The effects of two types of computer classes on computer anxiety and confidence

by

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CHAPTER I. INTRODUCTION

The number of microcomputers and their use have increased greatly in recent years. One measure of this increase is in the number of advertisements in all types of media which present the many ways in which computers can be useful. And even more than useful, it is implied that computers are essential to success in today's world. In one television commercial, the proud parents are waving goodbye to their college-bound son. In the next scene, their unshaven and slovenly son is getting off the train as the parents wait in disgrace for their dropout. Why did he fail? The implied reason is that he didn't have a microcomputer, which put him so far behind his classmates that he couldn't compete.

This advertisement illustrates a widespread belief that computer knowledge is the difference between success and failure, of getting a job or being unemployed (Luehrmann, 1984), and this may well be right. Luehrmann states that in today's world 50% of all jobs are information jobs, and by the year 2000 this will increase to 80%. An essential requirement for anyone having such a job is the ability to use a computer, and those who don't have this ability will be at a serious disadvantage when competing for these jobs against others who have prior knowledge and experience in working with computers.

The use of computers is growing not only in jobs, but in every facet of our lives. People in society take for granted now the built-in computers found in appliances, cars, and video games. Consumers have accepted, or in some cases resigned themselves to, the use of computers to bill them for utilities, add up their groceries, and keep both financial and personal records on them. Computers are such a part of their lives that even those who profess to "hate them" often times don't realize they are using single-purpose microchips, or computers.

The number of computers in schools has also increased tremendously. For example, in a survey of fifty schools in northwest Iowa in the fall of 1979, schools reported a total of three computers for instructional use. By the fall of 1985 this had increased to 376 computers (Roskens, 1986). And by the fall of 1987, these same schools will have approximately 500 computers (G. Roskens, Area Education 4, Sioux Center, Iowa, personal communication, April 8, 1987).

The use of microcomputers in schools nationwide has also increased. According to Microcomputers in Schools, 1984-1985, of 84,255 public schools surveyed in 1981, 18.2 percent were using microcomputers. These figures changed to 30.0 percent of 82,422 schools in 1982, 68.4 percent of 81,506 school in 1983, and the 1984 survey showed that 85.1 percent of the 81,100 schools responding used microcomputers.

The tremendous increase of computers in schools was also shown by the results of the national surveys of the school uses of microcomputers done by Johns Hopkins University (Becker, 1986). From the spring of 1983 to the spring of 1985, the number of microcomputers in the schools surveyed went from 250,000 to more than one million. Seventy-five percent of schools that had not been using computers in 1983 were using them in their schools by 1985. The proportion of secondary schools with 15 or more computers increased from 10% in 1983 to 56% by 1985, and the typical high school in 1985 had twenty-one computers compared to five for the typical high school in 1983.

But while computers have become a much more common fixture in schools and society, educators disagree on what should be done with computers and who should do it. Are computers only good for playing games? Should students receive instruction about computers as units in English or social studies classes or in a separate computer class taught by a highly-qualified teacher? Does a student need to program to be "computer literate"? These and other questions are being debated in educational communities.

Research on Computer Use

To help in answering these questions and in planning a curriculum which includes computers, educators have studied ways to use and teach about computers, and what the effects of these efforts have been. This research can very broadly be classified as looking at either the cognitive or the affective consequences of using computers in education. Although both areas have been researched, the increased awareness in our society about academic performance and achievement test scores has led to an emphasis being placed on the cognitive skills.

But before the schools focus entirely on the cognitive skills which students must acquire about computers, educators must also consider the affective implications of computer education. If students are to become users of computers in their later lives, they must view their exposure to computers in education as a positive experience. It is sometimes assumed that all children like computers and are eager to use them, but this may not always be the case. Some children are apprehensive about computers and reluctant to use them.

This recognition of differing views was discussed in an article in Public Opinion Quarterly (Lee, 1970). People seem to view computers in two ways. Some regard computers as a beneficial tool, but others see computers as superhuman thinking machines that downgrade man's previously unique significance. Lee warns that this is "a highly symbolic and disquieting undercurrent of great emotional significance centering on the notion that the machine is autonomous and that it 'thinks' as humans do" (p. 56).

The power of the computer to evoke "strong feelings" and differing feelings has been written about more recently by sociologist/psychologist Sherry Turkle (1984). Adults who know the computer well "say the machine is fascinating. They say it is hard to put away" (p. 14). But other people "fear the machine as powerful and threatening" (p. 13). These adults are uneasy about how involved their children become with computers and the new generation of electronic toys, and are uncomfortable with the idea that their child's playmate is a machine.

Jay says that some educators themselves suffer from computerphobia (1981). Their symptoms are a resistance to talking or thinking about computer technologies, fear or anxiety about computers, and hostile or aggressive thoughts and acts. This computerphobia is caused by the failure to "keep up", the feeling that institutions fail to take a person's job into account when planning to use new technology, and a failure by educational institutions to provide incentives to keep abreast of new technologies. He says that computerphobia may increase in the future because of the lack of funds in schools, the increased impact of computers without proper planning, and the more pervasive use of computers in our society.

If the adults in our society and in educational systems have feelings such as these toward computers, then educators must also be aware that students may also share these attitudes. Because of this, educators should consider the affective consequences of using computers in education.

In studying computer attitudes and anxiety, one approach is to measure these and attempt to ascertain what factors are related to them. Studies have looked at the relationship between experience and attitudes (Chen, 1985; Johansen, 1985; Loyd & Gressard, 1984; Powers, Cummings, & Talbott, 1973; Wilder, Mackie, & Cooper, 1985), gender and attitudes (Chen, 1985; Johansen, 1985; Loyd & Gressard, 1984; Swoope & Johnson, 1985), age and attitudes (Loyd & Gressard, 1984), and if there was a relationship between the type of computer use and attitudes (Wilder, Mackie, & Cooper, 1985).

The other major approach of researchers has been to see if a particular method can be shown to improve attitudes toward computers and reduce anxiety. Researchers have looked at the results when students are introduced to computers by using application software (Baumgarte, 1984; Gross, 1983; McManus, Cannings, & McCall, 1985; Spero, 1982; Widmer & Parker, 1983) or by using computer simulations in other subjects (Bolton & Mosow, 1981; Shaw & Okey, 1985). BASIC programming has also been used as a method to change students' attitudes and anxiety (Kopke, 1984; Menis, 1984). Even computer games have been used to reduce the computer anxiety of users (Knight, 1979).

Inadequacies of Present Research

This body of research has given educators guidance in implementing computers in the schools, but does not answer all the questions which teachers and administrators are asking. The first problem is that most of the studies deal with how prior computer experience, gender, and the age of the user effects their attitudes and anxiety. But these are all factors over which teachers have little, if any, control. Such studies are not very useful in helping teachers devise curriculum which will change attitudes.

Other research on affective implications of computers in schools does focus on changing attitudes and anxiety of students toward computers by having the students use computers in various ways. The problem with this research is that the instructional uses of the computers are so diverse that it is difficult to draw conclusions from the studies. Even studies which are nominally the same may in fact be very different. An example is studies which are grouped together because they attempt to change students' attitudes toward computers by having the students use software. This software varies from application software (Baumgarte, 1984) to simulations (Bolton & Mosow, 1981) to games (Knight, 1979). When taken as a whole, the results from studies which use such different programs indicate very little. Though these studies indicate that attitudes can be changed, each study seems to suggest a different way that this can be accomplished.

