"I have obtained a PC and some data base softwear [sic]- its a real challenge"

"Received special minigrant. BASIC course, Pascal course. ITEC/RCRC workshop."

"Writing programs, acquisition of hardware."

"Spread sheet, data base (courses), Prescription Learning Center"

"Have taken other workshop courses"

"Workshops, U of Penn courses (unfunded) at U of Penn"

"I write my test on computers, term papers and anything I can, only this is done at home. There isn't enough time in school to work on computers unless you in that area."

"None in school. Attended "project Attain" sessions. Had no desire to be part of it- because I wouldn't get the computer. Seemed like more work than I was already doing"

"More course & workshops"

"I took a workshop at Rutgers on "Logo Geometry" which I am able to use with interested students after school."

"DOE summer institute at the Franklin Institute. Review software in the area of science. Learned about free MECC tapes software."

"Workshops, courses?"

"Took workshop on IBM at Ambler this summer."

"Intro to BASIC"

"Hoping to write a grant proposal for a computer" [None]

"Writing proposals for computers. incorporate lifestyle programs."

"The acquisition of new hardware. Taken over a CompSc/Application class from Vocational Ed of Adults"

"I'm integrating computers into the curriculum in 4th grade."

"Workshops- Appleworks (Textile). Appleworks for Special Education (PRISE)"

Appendix G

RESPONDENTS' COMMENTS

3. Factors Influencing Current Computer Use.

"Simple logistics of trying to manage computer instruction as a learning center type activity in a classroom of low achievers" with out assistance

"My principal is eager to have them implemented tonight."

"It is a part of the curriculum for business education (word processing and information processing)

"Not enough hardware/software for individual usage."

"Quality of instruction would improve if it were a full time endeavor for the teacher- finances restrict it."

"The hardware and software is available but the room is not always accessible. Would like computer.. in my own classroom. We have a computer room and a teacher, The room is often locked."

"A Chapter 1 program. C.C.C. - but I cannot control it"

"I have to store my computer in the school's computer lab & cart it to my room and back every day. This is a real pain in the ass."

"student interest!!"

"The development level of children at my special-needs preschool program makes the selection of software very difficult."

"A computer literacy course for students was started shortly before I took your course. Computer became available for my use with students"

"Computers are not available for me to use with my classes"

"Lowest school in Tells- high absent rate- SAT- involvement by parents teacher participation"

"The computers are kept locked in a single room- those that are working. Two teachers have taken them home and have not returned them yet. This makes it less available to students."

"Selected to teach in new computer lab."

"Our faculty does not like computers and are not encouraging."

"Computer literacy mandated for student"

"Time for training"

"Number of available computers"

"One computer is available at all times for Social Studies department utilization."

"I'm coordinator- have to set a good example"

"Presently must make an inhouse effort to get computer time at school. Would use computer for instruction if I had machine at home to prepare work."

"Our lab is run by volunteer parents and we can only send 8 students at a time. No prep time that would allow you to preview software packages so you could make better use of the school's resources."

No access to computers, no funding for software.

"We are greatly encouraged to use computers. Also the effort of our administration to look around for more computers for our children's use since we are a poor parochial school."

"Computer specialist on hand"

"Computer center is constantly used by classes. Computers are not available for individual use very often and I can't use them when my class is scheduled because I must help the students."

"New classroom setup for class usage. However the teacher does not have support personnel in the computer classroom."

"Time vs. course of study."

"Scheduling problems"

"I am the computer science teacher. I only teach that subject."

"I don't have the availability of computers for me to use either in my classroom or lab."

"There are no computers for student use."

Students have "45 minutes a week with computer teacher."

"Math teacher" uses computer with students.

"It is frustrating because my principal allows computers to stay broken. People steal software that does not get replaced. We have no classroom to house them, they get transported to our rooms. The children have a right to be educated about computers."

"I teach children computer use. Its not yet used by other teachers."

