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ABSTRACT

Since the fall of 1985, teacher education students in the state of Texas have been required to take a computer literacy course as part of their certification requirements. Since 1986, students entering into Texas Tech University's College of Education's computer literacy course (EDIT 2318) have been surveyed each fall semester. The purpose of this study was to examine the survey results for trends. The major findings of the study were an increase in the positive attitude among the students toward computers and a corresponding increase in their perception of their own computer-related skills. However, a significant correlation was found between gender and computer-related skills and attitudes toward computers, and it was recommended that an attempt be made to incorporate strategies to alleviate this difference in the course. A copy of the survey questionnaire is appended. (18 charts, 21 references) (Author/BBM)

Five Year Trends in Computer Students' Attitudes and Skill-Levels

By

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December 1990

CONTENTS

ABSTRACT

Since the fall of 1985, teacher education students in the state of Texas have been required to take a computer literacy course as part of their certification requirements. Since 1986, students entering into Texas Tech University's College of Education's computer literacy course (EDIT 2318) have been surveyed each fall semester. The purpose of this study was to examine the survey results for trends. The major findings of the study were an increase in the positive attitude among the students toward computers and a corresponding increase in their perception of their own computer-related skills.

INTRODUCTION

Technological innovations in the 1970's directly let to the development of the microcomputer. The introduction of the microcomputer helped speed the transition of our society from the industrial age to the information age (Naisbett, 1982). As this transition became more evident in the late 1970's and early 1980's, an increasing number of schools began purchasing microcomputer hardware (Brunson, 1988). With the 1983 publication of A Nation at Risk (National Commission on Excellence in Education), which recommended the addition of a one-half year computer science course on the high school level, the outlay of monies by public schools for microcomputers significantly increased (Brunson, 1988).

Even as microcomputers were being rapidly introduced into the public schools during the mid-1980's, questions about their effectiveness in enhancing the educational process began to appear. Tetenbaum and Mulkeen (1984) identified the lack of teacher training as a major barrier to the successful implementation of computer technology in the schools.

In 1984, as the legislature of the state of Texas considered, and later enacted, a series of bills which would establish specific requirements for the teaching of computer

literacy courses on the junior high and high school levels, new teacher certification standards were also considered. To facilitate the educational uses of computer technology in the public schools, the legislature included a three hour computer literacy course in the new teacher certification standard (Texas Administrative Code, 1989).

At the junior high level, the state mandate (effective June 1984) required that in either grade seven or grade eight, a one-half unit of computer literacy had to be taught, covering the essential elements of (Texas Administrative Code, 1989):

1. Computer-related terminology and use
2. History and development of computers
3. Using the computer as a tool (applications oriented)
4. Communicating instructions to the computer
5. Problems and issues of computer use in the society

For the high school level, the taking of a computer literacy course was not required in order to receive a general high school diploma. Students wishing to complete an advanced high school program (college prep) were required to complete one unit in computer science-related courses.

The one-unit could be selected from a variety of course offerings, which included (Texas Administrative Code, 1989):

1. Computer mathematics I or II
2. Business computer applications and business computer programming I
3. Business computer applications I or II
4. Business computer programming I or II
5. Advanced word processing
6. Computer science I or II
7. Business information processing
8. Microcomputer applications

The new teacher certification requirement was mandated for students graduating in the spring of 1986 and thereafter. Colleges and universities in the state of Texas that offered teacher certification were obligated to begin offering courses to meet the new standard by the fall of 1985.

The certification requirement called for three semester hours in "computing and information technology (including societal and ethical implications, and proficiency in use as productivity tools)." (Texas Administrative Code, 1989)

A pilot course, meeting the proposed guidelines set by the Texas Education Agency, was implemented at Texas Tech University in 1984. In 1985 the course, known as EDIT 2318-Computers and Technology, was fully incorporated into the teacher education curriculum.

Starting in 1986, a 37-question survey has been administered at the beginning of each fall semester to the

students in EDIT 2318. The purpose of this study is to examine the results of the surveys conducted from 1986 through 1990 in order to determine if the state mandated junior high and high school computer literacy courses are impacting the entry-level attitudes and perceived computing skills of the students in EDIT 2318.

REVIEW OF LITERATURE

Computer anxiety is defined as "fear of impending interaction with a computer that is disproportionate to the actual threat presented by the computer," (Howard, 1986, p. 18). In a study conducted by Howard, Murphy and Thomas (1987, p. 13), it was "found that approximately one-third of the students entering an introductory computer course had seriously high levels of computer anxiety." Miura (1987) stated that negative attitudes towards computers may be linked to a lack of experience working with computers.

Students majoring in education were found to be less positive about computers, and attributed less value to computers in providing beneficial effects, than business majors (Violata, et al., 1989). Only 29% of the education majors in a nationwide survey considered themselves prepared to teach with computers (Fulton, 1988), while a majority of student teachers surveyed viewed computers as unimportant (Stevens, 1982).

Stevens (1982) reported that practicing teachers and teacher educators were more comfortable with computer technology than were student teachers. But Smith (1987) found that even though practicing teachers generally made positive statements about computers, they were much less positive concerning their own use of computers. Violata et

al. (1989) stated that the value teachers place on computers may be an important factor in how successful computer technology is implemented in the classroom.

With the state of Texas mandating the teaching of computer literacy at the junior high and high school levels, and the general trend toward increased use of the computer in elementary and secondary schools, teacher attitudes toward computers and their confidence in their computing skills will probably play a crucial role in how successfully the mandate is implemented.

Clement (1981) reported that college students in general have a more positive attitude toward computers than education majors in particular. Thus it would seem critical that in order to improve the prospects of graduating a future corp of computer-literate, computer-comfortable teachers, efforts must be made to increase the computing knowledge- and comfort-levels of education majors.

In a study conducted by Howard et al. (1987), it was hypothesized that the computer knowledge and computer experience gained by students from a computer literacy course brought about a reduction in computer anxiety. Koohang (1986) found that computer experience was significantly related to a more positive attitude. In 1987, Koohang, along with Byrd, found that the more extensive the

computer experience, the more positive was the student in the perceived usefulness of computers. Finally, in a survey conducted by Durndell et al. (1987), the findings indicated a positive correlation between attitude toward computing and experience with computers.

METHOD

Subjects

Beginning in 1986, students enrolled in EDIT 2318 participated in the survey. The number of students included in the survey each year is shown in the table below.

Year	Number of Students
1986	125
1987	203
1988	178
1989	569
1990	289

The classification of the students ranged from freshmen through graduate students. While most of the students were enrolled in EDIT 2318 in order to fulfill the computer literacy requirement for teacher certification in Texas, the course also included a significant number of students who were taking the course in order to complete the technology requirement of the Texas Tech general education curriculum.

Procedure

The survey was conducted during a class period at the beginning of each fall semester. A three page questionnaire was used, with the students marking their responses on an answer sheet (see Appendix A).

The first three questions asked the students to state their classification, sex, and age group. Questions 4 and 5

dealt with the number of semester hours and short courses the students had previously taken. Based on these two questions, question 6 asked the students to specify what type of courses, if any, in which they had been enrolled in the past.

In order to find out how often students used a computer outside of a class setting, and the type of activity for which they employed the computer, questions 7 through 9 asked students if they had worked directly with computers for more than 40 total hours, if they used a computer on a regular (at least weekly) basis, and the primary activity for which they used the computer.

Question 10 asked students if they thought they would be using the computer on a regular basis the future.

The last two general questions, numbers 11 and 12, asked students to specify what they would most like to learn about computing and in what setting that learning experience should take place.

To evaluate the students' attitudes toward the computer, a set of eight pairs of word extremes were listed, prefaced by the question, "What is a computer more like?" For example, word pairs such as friend/foe and hard/soft were presented.