Significance

The number of computers for instructional use in our schools has increased tremendously. This can be illustrated by the fact previously referred to that fifty schools in northwest Iowa went from a total of three computers in the fall of 1979 to approximately 500 by the fall of 1987, and that in the national survey cited the percent of schools using microcomputers went from 18.2 in 1981 to 85.1 in 1984. As the number of computers has increased, so have the options of educators as to how to integrate the computers into their curriculum. And as the number of options has increased, so too has the difficulty of deciding how to utilize the computers within each school.

This study's interest is with high school students and their use of computers. Specifically, how does the curriculum of classes concerned with teaching students how to use computers affect the students' attitudes toward computers and any anxiety which they may feel toward computers? The purpose of this study will be to relate two computer classes, a BASIC programming class and an applications software class, to the computer attitudes and computer anxiety of high school students. The attitudes and feelings which these students have about computers after the completion of the classes will to some extent determine how well they will work with computers as they continue their education and move into jobs of their choice.

Students in the high school classes are both male and female, have had varying amounts of experience with computers previous to taking the classes, and range in age from 15 to

19. As their instructor, there is no way of influencing any of these variables before they take the class. Any effect which instruction may have on their attitudes must be attributed to what happens in the classroom during instruction, and the main factor in this is the course content. This study will focus on the changeable variable of course content by comparing the effects of a programming class and an applications software class.

The study will also focus on the type of computer use by comparing only a specific course in BASIC programming with a course in which the use of software is restricted to those programs referred to as application software; word processing, data base management, and an electronic spreadsheet.

The findings of the study may provide an indication of which type of class more favorably influences the students affectively. Because of the high cost of both hardware and software, programming as a school's first or only computer class is attractive because the cost per pupil is lower. But as hardware and software costs fall and the schools expand their computer offerings, educators may be in the position where they must decide between offering as a first class one which teaches a student to use application software or one which teaches a student how to program. In this decision, the consideration of how this class will affect the students' feelings toward computers should be an important one. If an application software class would give a student more positive attitudes and more confidence toward working with computers than a programming class, the importance of offering such a class would increase. The same would be true of a programming class if it did a better job of influencing students' attitudes and feelings. As more schools and more people in society use computers, it is important that they are introduced to computers in a positive way. This study will look at the effects which the two different classes have on the students, and the findings may give guidance as to which type of class would better serve to give students positive attitudes toward what will be for many a lifetime of working with computers.

Hypotheses

1. At the conclusion of the study, students enrolled in the application software class will show no change in the amount of anxiety which they exhibit toward computers.
2. Students in the application software class will show no change in computer confidence scores.
3. At the conclusion of the study, students enrolled in the BASIC programming class will show no change in the amount of anxiety which they exhibit toward computers.
4. Students in the programming class will show no change in computer confidence scores.

Limitations

The main limitations are imposed by the fact that it was possible to run the study on only those students who enrolled in the programming class and the application software class during the 1985-1986 school year, which was twenty-five students for the programming class and nineteen students for the application software class. The study was done in a rural high school of approximately 160 students in grades 9-12. Situations which were unique to the classes were the materials used in each class, and the teachers and their teaching methods. The programming class had the same teacher for the whole semester, but the application software class had two teachers. The business teacher taught the word processing unit, which took approximately five weeks, and then the programming teacher taught the remainder of the class. Another factor to be considered is that this was the first year for the software class, but the second year during which the programming class was taught.

CHAPTER II. REVIEW OF LITERATURE

As the number of computers has increased in schools, researchers have attempted to ascertain how computer use has affected students. The research which is cited in this section is relevant to this study because it looks at the affective consequences of teaching students about computers, and how these consequences are related to certain characteristics of the students and methods used in the instruction. This section also looks at how computers have been used in schools and how they are presently being used. These topics relate to this study in which the computer anxiety and computer confidence of students was measured. The two different computer classes involved in the study represent ways in which schools are using computers.

The review of literature is divided into three parts. Section one looks at the literature which measures the attitudes and anxiety of computer users, and attempts to ascertain what factors affect attitudes and anxiety. The second section deals with methods to improve attitudes toward computers and reduce anxiety about computers. The third section deals with the ways in which computers have been used in school and how they are being used in schools presently.

Factors Affecting Attitudes and Anxiety

Experience

One factor which has an effect on attitudes is that of experience. In a study on gender differences, Chen (1985) found that males tend to have better attitudes because they have had more computer experience. Another study which focused on gender and computers said that previous experience with computers made both males and females feel more comfortable (Wilder, Mackie, & Cooper, 1985), even if this experience was general introductory courses which did not increase the person's ability to use the computer.

Other studies not primarily concerned with gender differences have also found experience to be an important factor. Johansen (1985) looked at the attitudes of sixth through eighth grade students. The students were taken from regular classes two days per week and put in a computer literacy class. The class for the most part was instruction in BASIC, and included instruction in keyboarding, operation of the computer, its impact on society, and the history of computing. Those students who had a home computer showed a significant difference on a pre-test and a post-test on programming ability. And the most significant indicator of programming ability was the student's self-assessment of their own ability on the pre-test. Experience has also been shown to be significant at other educational levels. When

344 students, with roughly a third each from a high school, a community college, and a four-year college were tested, the amount of computer experience was found to be a significant factor in their attitudes (Loyd & Gressard, 1984).

Gender

Loyd and Gressard also looked at the effect of sex on computer attitudes and found it to be insignificant. Wilder, Mackie, and Cooper said that previous experience accounted for any differences between males and females, while Chen said that "gender differences were not significant among male and female students enrolled in any pre-high school course using computers as well as high school courses offering non-programming applications" (p. 24). Among the sixth through eighth grade students, sex was found to be a significant factor in the attitudes of the students. As measured on the pre-test, girls were less likely to feel they could program. They were also less likely to express enjoyment, and were more likely to express more concern prior to class (Johansen, 1985).

Methods to Improve Attitudes and Reduce Anxiety

Most of the factors affecting attitudes and anxiety are beyond the control of educators. The primary concern of teachers should be with discovering methods which will improve the attitudes of their students and reduce their anxiety toward computer use. One study on gender differences

(Wilder, Mackie, & Cooper, 1985) suggests that the type of computer class does make a difference in the students' attitudes, and other authors also propose certain methods to change both attitudes and a student's anxiety level.

Application Software

Several articles talked about using application software either by itself or in conjunction with other techniques to improve attitudes and reduce anxiety. Baumgarte (1984) discussed techniques which were used in a workshop to reduce anxiety. The first step was a general explanation of the logistics and functioning of the computer and software components which reduced blind dependency. Next, the students were given a set of rules which they memorized. It was emphasized that failure was part of using computers, but the students were given the opportunity for success by providing them with clear exercises. A fourth technique was that orderliness, sequencing and attention to detail were emphasized on pre-computer assignments. Finally, early assignments used tasks relevant to student's goals, and this was done by using well-chosen software, which might include application software.

Workshops that dealt with fear of computing were also the subject of a second article, in which Gross (1983) said that the general objective of the workshops was to inform participants about the value and usefulness of computers. This objective was accomplished by hands-on with software such as word processors and data bases. Other authors (McManus, Cannings, & McCall, 1985) said that schools should promote word processing as the initial and most important use for all students, but instead, the longer a school pursued the use of computers, the more they moved into teaching programming. The reasons for this were that teaching applications for software was not easy, and it was easier to receive approval for teaching BASIC because the textbooks were plentiful, the computers were utilized better, knowledge of BASIC was easy to test, and BASIC came built-in on the machines.