"Not having enough computers available is frustrating."

"The students are very enthusiastic about computers. They are very eager to learn programming as well as use software."

"Plenty are available. Principal supports use"

"Lack of budget. Exploring Professional Career clusters demands some basic computer instruction knowledge."

"This is the first year I have had computers in the classroom. I have 2 TRS-80s computers in the classroom which I must first become familiar with myself and a limited number of software programs that must be shared with other teachers. Time to become familiar with what I have is the biggest factor."

"As a teacher of a large class (37) it is very difficult to give every student computer time, with only 9 computers to work with."

"Lack of computers available to the students"

More funds.

"Not enough tutoring disks. Not enough computers in the classroom for English activities."

"The availability of enough machines. Time constraints within the curriculum."

"I'm ecstatic that Business finally has computers over Math department. Complete opposite of previous employer!"

"I wish I had more time to teach. Our day goes so quickly."

"help from some teacher"

"Junior High setting does not heavily promote use of computers like the high school setting does."

"Lack of at least one computer I can use as a simulation station. Right now I only can use the math teacher's when he doesn't have a class.

"I do not teach computer instruction. Computer education is being taught by another teacher."

"Just beginning this program"

"Time"

"Availability of the hardware."

"In library science, we hope to get everything on disk- it's on order - by 1988 the job will be done?"

"Not enough available software"

"Not enough time available during regular work day. Must either work with children before or after regular classes."

"I have support from both the principal and V.P. I have the availability of the computer room to schedule all 5 of my classes once a week."

"I would like to have software in my area of "Cosmetology". The theory would be absorbed much easier by the students."

"It is difficult to use computers during school hours because of scheduling problems."

"With one computer and 250 students, I use the computer more for managing my grade system and printing test."

Got computer in my own classroom.

"Lack of equipment"

"Inavailablilty of computers and limited time for student use hinders use- Would prefer a computer and software in class."

"Computer is hardly available to me"

"The administration has been helpful in buying new equipment but we need text & software to use with IBM PS-30."

"A new computer teacher at our school is encouraging me to make use of the computer in different areas of the curriculum."

"Little flexibility of schedule and standardized curriculum."

"A fantastic computer teacher"

"Not enough available software"

"I have 1 computer for 15 students. All students wish to use it. It is often hard to enforce rules for its use."

"Great support from principal"

"An aide is needed all day if maximum number of students is to have access to computer for drill and practice."

"I am not in instruction now. Since the course I have kept all discipline records have been carefully kept on file in various computers."

"Purchasing software"

"Administrative support"

"Inability to leave computers set up in classroom due to security problems. Also time needed to review software & time to prepare."

"Time to adapt programs for use"

"We now have a computer lab with a regular computer teacher. Until other computers come into our school, the regular school computers are not for teacher use."

"The computers are used by students taking the course. Other teachers cannot schedule time for a class to use the computers."

"Computer magnet program use to attract students to the school."

"Although computers are in the bldg. they are not convenient for classroom usage. Their location is a problem."

"Computer lab"

"Student interest"

"I have been assigned as the interim computer science teacher until someone is available from the Board's list"

"Presently I am assuming the responsibilities of the Vice Principal. I am no longer teaching."

"I teach K."

"I am working as a substitute teacher so I do not get much more chance to work with computer but in future this course will be very useful to me."

Appendix G

RESPONDENTS' COMMENTS

4. Factors Influencing Computer Use That Have Changed Since Taking the RCRC Course

"Better and more software is now available"

"Am better equipped to judge educational value of software. Much more comfortable using micros."

"I am still not totally comfortable with computers. Lack of practice hinders my improvement." [No change]

"Increased software and hardware"

"Our school has a computer "teacher". Limited use of computer room."

"Knowledge of computers and ability to evaluate software"

"I now have more computer knowledge & I know it's not me that's the problem."