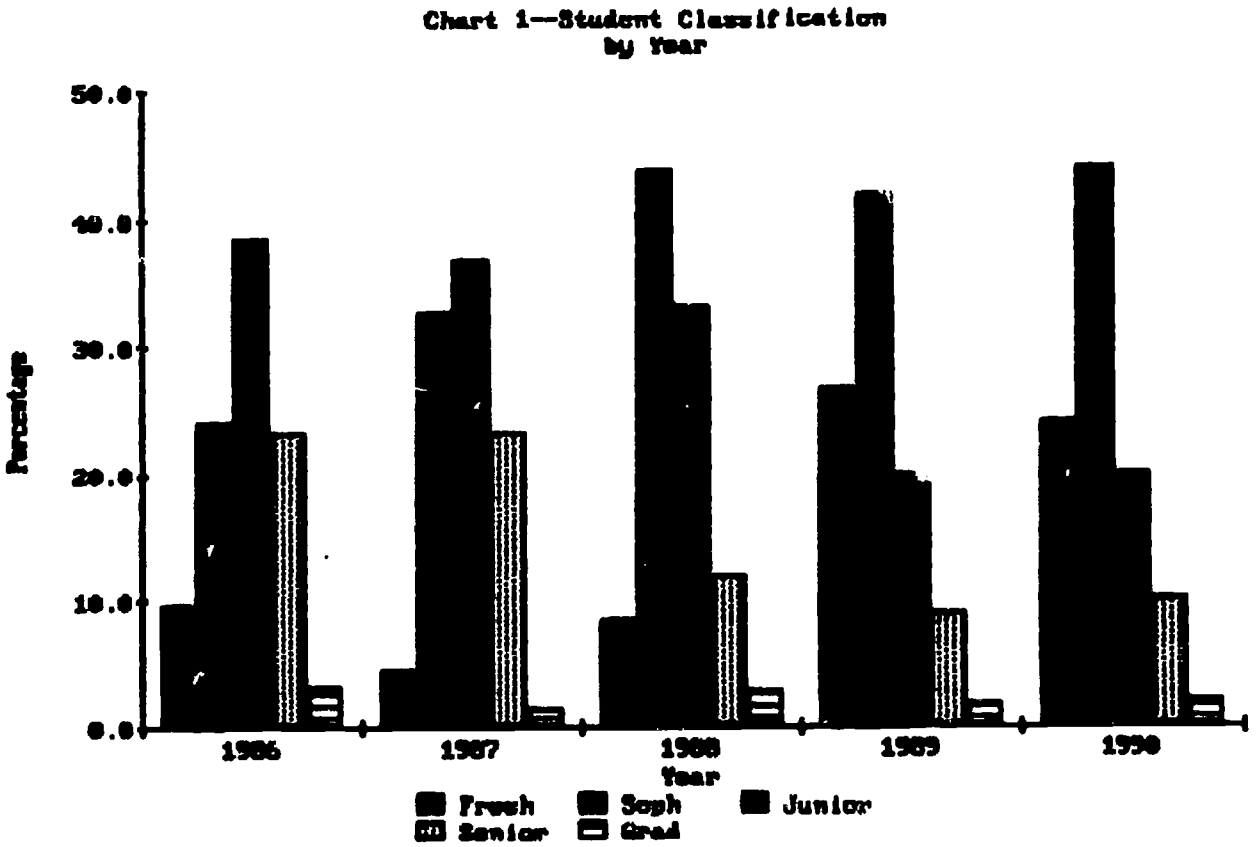
The final section of the survey asked the students to rate their present ability level in specific computer-related skill areas. The scale used ranged from A to D (A, little or no skill; B, somewhat skilled; C, moderately skilled; D, proficient).

Analysis of the results of the surveys was limited to the extent that only total counts of student responses to each question were available for the years 1986, 1987, and 1988. Only the years 1989 and 1990 had available the specific responses of each student to the questions. Due to this limitation, a correlation analysis was conducted on the general data available from the five surveys. The focus of this paper will thus be on the significant changes evident in the mean responses of students to the questions over the five year span of the survey.

ANALYSIS OF THE FIVE YEAR TRENDS

The first year of the survey indicated that the mean classification for the students enrolled in EDIT 2318 was 2.862 (based on 1 for freshmen and 5 for graduate students). In the succeeding years, the survey results showed a marked trend toward enrollment in the course by freshmen and sophomores. The mean classification actually hit its low point in 1989 at 2.167. The 1990 survey indicated that the mean classification had risen to 2.208, though the change was not statistically significant ($p>.05$). When grouped together, the freshmen and sophomores comprised 33.6% of the class in 1986, whereas by 1990 they represented 68.0% of the students in EDIT 2318.

The classification trend (see Chart 1), though indicating that EDIT 2318 is being taken earlier in the students' college careers, does not clearly provide information on the impact of elementary and secondary computer courses on the entry level skills and attitudes of the students. With the widespread introduction of microcomputers in the workplace during the 1980s, along with a significant increase in non-traditional students enrolling in college, the changes in skill levels and attitudes the students have upon entry into EDIT 2318 (which will be



discussed later) may be influenced more by forces outside of the formal education setting.

Question number three of the survey asked students to place themselves in one of four age categories: 1) 18 or under; 2) 19-20; 3) 21-22; and 4) over 22. In 1986, the mean age category of the students was 2.769, with 21-22 as the modal age.

The 1990 survey indicated that the modal age had dropped to the 19-20 year old group. The mean age category had also decreased to 2.280. What is more significant was the sudden drop in mean age over the past two years. By

combining the 1986, 1987 and 1988 results, the mean age was found to be 2.700. The combined 1989 and 1990 mean age of 2.311 indicated a sudden rise in younger students taking EDIT 2318. Whereas in 1986, 59.2% of the students were 21 and over, by 1990, 69% were 20 years old and younger. Thus, non-educational influences on the changing nature of the students' skill levels and attitudes would seem to be minimal, based on the assumption that most younger students have had little exposure to work-related computer usage.

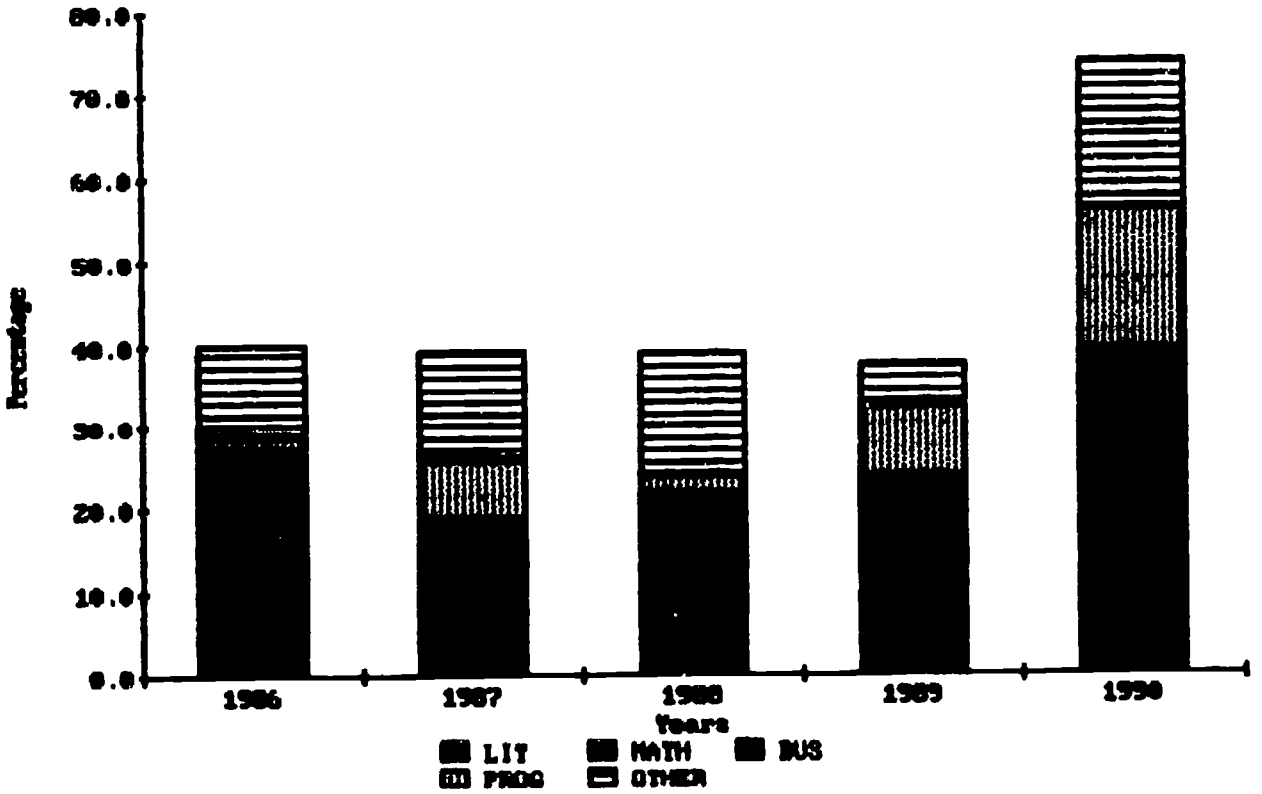
Over the years that the survey has been conducted, the number of computer related formal and informal courses that the students had previously taken, steadily increased. In 1986, 12.8% of the students had taken one or more short courses in computing. By 1990, the percentage had increased to 17%. During the same period, the percentage of students having been enrolled in a semester computer course had almost doubled, from 14.4% to 28%. The majority of the increase (72%) was due to the increased number of students having had exposure to more than one semester course.