In a course for preservice teachers at Iowa State University, "a major goal of the course is to provide students with both the ability and the motivation to continue to expand their use of the computer" (Thompson, 1985, p. 53). Of the thirteen weeks spent on laboratory experiences on computers in this course, nine weeks were spent on working with application software. Students in the class took a pretest and a posttest which included affective measures. Items on which students were asked to assess their own computer abilities showed that the student's "self-assessment was markedly more positive at the end of the course than it had been at the beginning" (p. 54).

Other, less structured approaches to teaching computer literacy have also used application software. At Cuyahoga Community College (Spero, 1982), eighteen instructors were given microcomputers, along with prepared software, to take home. As a result, most became interested in using computers, and the program continued with even greater support from other faculty and administration. In an article on how to beat micro-anxiety (Widmer & Parker, 1983), three suggestions were that computer applications be demonstrated, participants be given hands-on experience with "no fail" programs, and the use of the computer as a tool be emphasized.

Simulations

The use of the computer to provide simulations has also been used to examine attitudes (Bolton & Mosow, 1981). The study started in the Mobile County Public School System by giving a knowledge and attitude survey to students and teachers in three middle and three high schools. Next, a microcomputer's parts and functions were explained. After this, the students did a Civil War simulation, which was followed by a post-assessment. One result of the simulation was that the students' attitudes toward computers had improved.

Games

Computer games have been used to decrease the computer anxiety of adults (Knight, 1979). The hypothesis of the author was that hands-on game playing was the most effective method for dispelling anxiety, and this was tested in a session at a mathematics conference. The presentation started with a lecture followed by a demonstration run of a game. The remainder of the session the participants were allowed to play games. The only results were from participant feedback, but these indicated a favorable response to the session.

Programming

Though one might expect a simulation and games to improve attitudes, learning BASIC might not give the same result. Two groups of Israeli ninth graders with uniform intellectual levels were used in such a study (Menis, 1984). The experimental group was taught two hours of BASIC a week, and computer games were placed at their disposal. The control group was chosen from a different school in which there were no computers and the students had no computers at home. The result showed more positive attitudes toward computers by the experimental group than the other group. However, the availability of games makes the results less clear as to whether it was the BASIC instruction or the use of the games which changed the students' attitudes.

Another study which also showed a positive change in attitudes was conducted on educators (Baylor, 1985). An introductory class on microcomputers covering six days was given to educators. The topics of the six days were computers, calculators, computer-assisted instruction, flowcharting, programming, and the BASIC language. A test given at the end of the class showed that it had influenced the educators' attitudes in a positive way, but again the inclusion of topics other than programming clouds the results.

Microcomputer Use in Schools

Past Uses

It is difficult to determine a definite time when schools started using computers, but Gerald Natkin (1984), who worked with the Louisville and Jefferson County, Kentucky schools, sets the time as the 1960s. In the 1960s, larger schools began using computers in their business office and for scheduling. "Later, computers moved into the classroom. The most common classroom application for many years was programming" (p. 13). Some computer-assisted instruction, where the "computer controlled presentation and reinforcement" (p. 13), and computer-managed instruction, where the computer keeps records on the students, were also done, but there weren't enough computers to make these uses very widespread in the schools at that time.

Programming tended to be the most common use of computers not only because of the limited number of computers, but also because of the opinion that programming computers was the best way for students to learn about computers. Arthur Luehrmann ("What is", 1982) said that "to tell a computer what you want it to do, you must be able to communicate with it. To do that, you will need to learn a language" (p. 197). The language to which Luehrmann refers is a programming language.

As the number of computers increased in schools because of the increase of microcomputers, the ways in which computers were used also increased. In a report on how microcomputers were used in the classroom, educational applications discussed in addition to programming were drill and practice, student-computer dialog, computer-managed instruction, and simulations (Becker, 1982). Given these different applications, Becker stated "it is my guess that of all the ways in which microcomputers have been used in schools, teaching programming has been the most common and the most successful" (p. 45).

Case Studies

Two case studies published in 1983 showed that in the school districts studied, programming remained the predominant use of computers. Sheingold, Kane, and Endreweit (1983) reported that in a district they called Salerno, microcomputers were used to teach programming and computer literacy. In the Granite school district, they were used for classes in math and business, where again the computer activities were primarily programming. And in Greenview, microcomputers were used in a seventh grade computer literacy, where the emphasis was on programming.

The second study also found programming to be the most common way for schools to integrate computers into their curriculum (Lindelow, 1983). In the Lyons Township, Illinois secondary schools, the only elective courses using computers available for students were courses in programming, with BASIC, FORTRAN, COBOL, and Pascal being offered. Other classes did make good use of computer-assisted instruction. In Miami Lakes, Florida, computers were used for classes in computer literacy, computer science, and again for computer-assisted instruction. In Cupertino, California, home of the Apple computer, programming was heavily emphasized. Young students were taught Logo, fourth graders were taught PILOT, and seventh and eighth grade students took classes in structured BASIC.

National Survey

In 1983, the Center for Social Organization of Schools at Johns Hopkins University conducted their first national survey of microcomputer use in schools. Of the 1,082 microcomputer-using schools included in the national sample, programming was by far the predominant activity in the secondary schools (Becker, 1983). The reported incidence of writing programs and computer literacy as teacher-directed computer activities was 81%. Computer applications, which included word processing, science laboratory use, data processing, and other uses for business classes, had only a reported incidence of 12%. When the total instructional time spent on computers was considered for both elementary and secondary schools, the time spent on programming and computer literacy in secondary schools was 48% of the total time, compared to 4% of the total time spent on computer applications in the secondary school. "Programming and computer literacy activities occupy fully two-thirds of the instructional time on computers" (p. 9) in the secondary schools.

In an article summarizing the survey, Becker (1985a) included the results of responses by teachers who classifed themselves as using microcomputers regularly or intensively in their classrooms. Teachers were asked to categorize microcomputer use as introduction to computers, programming instruction, business education/vocational, or student papers done with a word processor. When the responses were tabulated, "computer programming was the clearly preferred activity in secondary schools" (p. 8).

The second national survey by the Center for Social Organization of Schools was conducted in the spring of 1985. A person chosen by the principal as the "Primary Computer-Using Teacher" in their building was asked to "divide 100% of the student's computer use among five basic activities -- word processing, computer-assisted instruction, discovery learning and problem solving, programming, and 'other'" (Becker, 1985b, p. 14). The responses indicated that the time spent on programming was more than double the time spent on word processing. When the same group responded to a question as to how they view the computer presently as compared to when their schools first got computers, those saying that they saw the computer as a tool to do a task changed from 10% to 30% Those who said they saw the computer as something to learn about in literacy and programming classes was a majority in both responses about how the computer was seen when first obtained in the schools and how the computer was seen presently.

Summary

Computers do not elicit enthusiasm from all who must work with them or learn on them, and in some cases people become very anxious about using computers. Factors which have been studied as to their effect on attitudes and anxiety include experience, gender, and age. The most important factor seems to be previous experience on computers, which also accounts for most differences due to gender, as males tend to have more experience on computers than females.

To improve the computer user's attitudes and reduce any anxiety, varying methods have been tried. These include the use of application software such as word processors, electronic spreadsheets, and data bases. Computer simulations and games have been utilized with both adults and youngsters, as has instruction in programming. In almost all cases, the studies indicated that these methods produced favorable results.