"Knowledge of a computer's potential as a teaching tool and for managing.. paperwork in special education has increased due to this course, further reading and practice."

"RCRC gave me the necessary skills to free me from the fright of the computer."

"Available software ("quality") has increased as well as the cost of securing a proven system and the use of "trackstar" which now make compatability possible."

"The principal at this school does not stress the benefits of computers, whereas my previous principal really encouraged the teachers and the students"

"Better able to evaluate and select appropriate software. More confident in my computer skills. I have taken additional courses since RCRC and have been selected to teach our new computer lab arriving in Dec."

"My computer knowledge has increased"

"Available hardware- our network system was not satisfactory. I was able to get some additional disk drives but need 4 more."

"I use computers daily. Since taking the RCRC course I now run our computer lab in the mornings."

"I've changed positions. My current position has better funding and more chance of getting computers in each classroom."

"Faculty and administrative support has increased tremendously. The district has budgeted an additional $3000 to develop a pilot program with a global electronic mail network."

"Knowledge of computers"

"There was a lack of experience on the computer outside of RCRC class. Had no computer available for convenient use at school at that time." [No answer]

"We have more computers and more software available."

"Lost access to two computers used daily. Lack of funding for intermediate math software."

"I always had an interest in learning about computers. The RCRC course not only taught me a lot but deepened my interest and my wanting to learn more about it."

"I feel confident around computers. I'm now willing to try anything that deals with computers (taking other workshops, etc.)"

"Improved knowledge of computers and understanding of software."

"Knowledge of computers has increased"

"I know a lot more now. I changed teaching positions so I'm in a school equipped with Apples. Before I was in a school with TRS-80s. I teach computer all day. Before I taught one class/week with lousy equipment."

"More hardware"

"The RCRC course was a thorough and quite enjoyable introduction to the many functions of the computer. If one were available, I would use it.

"Greater facility with computers"

"Administrative support has increased"

"Software more closely selected."

"Since I had the course a whole new world opened for me. I have extra curricular activities and all [?], booklets I do on the IIe or Mac."

"Hardware more available. My knowledge has increased. Faculty more knowledgeable and therefore helpful."

"My own knowledge of computers and ability to create my own instructional programs greatly improved."

"Students are more enthusiastic"

"Better software. I have changed jobs but am still at the same schools. Now at our school there is more funds available to buy software/hardware."

"Since I took the RCRC course, I am comfortable with the computer and am better able to help students use the computer."

"Less access to computer classes"

"I feel I have a better understanding of basic computers, although I need much more training to feel able to teach the students well."

"Knowledge of computers"

"I realized that you just "dive in". You needn't be Eckerd [sic] or Mauckley [sic]"

"Almost all" factors have changed.

"I have learned more about the use of computer- both Apple IIc and McIntosh [sic]"

"My knowledge of computers has expanded. I feel much more comfortable with the computer."

"I am now better able to evaluate software and ask questions of the right people to get meaningful answers."

"Teaching BASIC programming has helped my computer fears. My students enjoy the program I designed in the RCRC course.

"Absolutely- my knowledge helps me initiate interest in children's use of PC."

"More confidence in ability to use computers"

"I have changed and my approach to the use of computers in education have changed."

"Since I took the course, I present the computers to the children with confidence and security. I feel I know the basics."

"Received computer strictly for use in the science room."

"I've found out about MECC software. We didn't have weekly access and were sharing one computer
for 6 classrooms. I finally got my own in my classroom"

"We are probably more frustrated because we want to use equipment now and don't have any."

"Increased knowledge of computers has made me more receptive to using computer for my work and teaching."

"My knowledge of computers has improved"

"I have learned not to be afraid of computers."

"I was working with many different high school business classes, now I am working in my own Comp Sc/Applications class. I have half & half, half old equipment, half brand new."

"More student interest. More interest by new computer teacher."

"My knowledge has expanded allowing me to pass this on to students. I could not function without my computer."