Survey question number six asked the students who have had a previous computer course (in either junior high, high school or college) to indicate the focus of the material presented in the course(s). Allowing for more than one answer, the students could chose from computer literacy,

computer math, business applications, programming, or other. From 1986 to 1989, the percentage of students having had previously taken a computer literacy course had held steadily at 10.4%. In 1990, the percentage almost doubled to 20%.

Enrollment in computer math courses dropped from 14.4% of the students in 1986 to 10% in 1990 (see Chart 2). This may indicate a trend toward course work in other computer-related areas. Over the same period of time, the percentage of the students who had previously taken a business application course increased from 2.4% to 9%. More

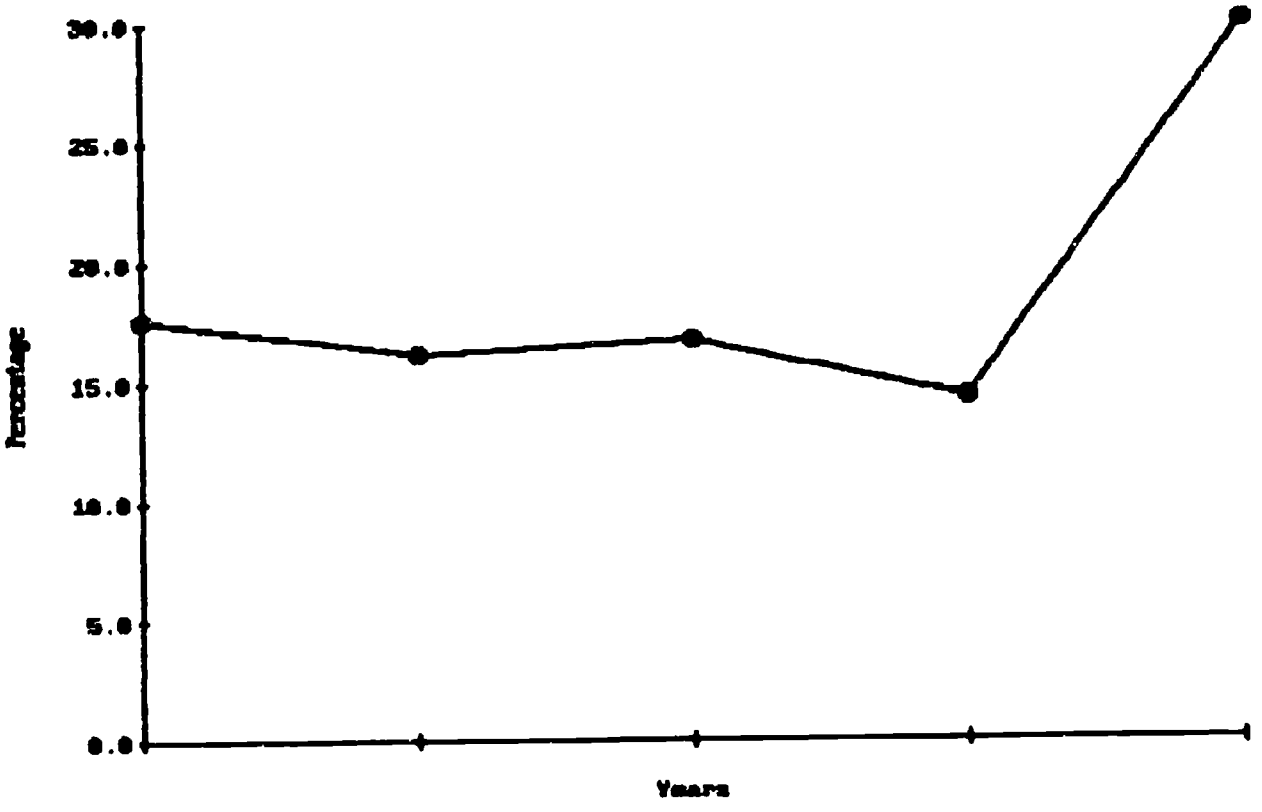
Chart 2—Types of Computer Courses



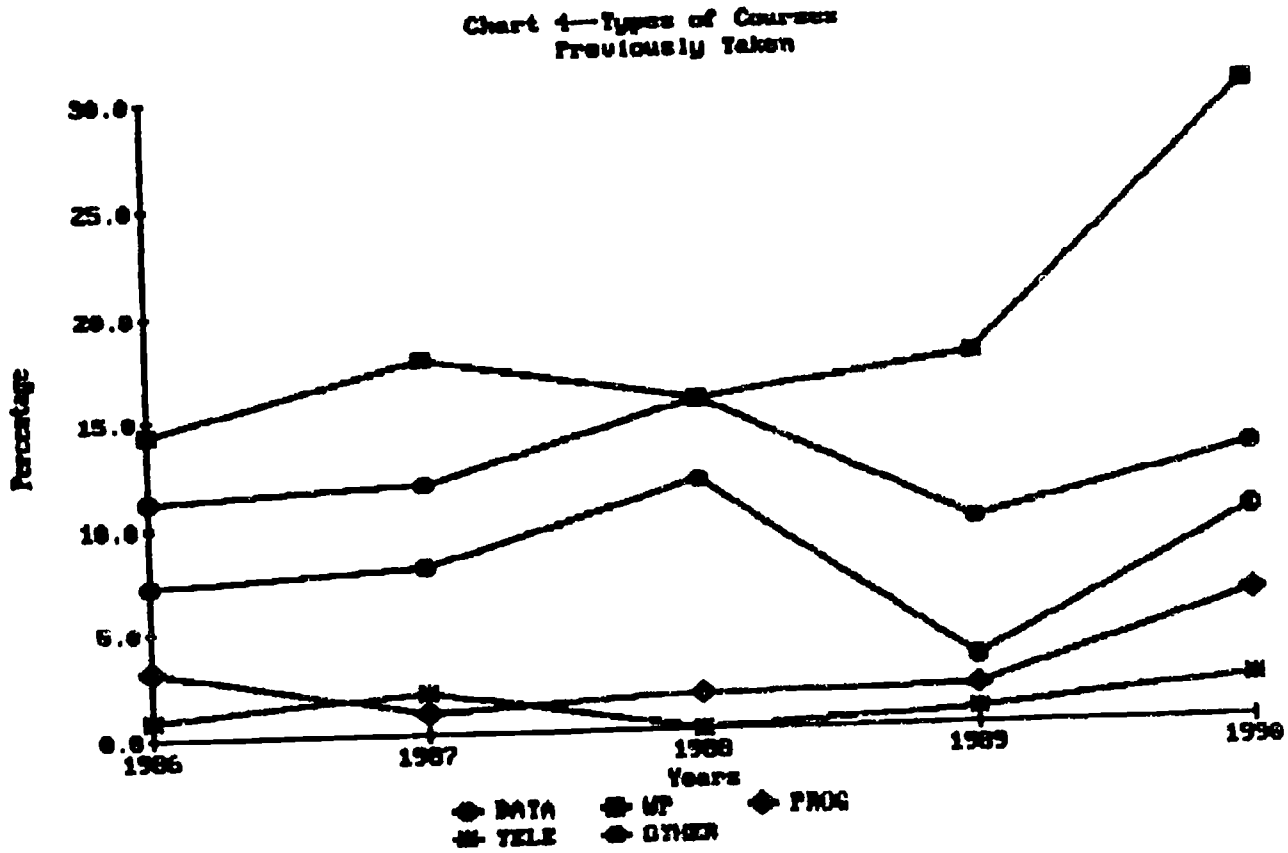
significantly, the number of students with some programming background had increased over 1000%; from 1.6% to 17%, with the percentage almost doubling from 1989 to 1990 alone.