Within the context of education in secondary schools, the demand for computer knowledge has led to the establishment of computer classes which have overwhelmingly been either classes in programming or computer literacy. These classes predominated because of considerations of the number of computers available, and also because many educators considered them to be the best way to teach students about computers. But while classes which learn about computers are still the most common, classes which view the computer as a tool and teach students the use of application software are becoming more frequent. It is difficult to document the most recent numbers in this move because of the rapidly with which schools have increased their computer use, and because of the time it takes to survey schools and then report the results. Both types of classes, those that view the computer as something to be learned about and those that view the computer as a tool, have merit from a cognitive standpoint, but should also be considered from an affective viewpoint.

A student who takes computer classes will not only receive knowledge about computers, but will also develop attitudes toward computers. It is possible that the type of class, either instruction in programming or instruction in software use, may have different effects on the student's attitudes. To look at this possibility, this study measured the attitudes and anxiety of students taking a programming class and those taking an application software class.

CHAPTER III. PROCEDURES

Subjects

Subjects consisted of ninety-six students from grades ten, eleven, and twelve. Prior experience with computers in school ranged from none to one semester in an introductory course. All students were enrolled in the Hartley-Melvin High School in Hartley, Iowa. Hartley is located in northwest Iowa and has a population of approximately 1,700.

The Hartley-Melvin school district can be characterized as a rural school district having students who are well-above average academically. The average composite scores of high school students in the district on the Iowa Test of Educational Development rank at the 92nd percentile nationally.

During the 1985-1986 school year, ten microcomputers were used for instruction in the high school building. Two of these were used by the learning disabilities teacher, one was located in the library, and the remaining seven were in the classroom where the computer classes were taught. There was very little use of computers by students outside of class or by teachers in other classes due to the lack of software and availability of the computers.

Instruments

Prior to the study, students were given two pencil and paper pretests, one to measure their computer confidence and the other to measure their computer anxiety. At the conclusion of the study, students were given the same tests.

Computer Confidence Test(CCT): This test was taken from the Computer Attitude Scale, developed by Clarice Gressard and Brenda H. Loyd (1985) at the University of Virginia. The Computer Attitude Scale consisted of three ten-item subscales labeled as Computer Anxiety, Computer Confidence, and Computer Liking. Of the ten items in the Computer Confidence subscale, five were positively worded and five were negatively worded. (See Appendix B.) A scoring strategy was used so that a higher score corresponded to higher confidence.

As part of the process of validating the Computer Attitude Scale, it was subjected to three validation studies. In the first of these studies, the reliability and factorial validity of the Computer Attitude Scale and its subscales were examined. For the Computer Confidence subscale, its alpha coefficient, which is a measure of internal consistency, was a .89. This finding suggests that the "scores of the three subscales are sufficiently stable to be used as separate scores" (Gressard & Loyd, 1985, p. 8).

The second study correlated the three subscales with another computer attitude inventory in order to determine the convergent validity. The magnitude of the correlations which were obtained validated each of the subscales as measuring one of the three main types of attitudes; confidence, liking, or anxiety.

The third study analyzed results of the tests when given both before and after a program of computer study to determine if the subscales were effective in reflecting a change in computer attitudes. The alpha coefficient of the Computer Confidence subscale was .88 when given pre-program, and was .89 when given post-program. The pretest and posttest scores of the subjects were analyzed using a dependent t-test, which showed that the subjects were significantly more positive after the program than before. This statistical finding was consistent with the instructor's observations. "Thus, the results support the use ... where a documentation of changes in computer attitudes is needed" (Gressard & Loyd, 1985, p. 17).

Computer Anxiety Index (CAIN): The CAIN is part of the Standardized Test of Computer Literacy which was developed at Iowa State University. Twenty-six items make up the CAIN, which is designed to identify students who have computer related anxieties. On the test given to students, it is called Computer Opinions Survey to reduce the chance of biasing the student's answers. (See Appendix C.) When used at the beginning of a computer course, the CAIN can help to identify anxious students, while using it at the end of a course will help "to identify changes produced in student attitudes as a consequence of learning about computers" (Montag, Simonson, & Maurer, 1984, p. 6).

When the CAIN was pilot tested, data showed that "the CAIN had a reliability estimate of .94 using the Cronbach alpha method" (Simonson, Maurer, Montag-Torardi, & Whitaker, 1987, p. 239).

The CAIN was also correlated with the state anxiety portion of the State-Trait Anxiety Index by giving the subjects the CAIN two weeks before the beginning of a class on computer use. The State-Trait Anxiety Index was then administered to the subjects two weeks later at their computer terminals. The subjects were also observed and rated as to their level of anxious behavior. "The CAIN was found to correlate significantly to both the STAI score, and the observation score (r = .32 and .36 respectively)" (Simonson et al., 1987, p. 240).

Treatments

Twenty-seven of the students were enrolled in Introduction to Computers, a one-semester course which was the first computer class offered in the high school. The textbook for the course was Computer Literacy: A Hands-On

Approach by Arthur Luehrmann and Herbert Peckham. The course was taught on Apple IIe computers, with one computer for every two students in the class, and the programming language used in the course was Applesoft BASIC. The textbook and the class were organized so that class sessions alternated between discussion/lecture sessions and hands-on or lab sessions.

In lab sessions, students worked in pairs on the computers. They either typed in or loaded off a disk a BASIC program which was intended to introduce them to one or more BASIC statements. By observing the output of the program and by changing the program to produce slightly different output, the students were encouraged to discover what each BASIC statement did. All the labs were done by students during the class period while the instructor observed and answered questions.

On the following day in the discussion session, the results of the lab were reviewed and the statements were defined. An explanation of how the computer executed the statements was given by using a model of the computer. Related topics such as the use of computers in art and entertainment, information processing, and in many jobs were also presented and discussed.

Throughout the class, the ideas of "top-down design" and "structured programming" were emphasized. "Top-down design" was defined as an approach in which the general outline and ideas are arrived at first, and then the details are filled in. When students had to write their own programs, they were expected to start by writing an English-language version of the body of the main routine. As they converted this into BASIC, subroutines were used to define complex actions which took more than one or two BASIC statements to accomplish. "Structured programming" was illustrated by requiring students to use the GOTO and IF statements only as parts of block outlines, and restricting the targets of these statements to other statements in the block. A course outline of the class is in Appendix D.

Another twenty-two students were enrolled in Computer Management Systems, which was also a one-semester course. This course taught the students the use of word processing, spreadsheet, and data base management. The software used was AppleWorks, and the textbook was The Power of: AppleWorks. A very small amount of each class period was spent on defining terms and answering questions about common problems with a particular aspect of the programs. For the largest portion of most classes, students worked by themselves on the computers, and asked for help when they needed it. Those students who didn't have access to a computer during the class period worked on other studies during the class and came down to the computer room during their study halls to complete their assignments. The business teacher taught the first five weeks of the class during which the word processor was covered. The next five weeks were spent on data base management, and then five weeks on the spreadsheet capabilities of AppleWorks finished the book over AppleWorks.

After learning how to use AppleWorks, each student worked on a word processing project. This either involved doing selected exercises chosen from the second semester of a typing class, or typing their English term paper on the word processor. Each student also developed his/her own application of both a spreadsheet and a data base. They were responsible for proposing their application, structuring their spreadsheet or data base, entering the information, and demonstrating how their application utilized the capabilities of the spreadsheet and the data base.

In the final weeks of the course, students returned to the textbook to redo assignments which had been done previously with AppleWorks. The second time, however, they used different word processing, spreadsheet, and data base management programs. The instructor emphasized the common features of the different programs, and stressed that other application software would also contain many of the same features. Appendix E contains a course outline of the class.

Procedure

The researcher explained to the students that they would be involved in a project to compare the effects of the two computer classes but that their grade in the class would not be influenced by any findings. A letter explaining the project was given to each student. (See Appendix A.) The Iowa State University Committee on the Use of Human Subjects in Research reviewed this project and concluded that the rights and welfare of the human subjects were adequately protected, that the risks were outweighed by the potential benefits, that confidentiality of data was assured and that informed consent was obtained by appropriate procedures.

Both the Computer Confidence subscale and the CAIN were given to the students in both computer classes on their first day in class. An exception to this was three students in the application software class the second semester who had taken the programming class the first semester, reducing the sample size of that class to nineteen. There were also two students in the programming class who were not given the pretest and were not included in the data, reducing the sample size of that class to twenty-five. In addition to students in these classes, the tests were also given to forty-seven tenth, eleventh, and twelfth grade students during their study halls. These students were not in either class during the school year, and had their study halls at times when the researcher was in the high school building. Every tenth through twelfth grader in these study halls was asked to consent to taking the tests, and all who did so were given both tests.

On the last day of the semester in which the students would be in class, they were again given both tests. This applied both to students taking the computer classes and to those in study hall.

Data Analysis

The three groups of students were determined by choices which the students had made during class enrollment that took place the previous school year. By choosing to take Introduction to Computers, Computer Management Systems, or neither one, students determined which group they would be part of, as compared to being randomly assigned to one of the three groups, which was not possible. All students in each group who consented to take both tests were included in the study.

The CAIN was sent to Iowa State University where it was scored by computer. The Computer Confidence Test was scored as follows: Responses to the positively worded items (1, 4, 6, 7, and 9) were given four points for a response of "Strongly Agree", three points for "Slightly Agree", two points for "Slightly Disagree", and one point for "Strongly Disagree". For negatively worded items (2, 3, 5, 8, and 10), "Strongly Agree" responses were coded as 1, "Slightly Agree" as 2, "Slightly Disagree" as 3, and "Strongly Disagree" as 4. This strategy resulted in higher scores corresponding to higher confidence. Because each student took the same test as both a pretest and posttest, a t test of dependent samples was used to analyze the score of each student on both tests.

Summary

Students from the two high school computer classes and students who took neither class during the year were given a measure of computer confidence and one of computer anxiety. One of the high school classes was an introductory computer class which spent the semester learning BASIC, and the other spent the semester learning the use and applications of the electronic spreadsheet, word processor, and data base management. At the end of the semester, all students, both those in class and those who weren't, were again given the tests which measured computer confidence and computer anxiety.

CHAPTER IV. RESULTS

In this chapter, the results are reported as they related to each hypothesis. Each student in a BASIC programming class and in an application software class was given two tests on the first day of class, one to measure computer anxiety and one to measure computer confidence. The same tests were again given to each student on their last day in class. The tests given at the beginning of the class will be referred to as pretests, and those given at the end as posttests. The scores were analyzed using a dependent t-test. This was chosen because the study was more interested in changes within each group rather than across groups.

Testing the Hypotheses

Hypothesis 1: At the conclusion of the study, students enrolled in the application software class will show no change in the amount of anxiety which they exhibit toward computers.

There was no significant difference at the .05 level between the pretest and posttest on computer anxiety for the application software class. Therefore, hypothesis 1 failed to be rejected.

Table 1
Comparison between pretest and posttest computer anxiety scores for application software class

COMPUTER ANXIETY	N	MEAN	STANDARD DEVIATION	T-VALUE	2-TAILED PROBABILITY
				.219	.999
PRETEST	19	62.105	19.353		
POSTTEST	19	61.579	17.583		

As reported in Table 1, students scored lower on the posttest, which indicated lower computer anxiety. The mean on the pretest was 62.105, compared to a mean of 61.579 on the posttest. The scores on the pretest ranged from 34 to 101, and from 33 to 96 on the posttest. The standard deviations were large, with 19.353 on the pretest and 17.583 on the posttest.

Hypothesis 2: Students in the application software class will show no change in computer confidence scores.

Table 2
Comparison between pretest and posttest computer confidence scores for application software class

COMPUTER CONFIDENCE	N	MEAN	STANDARD DEVIATION	T-VALUE	2-TAILED PROBABILITY
				-1.590	.252
PRETEST	19	30.000	4.425		
POSTTEST	19	31.700	5.090		

There was no significant difference at the .05 level between the pretest and posttest for application software students on the test of computer confidence. Therefore, hypothesis 2 failed to be rejected.

Students scored higher on the posttest than the pretest, as indicated by Table 2, indicating an increase in their computer confidence. The mean was 30.000 on the pretest and increased to 31.700 on the posttest. The scores had a range of 22 to 37 on the pretest and ranged from 24 to 39 on the posttest. The standard deviation also increased from 4.425 on the pretest to 5.090 on the posttest.

Hypothesis 3: At the conclusion of the study, students enrolled in the BASIC programming class will show no change in the amount of anxiety which they exhibit toward computers.

Table 3
Comparison between pretest and posttest computer anxiety scores for BASIC programming class

COMPUTER ANXIETY	N	MEAN	STANDARD DEVIATION	T-VALUE	2-TAILED PROBABILITY
				.743	.999
PRETEST	25	59.920	17.041		
POSTTEST	25	58.360	17.661		

At the .05 level, there was no significant difference between pretest and posttest scores on the computer anxiety test for the programming class. Therefore, hypothesis 3 failed to be rejected.

As shown in Table 3, students in the programming class had lower scores, indicating less anxiety, on the posttest.

The mean of the pretest was 59.920, which dropped to 58.360 on the posttest. Scores on the pretest ranged from 28 to 98, while those on the posttest went from a low of 26 to a high of 109. Similar to the application class, the standard deviations were large, with 17.041 for the pretest and 17.661 for the posttest.

Hypothesis 4: Students in the programming class will show no change in computer confidence scores.

Table 4
Comparison between pretest and posttest computer confidence scores for BASIC programming class

COMPUTER CONFIDENCE	N	MEAN	STANDARD DEVIATION	T-VALUE	2-TAILED PROBABILITY
				-3.252	0.000 **
PRETEST	25	28.960	5.037		
POSTTEST	25	31.480	5.026		

** p < .01.

There was a significant difference at the .05 level between pretest and posttest scores of students in the BASIC programming class on the test of computer confidence. Therefore, hypothesis 4 is rejected.

Table 4 shows that the mean increased from 28.960 on the pretest to 31.480 on the posttest. The lowest score on the pretest was 21 and the highest score 37, while on the posttest the lowest score was 19 with a high score of 40. The standard deviations were 5.037 for the pretest and 5.026 for the posttest.

The two instruments were also administered to students who took neither class during the year. The following tables show those results.

Table 5
Comparison between pretest and posttest computer anxiety scores for students in neither computer class

COMPUTER ANXIETY	N	MEAN	STANDARD DEVIATION	T-VALUE	2-TAILED PROBABILITY
				-2.292	0.050
PRETEST	47	69.745	18.579		
POSTTEST	47	74.851	21.992		

The mean of the students in neither computer class went from 69.745 on the pretest to 74.851 on the posttest, with a higher score corresponding to higher anxiety. The group had a large range of scores, with a low score of 32 and a high score of 108 on the pretest, and a range going from a low score of 33 to a high score of 119 on the posttest. The standard deviations were also large, recorded by Table 5 as 18.579 for the pretest and 21.992 for the posttest.