While student exposure to computers has increased over the five years of the survey, their use of computer technology on a regular basis in the home, at work, or at school, held fairly steady from 1986 to 1989. The results of the 1990 survey indicated a sharp increase in the regular usage of computers--from a low of 14.4% of the students in 1989 to 30% in 1990 (see Chart 3). Most of this increase can be attributed to the significant rise in the percentage

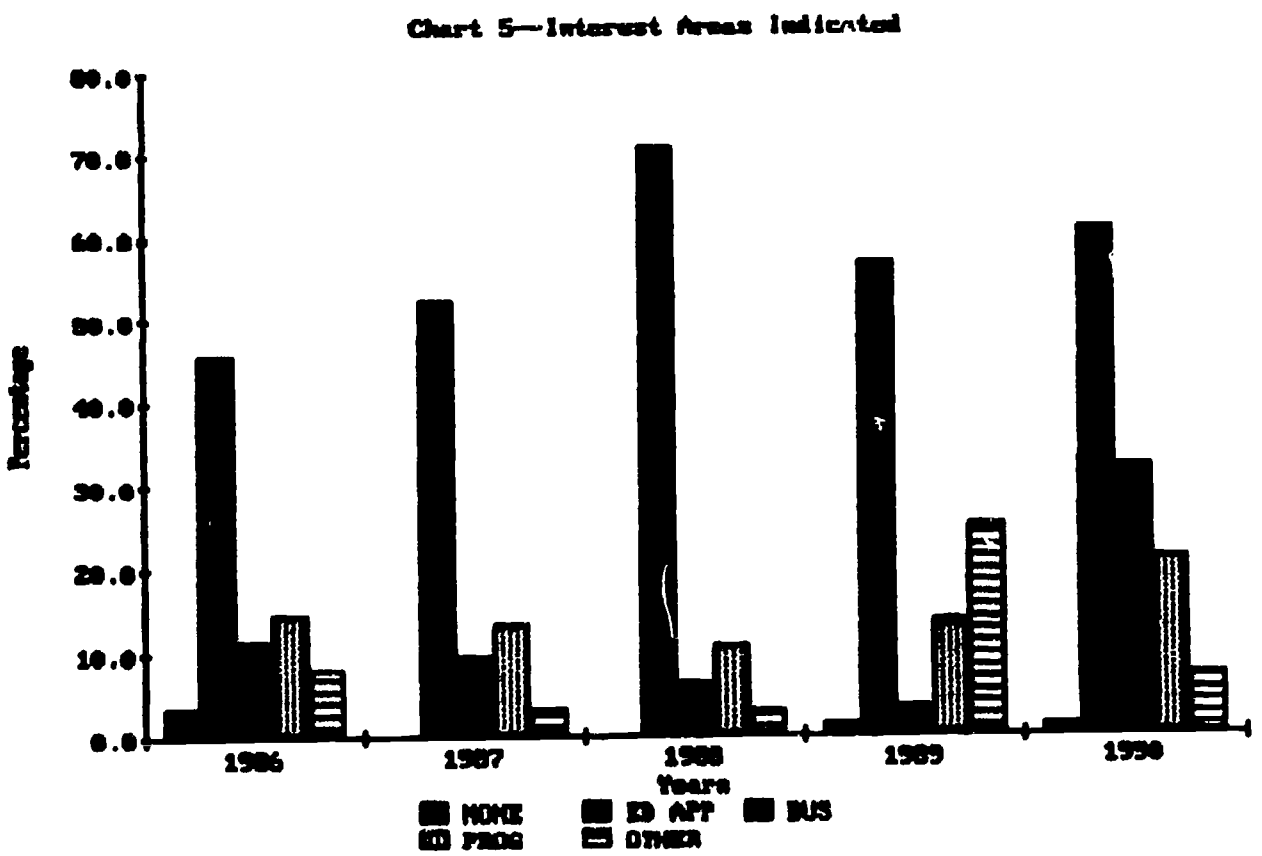
Chart 3—Regularly Use a Computer



of students using computers for word processing (17.6% in 1989 to 30% in 1990) (see Chart 4), which generally is one of the major pieces of software students encounter in computer literacy and business application courses.



When asked to indicate what they would most like to learn about computing, the students were given five areas from which to choose: nothing, educational applications, business applications, programming, others. As would be expected, educational applications have been the major choice over all five years (see Chart 5). The areas of choice have fluctuated somewhat over the years, but 1990



indicated a significant increase in interest in learning about business applications and programming. This interest may possibly be attributed to the groundwork laid in previous computer courses.

Survey questions 13 through 20 asked the students to choose between pairs of adjectives, which word they would associate with a computer. The set of questions started out with: "Which is a computer more like?" Of the eight sets of choices, six are discussed here because of their relevance to evaluating student attitudes toward computers. The other six choices are: friend/foe, soft/hard, savior/threat,

pleasure/pain, solution/puzzle, and messiah/monster. The choices were combined to produce the following table:

Year	% Word 1	% Word 2	Mean
1986	56.5%	43.5%	1.435
1990	62.0%	38.0%	1.380

Though the 1990 change in percentage was not large, the change in the mean was significant, near the .001 level. Overall, this would indicate the development of a more positive attitude toward computers on the part of the students enrolled in EDIT 2318.

The three charts displayed on the following pages best illustrate specific trends toward viewing the computer more as a helpful tool, and less as a menacing device.

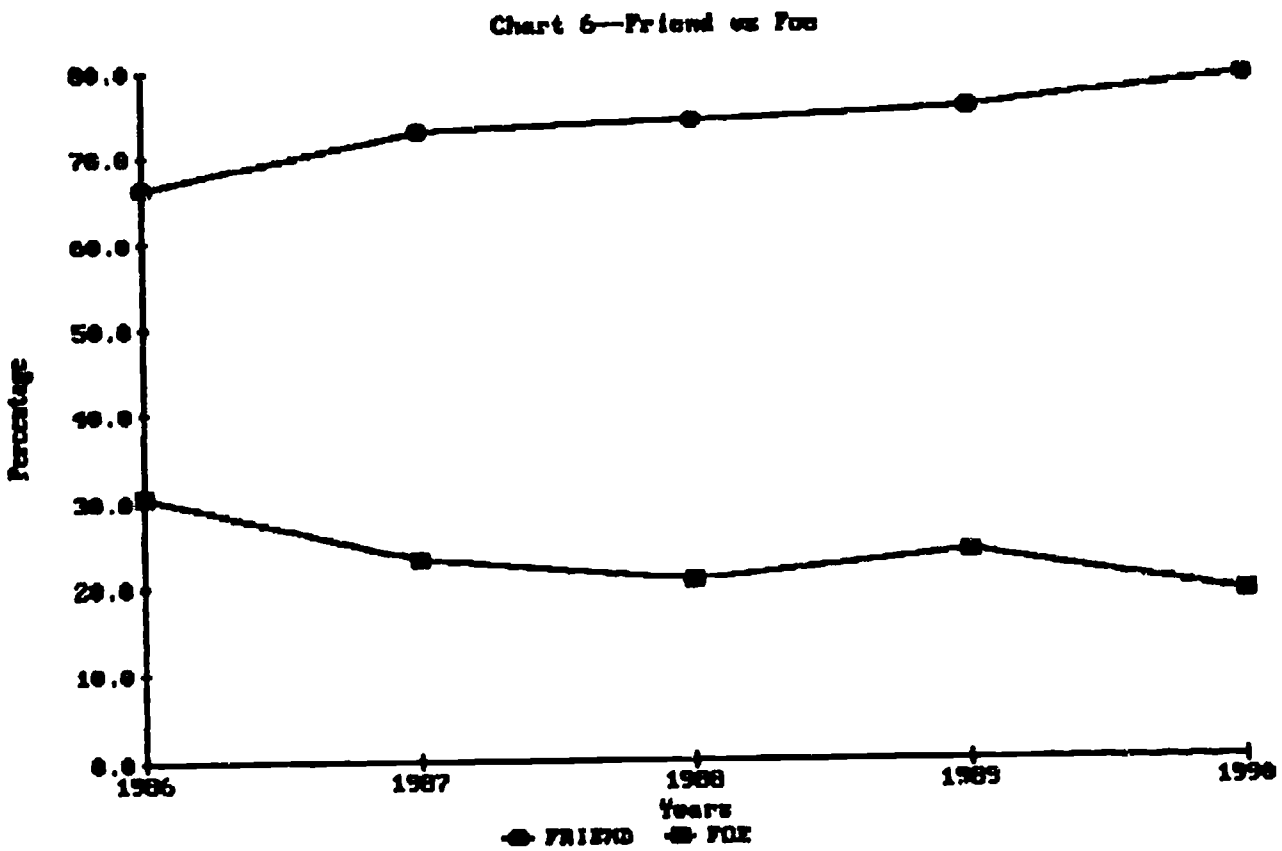


Chart 6—Friend vs Foe
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Percentage
1986
1987
1988
1989
1990
Years
FRIEND
FOE