Table 6
Comparison between pretest and posttest computer confidence scores for students in neither computer class

COMPUTER CONFIDENCE	N	MEAN	STANDARD DEVIATION	T-VALUE	2-TAILED PROBABILITY
				0.500	0.999
PRETEST	47	28.894	6.305		
POSTTEST	47	28.596	6.064		

The mean on the computer confidence pretest and posttest changed very little, with a mean pretest mean of 28.894

dropping to a mean of 28.596 on the posttest. The range of scores on the pretest was from 17 to 39, with scores on the posttest going from a low of 16 to a high of 38. The standard deviation on the pretest was 6.305 and that on the posttest was 6.064.

As a method of determining the degree of relationship between the scores on the pretest and the posttest, the Pearson product-moment correlation was used. The following table summarizes the values obtained.

Table 7
Correlation between pretest and posttest scores

GROUP	TEST	PEARSON R	T-VALUE	1-TAILED PROBABILITY
APPLICATION	CAIN	.843	6.468	<.001
SOFTWARE	CCT	.502	2.466	.023
BASIC	CAIN	.818	6.810	<.001
PROGRAMMING	CCT	.704	4.748	<.001
STUDENTS IN	CAIN	.729	7.140	<.001
NEITHER CLASS	CCT	.782	8.429	<.001

The results as recorded in Table 7 suggest that there exists a substantial positive correlation between the pretest and posttest scores for all three groups of students on both measures. Also, the probability of this correlation occuring by chance is less than .001 for all but the application software class on the Computer Confidence Test, when this probability of the correlation occuring by chance is .023.

The results as summarized in Table 8 show a substantial negative correlation between a student's scores on the

Computer Confidence Test(CCT) and the Computer Anxiety Index(CAIN), and that the probability of this occuring by chance is very low. This suggests that a student who has a high score in computer anxiety will also have a low score in computer confidence.

Table 8
Correlation between CCT and CAIN scores

GROUP	PEARSON R	T-VALUE	1-TAILED PROBABILITY
APPLICATION SOFTWARE	-.674	-5.693	<.001
BASIC PROGRAMMING	-.619	-5.456	<.001
STUDENTS IN NEITHER CLASS	-.774	-11.709	<.001

Overall Comparisons

In overall comparisons between the application software class and the BASIC programming class, the programming class showed indications of more positive affective consequences than did the application class. The programming class showed a decrease on the computer anxiety test from a mean score of 59.920 on the pretest to a mean score of 58.360 on the posttest. The application software class changed from a mean score of 62.105 on the pretest to a mean score of 61.579 on the posttest. Though both indicate less computer anxiety on the part of students, the drop in mean score for the programming class is 1.560, compared to a drop of only 0.526

for the application class, and neither is statistically significant.

Table 9
Summary comparisons between application software class and BASIC programming class

	APPLICATION SOFTWARE (MEAN)	BASIC PROGRAMMING (MEAN)
COMPUTER ANXIETY ON PRETEST	62.105	59.920
COMPUTER ANXIETY ON POSTTEST	61.579	58.360
DIFFERENCE IN SCORES (POSTTEST - PRETEST)	-0.526	-1.560
COMPUTER CONFIDENCE ON POSTTEST	31.700	31.480
COMPUTER CONFIDENCE ON PRETEST	30.000	28.960
DIFFERENCE IN SCORES (POSTTEST - PRETEST)	1.700	2.520

The change in the mean score for both classes on the computer confidence test also indicates a greater change for the programming class. The application software class went from a pretest mean of 30.000 to a posttest mean of 31.700, an increase of 1.700. On the other hand, the programming class had a pretest mean of 28.960 and a posttest mean of 31.480 for a positive change of 2.520.

When the scores of the students in neither computing class is included in a comparison, the students in both computer classes showed more improvement in both tests.

On the computer anxiety test, where a higher score corresponds to higher anxiety, both computer classes showed a decrease when the mean of the pretest was compared to the mean of the posttest, whereas the mean score of the students who took neither class increased from the pretest to the posttest. Table 10 also shows that the mean of those students in neither class on the computer confidence test decreased from the pretest to the posttest. In contrast, the mean of students in both computer classes shows an increase from the pretest to the posttest, with the increase for the programming class being statistically significant at the .05 level.

Table 10
Summary comparisons between application software, BASIC programming, and students in neither class

	APPLICATION SOFTWARE (MEAN)	BASIC PROGRAMMING (MEAN)	NEITHER CLASS (MEAN)
ANXIETY ON PRETEST	62.105	59.920	69.745
ANXIETY ON POSTTEST	61.579	58.360	74.851
DIFFERENCE IN SCORES (POSTTEST - PRETEST)	-0.526	-1.560	5.106
CONFIDENCE ON PRETEST	30.000	28.960	28.894
CONFIDENCE ON POSTTEST	31.700	31.480	28.596
DIFFERENCE IN SCORES (POSTTEST - PRETEST)	1.700	2.520	-0.298

Summary

Students who took either the application software class or the BASIC programming class showed less anxiety and greater confidence as recorded by the two measures. However, only the change in computer confidence of those students in the programming class was significant, with other results showing little change. When compared with the mean scores of students who took neither class, the mean scores of students who took the computer classes showed change in the opposite direction.

CHAPTER V. SUMMARY, RECOMMENDATIONS, AND CONCLUSION

Summary

The purpose of the study was to determine whether the enrollment of high school students in computer classes would have any affective results. More specifically, the study attempted to determine whether the teaching of BASIC programming or the teaching of the use of application software to the students would change their computer anxiety or computer confidence.

The experimental population consisted of ninety-six tenth, eleventh, and twelfth graders enrolled in a high school in Hartley, Iowa. The students were those who had chosen to take a BASIC programming class, an application software class, or those who took neither class during the 1985-1986 school year. All but five of the students took a test measuring computer anxiety and a test measuring computer confidence at the beginning of the semester, and took each test again at the end of the semester.

Although the differences were not statistically significant for those students in the application software class, the mean score for computer anxiety did decrease and the mean score for computer confidence increased (see Tables 1 and 2).

For the BASIC programming class, the mean score on the computer anxiety posttest was lower than the mean score on the pretest, although this decrease was not statistically significant (see Table 3). However, there was a statistically significant increase of the mean score on the computer confidence test for the BASIC programming class (see Table 4).

On both the computer anxiety test and the computer confidence test, the change in the mean score of those students in neither class was in the opposite direction of those students who were taking a computer class. The mean score on the computer anxiety test of students taking neither class increased and the mean score on the computer confidence test decreased very slightly (see Tables 5 and 6). Neither change was statistically significant.

Implications

Students in both computer classes showed a decrease in computer anxiety and an increase in computer confidence during the semester. During this same time, students in neither class showed an increase in computer anxiety and a decrease in computer confidence. While only the increase on the mean score of the computer confidence test by those students in the BASIC programming class was statistically significant, the changes toward less computer anxiety and more computer confidence by the students in computer classes (see Table 10) indicates that computer classes can have a positive affective influence on students taking those classes.

Though both computer classes showed positive changes in both computer anxiety and computer confidence, only the change in the mean score of the BASIC programming class on the computer confidence test was statistically significant. This might be partially attributed to the facts that the application software class had only nineteen students involved compared to twenty-five for the BASIC programming class, and the application software class had a higher mean score on the computer confidence pretest than did the BASIC programming class (see Table 9). The higher mean score for the students in the application software class was very possibly due to the fact that sixteen of those nineteen students had completed a one-semester class in programming prior to taking the application software class.

The mean score of the application software class also reflects that the students were not particularly anxious about using computers. In norm group characteristics of the CAIN, the mean score for college students was 70.2 (Montag, Simonson, & Maurer, 1984, p. 24), whereas the pretest score for the application software class was 62.105 and the posttest mean score was 61.579 (Table 9). Because of the smaller number of students, the relatively low amount of computer anxiety, and the higher mean score on the computer confidence test, it would be more difficult to show a statistical difference between the pretest and posttest means. Given the difficulty of showing a statistically significant difference in the application software class, an attempt to imply that the BASIC programming class is superior to the application software class in producing positive affective consequences in students would be overstated.

However, the statistically significant increase in the mean score on the computer confidence test of students in the BASIC programming class should not be dismissed because of the difficulty of showing a statistically significant increase for the application software class. The task of learning a programming language, even within a computer literacy class, can be hard and discouraging. But even given the difficulty of the task of learning BASIC, students can still benefit positively in an affective way from the experience of learning BASIC. Luehrmann (1984) argues that learning a programming language gives the student the ability to do something constructive with a computer, rather than merely a general awareness of facts about computers. The ability to control a computer, whether in a programming class or in an application software class, removes much of the mystery surrounding the computer and can result in an increase in the student's confidence and a decrease in their anxiety with respect to using computers.

Recommendations

The BASIC programming class showed a statistically significant increase by students in their computer confidence scores. However, some topics such as graphics and jobs with computers are not covered in all classes in BASIC programming. Other topics such as arrays were not covered in this class but are covered in other classes in BASIC programming. The method of teaching BASIC from class to class also varies widely, from a discovery method to the more traditional lecture method. More study needs to be done to further isolate what particular attributes of this class contributed to an increase in the computer confidence of the students.

The BASIC language has been the subject of strong criticism by computer scientists because of its unstructured nature. If other computer languages could produce positive affective changes in students while at the same time providing a better example of structured programming, their use would be advantageous to that of BASIC. Studies need to be done to establish this.

Another area for more study is to determine why the students in the application software class showed no statistically significant change in either computer anxiety or computer confidence. Could it be attributable to the methodology of the particular class and software used, or are factors involved which can be widely generalized?

The final recommendation coming from the study would be to more closely examine students from both classes. Within each class, there were students who exhibited change markedly different from the rest of the class. The statistics and methods used in this study carry implications only when looking at the students as a group. A study which concentrates on these individuals who showed large changes, either positive or negative, might help educators to better understand why those changes occurred.

Conclusion

As the number of microcomputers in schools increases, the options of how the schools will use the microcomputers also increases. From a time when the limited availability of computers precluded the offering of any computer class other than programming, schools have moved to an era where the number of microcomputers in schools have made the offering of other classes in computers a real possibility.

If classes in computers increase and in some schools and states become required, teachers will face more students who may have misgivings about computer use. Research has shown that the student's previous experience on computers may be a factor in producing feelings of anxiety toward using computers. When such feelings do occur in students, the teacher must consider ways to foster more positive attitudes toward computers by the students.

Previous research has looked at the effect on attitudes toward computers which different methods have produced. These methods have included teaching students about application software and programming in the BASIC language. Other studies have tried to determine what changes the use of computer simulations and computer games would make in students attitudes toward computers.

This study chose to look at the changes in computer anxiety and computer confidence of students in an application software class, a BASIC programing class, or in neither class. Though only the change in computer confidence of the programming class was statistically significant, the students in the computer classes exhibited a decrease in anxiety and an increase in confidence while the students who took neither class showed an increase in anxiety and a decrease in confidence. This supports those studies and articles which present classes in programming and application software as a means of promoting more positive attitudes and decreasing anxiety.

As educators face the opportunity and challenge of increasing computer offerings in the schools, they should always be guided by what is best for the students. In the decision of what computer classes should be offered, the affective consequences on the students of those computer classes should be taken into consideration. Proponents of classes which teach students about computers and proponents of classes which teach students to use computers as tools should both realize that the focus of any computer class should be how the student is changed, both affectively and cognitively.

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APPENDIX A

LETTER TO THE STUDENT

To the student:

During the 1985-1986 school year, Hartley-Melvin Community Schools and Iowa State University College of Education will conduct a research project. Students in Introduction to Computers and Computer Management Systems will participate in the project. The purpose of this project will be to look at some differences between the effects of the two classes.

You will be given two tests. I would like to use the resulting scores in my graduate work. All scores will be confidential, and will in no way affect your grade for the class.

To consent to taking the tests and the use of the results of the tests, please sign below and return to me.

Your signature

APPENDIX B

COMPUTER CONFIDENCE TEST

SURVEY OF ATTITUDES TOWARD LEARNING ABOUT AND WORKING WITH COMPUTERS

Brenda H. Loyd and Clarice P. Gressard
University of Virginia

The purpose of this survey is to gather information concerning people's attitudes toward learning about and working with computers. All responses are kept confidential. Please return the survey to your instructor when you are finished.

1. Name ____

2. Grade ____

3. Sex: ( ) Male ( ) Female

4. Experience with learning about or working with computers:
   ( ) 1 week or less ( ) 6 months to 1 year
   ( ) 1 week to 1 month ( ) 1 year or more
   ( ) 1 month to 6 months

   Briefly state the type of computer experience:____________________________

COMPUTER ATTITUDE SCALE

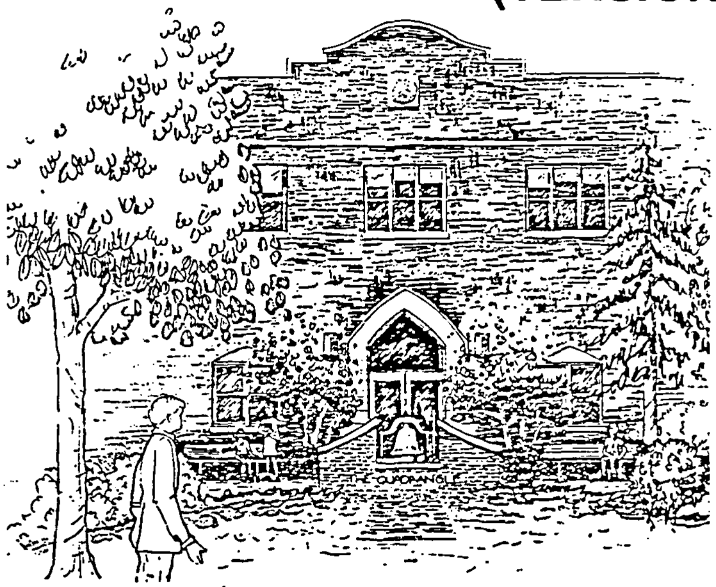
Below are a series of statements. There are no correct answers for these statements. They are designed to permit you to indicate the extent to which you agree or disagree with the ideas expressed. Place a check mark in the parentheses under the label which is closest to your agreement or disagrement with the statements.