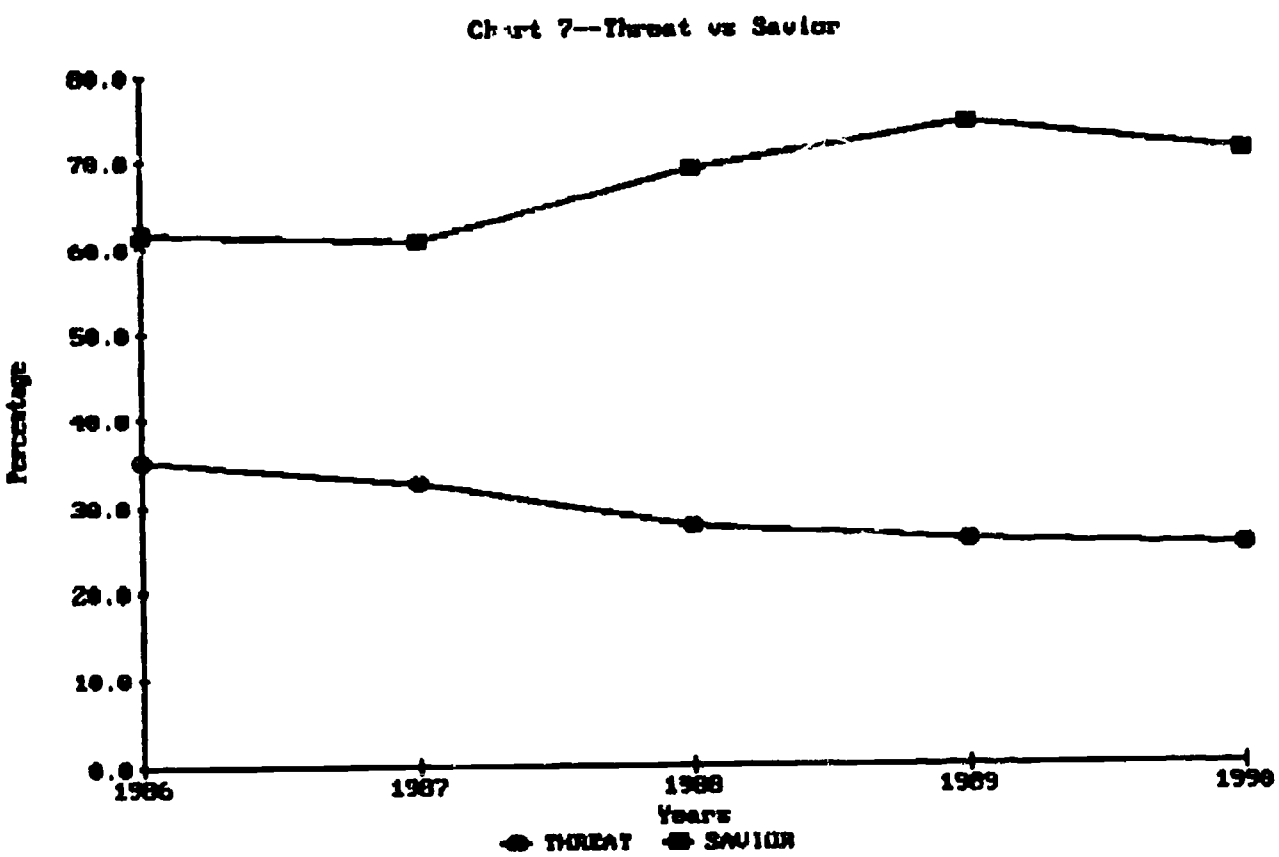
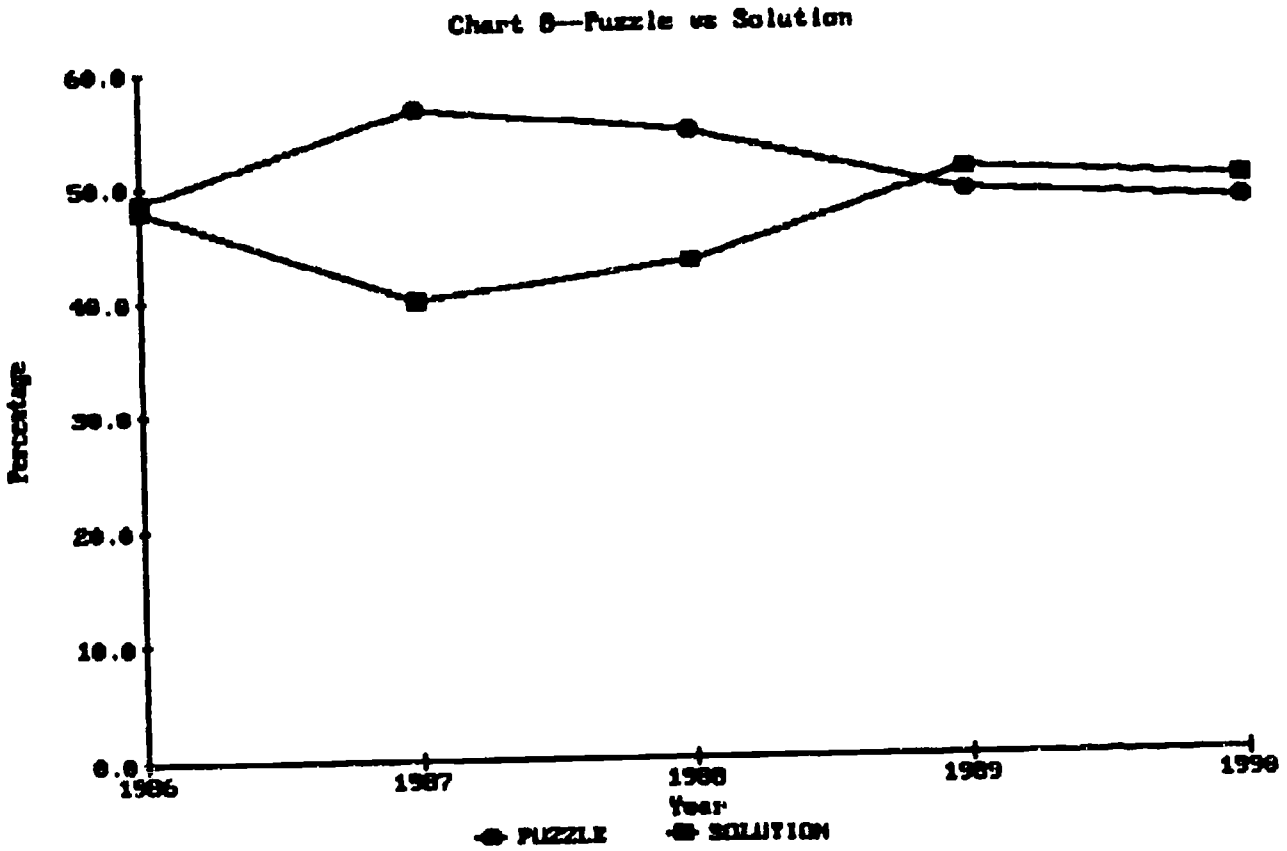


Chart 7--Threat vs Savior
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Percentage
1986
1987
1988
1989
1990
Years
THREAT
SAVIOR