	Strongly Agree	Slightly Agree	Slightly Disagree	Strongly Disagree
1. Generally, I would feel OK about trying a new problem on the computer.	( )	( )	( )	( )
2. I don't think I would do advanced computer work.	( )	( )	( )	( )
3. I'm no good with computers.	( )	( )	( )	( )
4. I have a lot of self-confidence when it comes to working with computers.	( )	( )	( )	( )
5. I do not think I could handle a computer course.	( )	( )	( )	( )
6. I could get good grades in computer courses.	( )	( )	( )	( )
7. I am sure I could learn a computer language.	( )	( )	( )	( )
8. I'm not the type to do well with computers.	( )	( )	( )	( )
9. I am sure I could do work with computers.	( )	( )	( )	( )
10. I think using a computer would be very hard for me.	( )	( )	( )	( )

APPENDIX C

COMPUTER ANXIETY INDEX

COMPUTER OPINION SURVEY
(VERSION AZ)



by
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Directions: •Use black lead pencil only.
•Do *not* use ink or ballpoint pens.
•Make heavy black marks that fill the circle completely.
•Erase cleanly any answer you wish to change.
•Make no stray marks on the answer sheet.

Name: Last, First, and middle initial - (Fill in the circles, too.)

Sex: Male or Female

Grade: Your grade in school (Example: Senior in High School = 12)

Birth Date: Month, Day, Year (fill in circles)

Special Codes:

K. Have you ever taken a course in computer literacy and/or computer programming?
1 = no
0 = yes

L. If your reponse to question K was yes, how many semesters of total course work in computer literacy have you had?
0 = less than a full semester
1 = one semester
2 = two semesters
3 = three semesters
4 = four semesters
5 = five semesters
6 = six semesters
7 = seven semesters
8 = eight semesters
9 = nine semesters

TURN TO THE BACK OF THIS PAGE AND CONTINUE.

COMPUTER OPINION SURVEY

Instructions: Please indicate how you feel about the following statements. Use the scale below to indicate your feelings. Mark the appropriate circle on the answer sheet.

1 = Strongly agree
2 = Agree
3 = Slightly agree
4 = Slightly disagree
5 = Disagree
6 = Strongly Disagree

1.	Having a computer available to me would improve my productivity.	1	2	3	4	5	6
2.	If I had to use a computer for some reason, it would probably save me some time and work.	1	2	3	4	5	6
3.	If I use a computer, I could get a better picture of the facts and figures.	1	2	3	4	5	6
4.	Having a computer available would improve my general satisfaction.	1	2	3	4	5	6
5.	Having to use a computer could make my life less enjoyable.	1	2	3	4	5	6
6.	Having a computer available to me could make things easier for me.	1	2	3	4	5	6
7.	I feel very negative about computers in general.	1	2	3	4	5	6
8.	Having a computer available to me could make things more fun for me.	1	2	3	4	5	6
9.	If I had a computer at my disposal, I would try to get rid of it.	1	2	3	4	5	6
10.	I look forward to a time when computers are more widely used.	1	2	3	4	5	6
11.	I doubt if I would ever use computers very much.	1	2	3	4	5	6
12.	I avoid using computers whenever I can.	1	2	3	4	5	6
13.	I enjoy using computers.	1	2	3	4	5	6
14.	I feel that there are too many computers around now.	1	2	3	4	5	6
15.	Computers are probably going to be an important part of my life.	1	2	3	4	5	6
16.	A computer could make learning fun.	1	2	3	4	5	6
17.	If I were to use a computer, I could get a lot of satisfaction from it.	1	2	3	4	5	6
18.	If I had to use a computer, it would probably be more trouble than it was worth.	1	2	3	4	5	6
19.	I am usually uncomfortable when I have to use computers.	1	2	3	4	5	6
20.	I sometimes get nervous just thinking about computers.	1	2	3	4	5	6
21.	I will probably never learn to use a computer.	1	2	3	4	5	6
22.	Computers are too complicated to be of much use to me.	1	2	3	4	5	6
23.	If I had to use a computer all the time, I would probably be very unhappy.	1	2	3	4	5	6
24.	I sometimes feel intimidated when I have to use a computer.	1	2	3	4	5	6
25.	I sometimes feel that computers are smarter than I am.	1	2	3	4	5	6
26.	I can think of many ways that I could use a computer.	1	2	3	4	5	6

APPENDIX D

INTRODUCTION TO COMPUTERS COURSE OUTLINE

INTRODUCTION TO COMPUTERS COURSE OUTLINE

I. Course Introduction and Taking Control of the Computer-10 days
   A. Class policies, prodecures, and grading scale
   B. The computer in your life
   C. Getting started
   D. Communicating with your computer
   E. Reading and changing program lines and statements
   F. Writing a program and saving it
   G. Creating patterns with the PRINT statement
   H. Writing and saving a design program

II. How Programs Work-8 days
   A. A model of the computer
   B. Designing your own HELLO program
   C. System programs: LIST and NEW
   D. Block editing and output control
   E. The RUN program
   F. Programming with REM, SPEED=, INVERSE, FLASH, and NORMAL
   G. The parts of real computers

III. Computer Graphics-6 days
   A. Introduction to graphics
   B. How graphics work
   C. Graphics project - student designs
   D. Computers for art and entertainment

IV. Software Tools: Subroutines-10 days
   A. Packaging statements
   B. Reading and changing programs with subroutines
   C. Top-down programming
   D. Practice with subroutines
   E. How GOSUB and RETURN work
   F. Exploring subroutine bugs
   G. The model computer and subroutine bugs
   H. Reading complex programs
   I. Subroutines: tools for thinking

V. Naming Things: Data and Variables-10 days
   A. Similar subroutines
   B. Why variables are needed
   C. Exploring variables
   D. How variables work
   E. Input and processing data
   F. How input and processing work
   G. Projects with variables and input
   H. The information machine

VI. Control Statements, Numbers, and Functions-10 days
   A. Changing statement order
   B. How the GOTO statement works
   C. Exploring numbers
   D. How numbers work
   E. Exploring functions
   F. How functions work
   H. A new kind of jump
   I. How the IF statement works

VII. Control Blocks: The Loop-11 days
   A. Programs with loops
   B. Structure of the loop block
   C. Programming project: loops
   D. Flowgraphs and counting loops
   E. Programming project: graphics
   F. What computers do well
   G. FOR/NEXT loop abbreviations
   H. How the FOR and NEXT statements work
   I. Programming project: FOR/NEXT loops

VIII. Control Blocks: The Branch-7 days
   A. Structure of the branch block
   B. Exploring the branch block
   C. Nesting program blocks
   D. Programming project: nested blocks
   E. Empty branches
   F. Programming project: empty branches

IX. Putting It All Together-8 days
   A. Playing a game
   B. Entering the program
   C. Designing the subroutines
   D. Entering the subroutines
   E. Refining the program
   G. Final changes
   H. Computers and work

X. Programming Project-8 days
   A. Program description
   B. The main routine
   C. Skeleton subroutines
   D. Designing the subroutines
   E. Entering the subroutines
   F. Debugging and refining the program

APPENDIX E

COMPUTER MANAGEMENT SYSTEMS COURSE OUTLINE

COMPUTER MANAGEMENT SYSTEMS COURSE OUTLINE

I. Overview-.5 week
   A. Class policies, procedures, and grading
   B. Hardware
   C. Software

II. Word Processor-5.5 weeks
   A. Creating a document
   B. Modifying a document
   C. Formatting a document
   D. Student project

III. Data Base-5 weeks
   A. Designing
   B. Creating and modifying
   C. Using
   D. Printing reports
   E. Advanced features
   G. Student project

IV. Spreadsheet-5 weeks
   A. Designing
   B. Creating and modifying
   C. Using
   D. Printing
   E. Advanced features
   F. Student project

V. Integrated Applications-.5 week
   A. Word processor files
   B. Data base and spreadsheet files with the word processor
   C. Data base and spreadsheet files

VI. Other programs-1.5 weeks
   A. Word processing
   B. Data base
   C. Spreadsheet