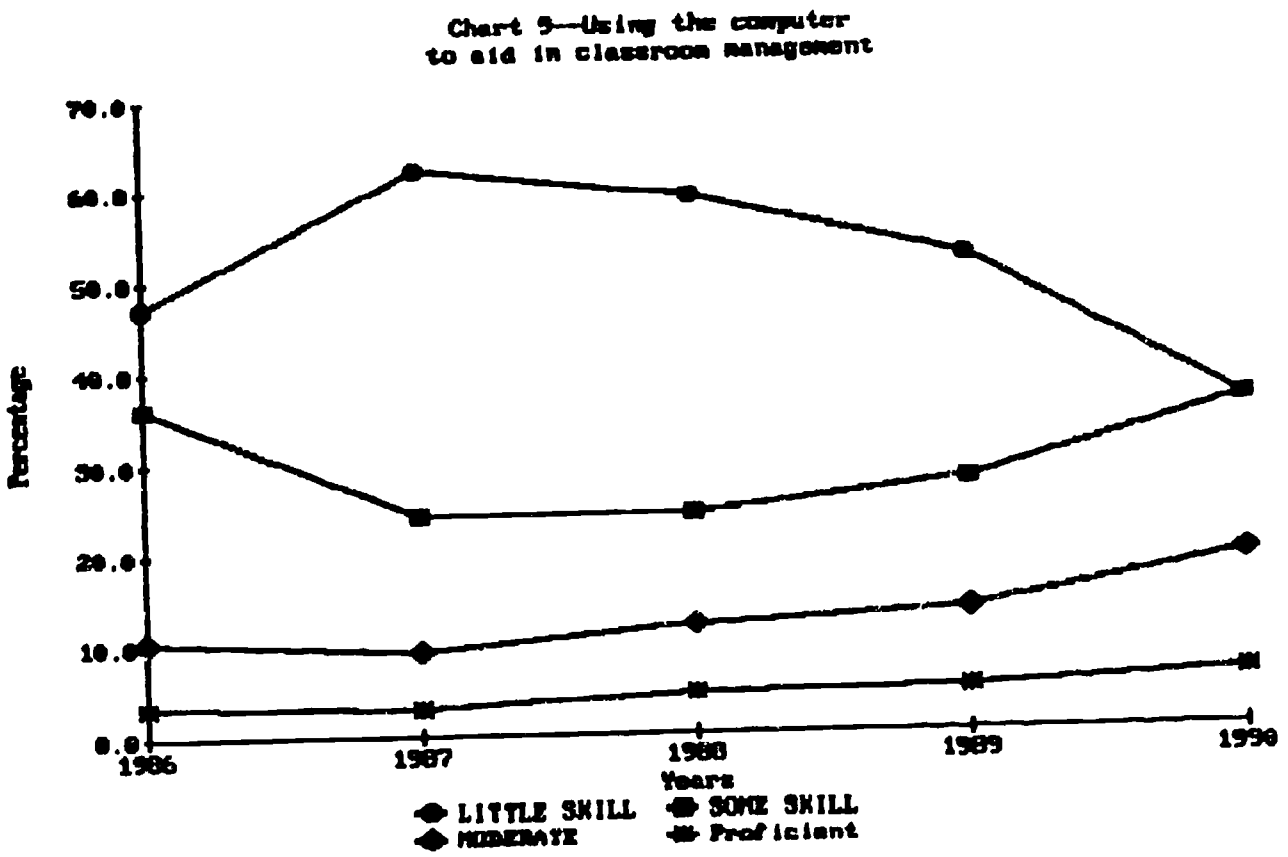


The final set of 17 questions asked the students to rate themselves in specific skill areas based on the following scale:

A--Little or no skill
B--Somewhat skilled
C--Moderately skilled
D--Proficient

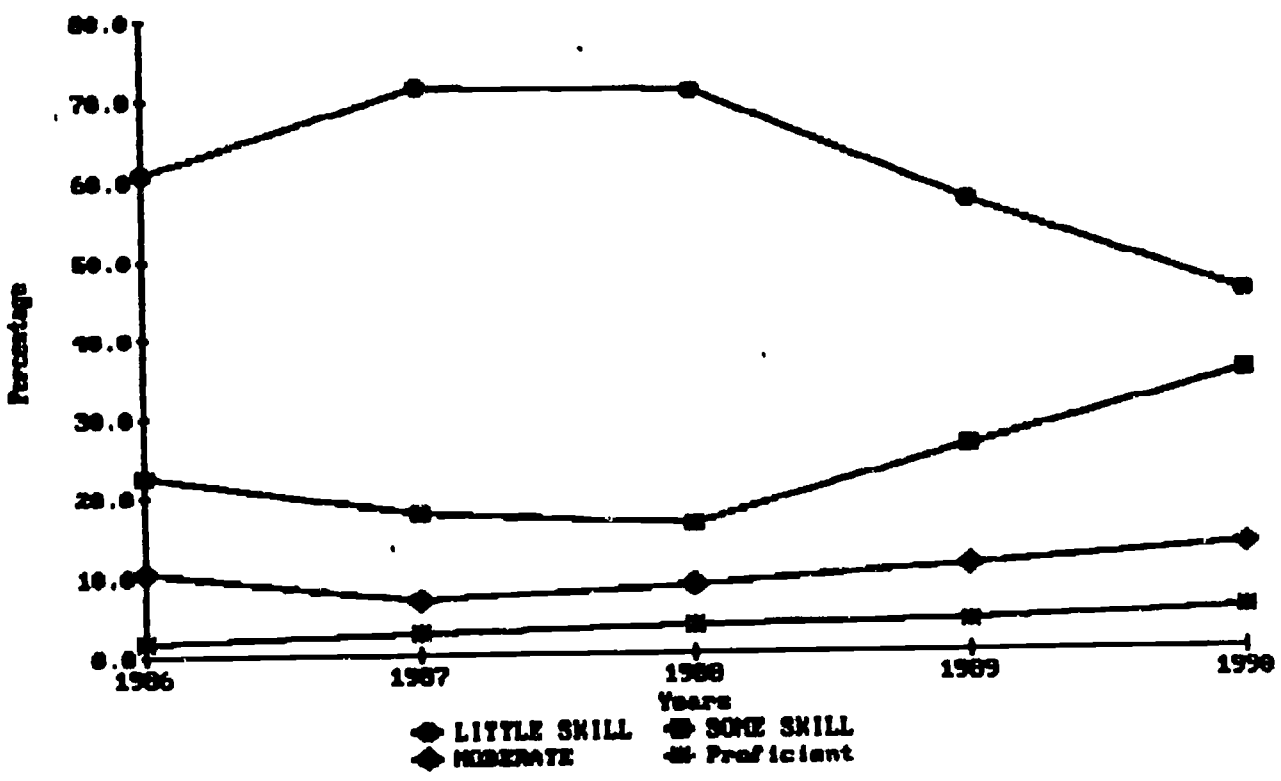
Questions 21 and 22 asked the students to rate their skill in using the computer for classroom management and in teaching activities. As chart number 9 clearly shows, there was a significant increase in the students' self-rating of their skill in using the computer for classroom management.

From 1986 through 1990, the percentage of students rating themselves as having little or no skill in this area dropped from a high of 62% in 1987 to the low of 36% in 1990. In the meantime, the top three skill ratings showed marked increased.



The percentage of students rating their skill in planning and carrying out activities to ensure successful use of the computer in the classroom almost doubled in the upper three rating-levels, when the low point of 27%, recorded in 1987, is compared to the 1990 percentage of 53 (see Chart 10).

Chart 10--Plan/carry out activities to ensure successful use of the computer

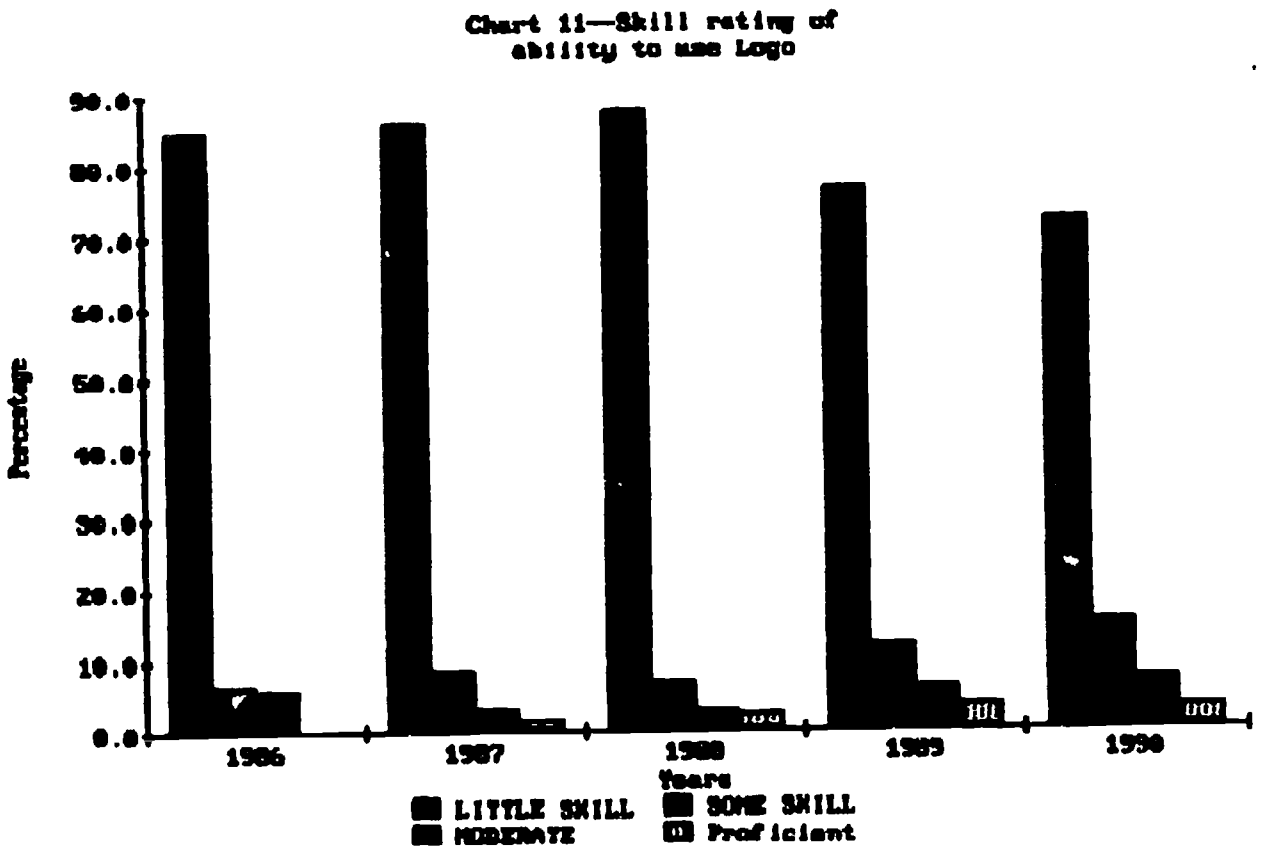


The change in means from 1987 to 1990 were significant for both questions (at the .001 level). For question 21, the mean skill rating increased from 1.525 in 1987 to 1.624 in 1990. Question 22 showed even a more dramatic increase, going from a mean of 1.395 in 1987 to 1.954 in 1990.

Communicating instructions to the computer in BASIC, Logo, and Pilot, and using DOS commands, was the focus of the next four questions. Question 23 asked the students to rate their level of skill in BASIC. In 1986, 32.8% rated themselves as somewhat skilled to proficient. By 1990, half of the students placed themselves in the top three ratings.

This should not be surprising since the most common programming language taught in the high schools has been BASIC.

According to question 24, 25% of the students in 1990 had some skill in Logo, compared to only 12% in 1986. As chart number 11 shows, there has been a gradual increase in

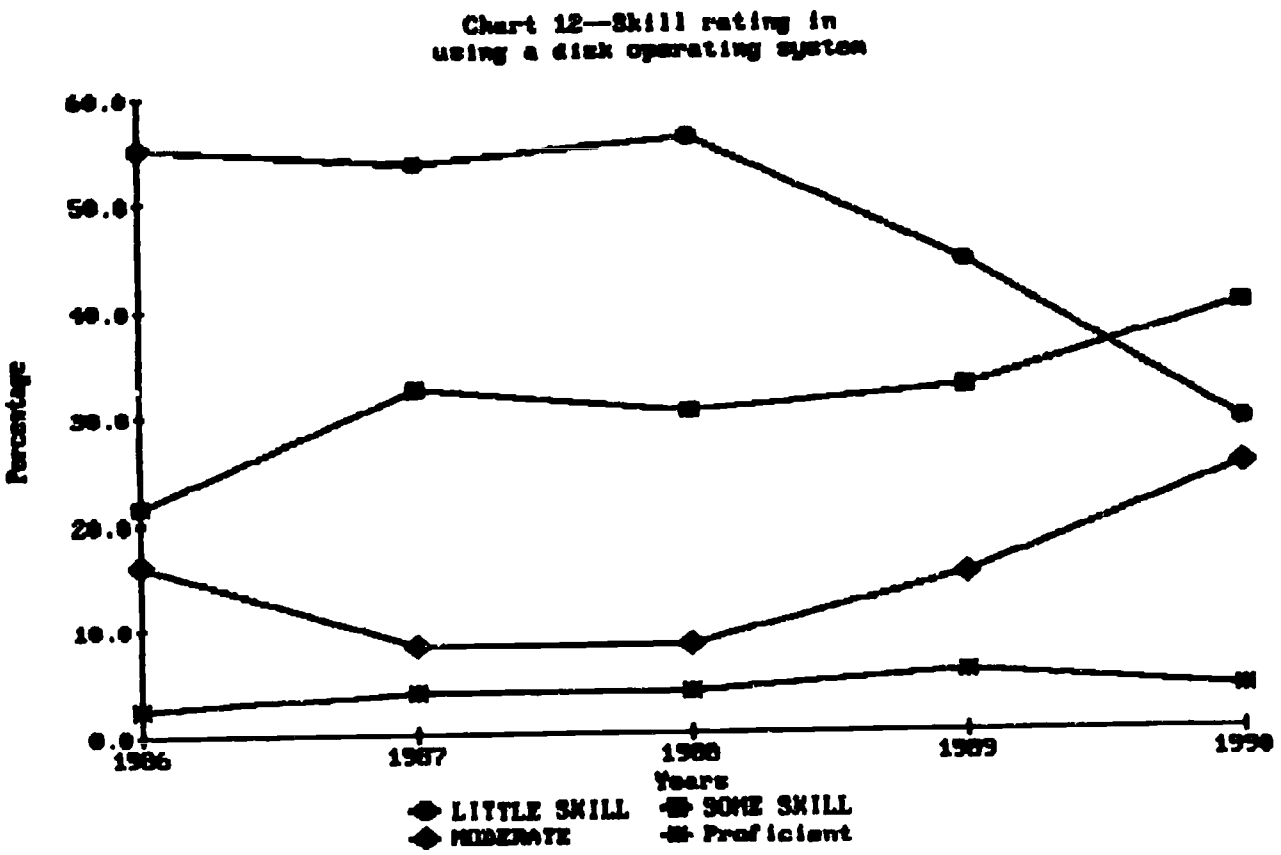


the percentage of students who have been exposed to the Logo programming language. The correlation analysis of the 1990 results indicates a statistically significant correlation, at the .0001 level, between short courses the students have taken and their rating of their skill in Logo. This may be

attributed to the increased teaching of Logo in the elementary and junior high schools. This exposure to Logo clearly shows up in the students who entered EDIT 2318 in 1989 and 1990 (see Chart 11).

The percentage of students indicating in question number 25 that they had little or no skill in Pilot dropped from 82.4% in 1986 to 79% in 1990. Though less dramatic than the changes in the skill ratings of BASIC and Logo, this does show a gradual increase in the number of students receiving some instruction in Pilot.

Performing computer operations using a disk operating system, as indicated in chart 12, is a student skill that has significantly increased over the five years of the survey. In 1986, 55.2% of the students rated themselves as having little or no skill in using DOS. By 1990, the percentage had dropped to 29%. More remarkably, 25% of the 1990 student surveys indicated a moderately skilled rating. The major increase in the level of skill in using DOS first appeared in 1989. The trend continued even stronger in 1990. The correlations between using DOS, taking short and semester courses, and regular use of the computer, were all significant at the .0001 level in the 1990 survey results. This would seem to indicate that there has been an increased emphasis in high school computer courses on students



learning how to perform operations using a disk operating system.

The next major area surveyed in questions 27 through 34, and question 37, deals with the students' perception of their knowledge of various computer-related topics. Appropriate skill in these topic areas would be needed to teach a computer literacy course. The nine specific topic areas covered by the questions are listed below:

---Impact of technology on career options
---Positive and negative consequences of computer technology's impact on society
---How computers work and how they are used for information storage

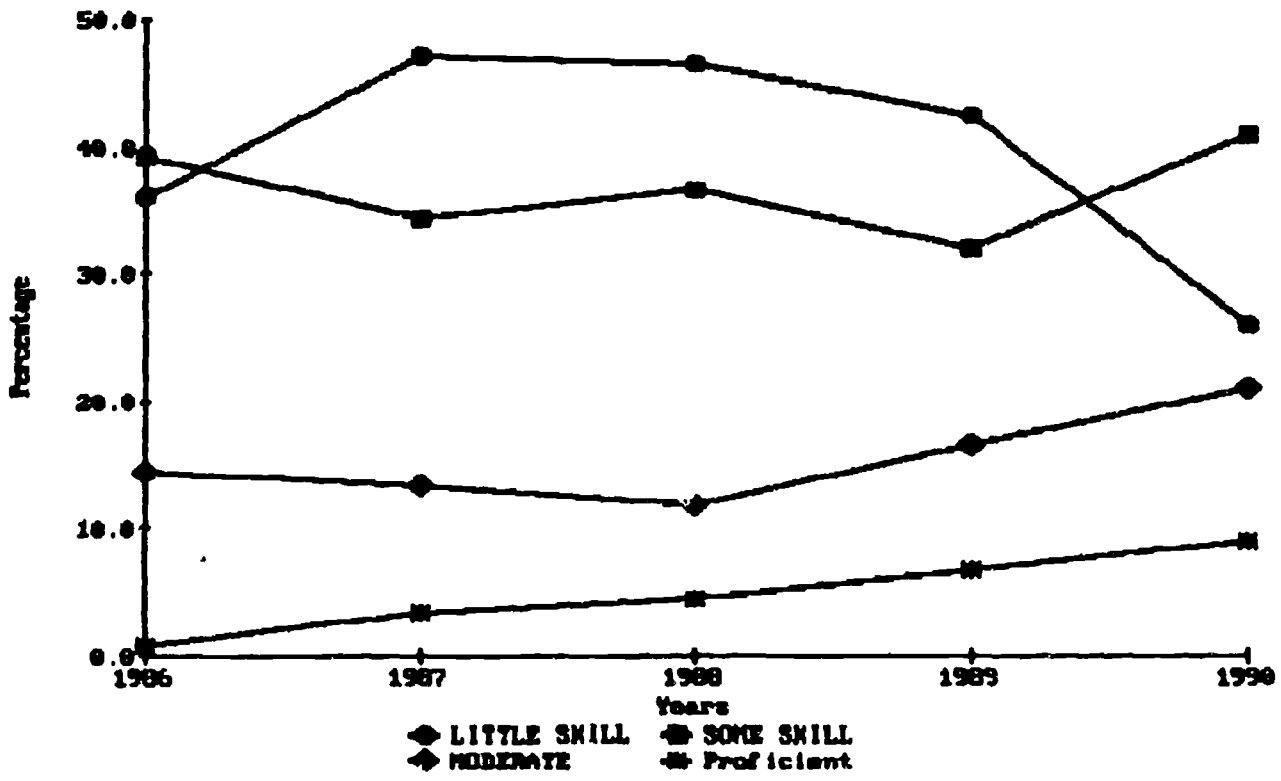
---How computers are used for simulation and modeling
---How computers are used for process control
---How computers are used for decision making
---How computers are used for processing information
---How to locate information regarding computer use
---The history and development of the computer

When comparisons were made between the 1986 and 1990 student ratings for each question, the results were statistically significant; all with p values of less than .001. The z values ranged from a low of 7.44 for question 30 to a high of 93.22 for question 33. The table below shows the changes in percentage that occurred between 1986 and 1990.

Question Number	Years	Little or No Skill	Somewhat Skilled	Moderately Skilled	Proficient
27	1986	46.4	30.4	16.0	3.2
	1990	33.2	36.0	22.5	5.5
28	1986	36.0	39.2	14.4	0.8
	1990	26.6	40.8	21.1	9.0
29	1986	66.4	18.4	8.0	4.0
	1990	42.2	35.6	11.8	7.3
30	1986	76.0	12.0	5.6	3.2
	1990	51.6	30.1	11.8	4.2
31	1986	75.2	8.0	4.8	1.6
	1990	54.3	30.1	8.7	4.5
32	1986	65.6	15.2	6.4	2.4
	1990	47.1	32.2	15.2	2.8
33	1986	64.0	16.0	8.0	2.4
	1990	38.4	35.3	19.4	4.2
34	1986	44.8	31.2	12.0	1.6
	1990	30.8	36.3	24.2	5.9
37	1986	49.6	21.6	7.2	1.6
	1990	33.9	41.2	17.0	5.5

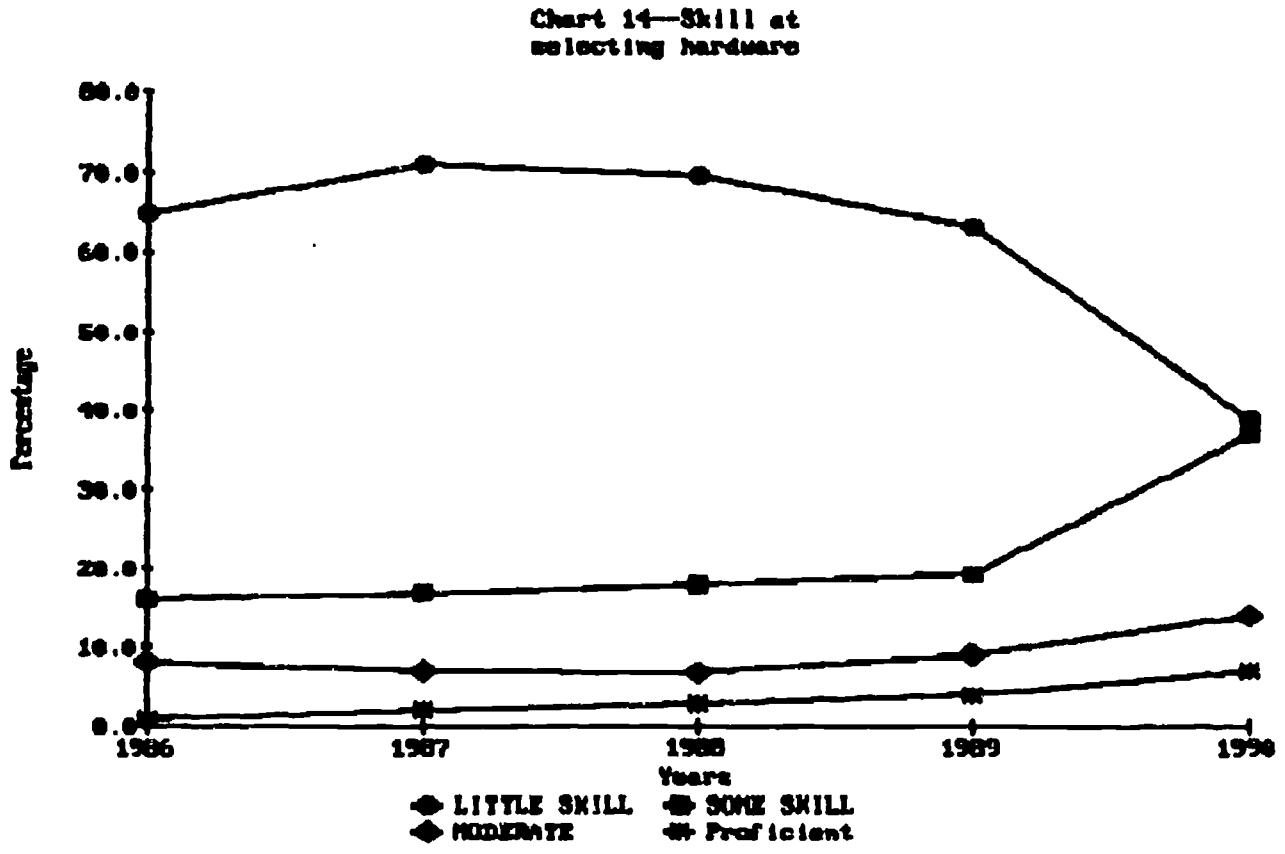
Though the percentages shown in the table clearly indicate significant changes in students' self-ratings of their knowledge and skills, chart 13 vividly illustrates the trend toward students having more confidence in the nine skill areas covered by this set of questions. Question number 28 was chosen to be displayed since the trend it demonstrates is average for the questions.

Chart 13—Discussing the impact of computer technology on society



The last area covered by the survey dealt with the students rating their skills in selecting computer hardware and software that best meet their needs. These skills play an important role both in selecting the right hardware for a

specific classroom or personal situation and matching the appropriate software to meet their given need. The charts displayed below for questions 35 and 36 exhibit the trend toward increasing confidence in these skill areas among the students when they entered EDIT 2318. Both skill areas showed significant changes ($p < .001$) over the five years of the survey.



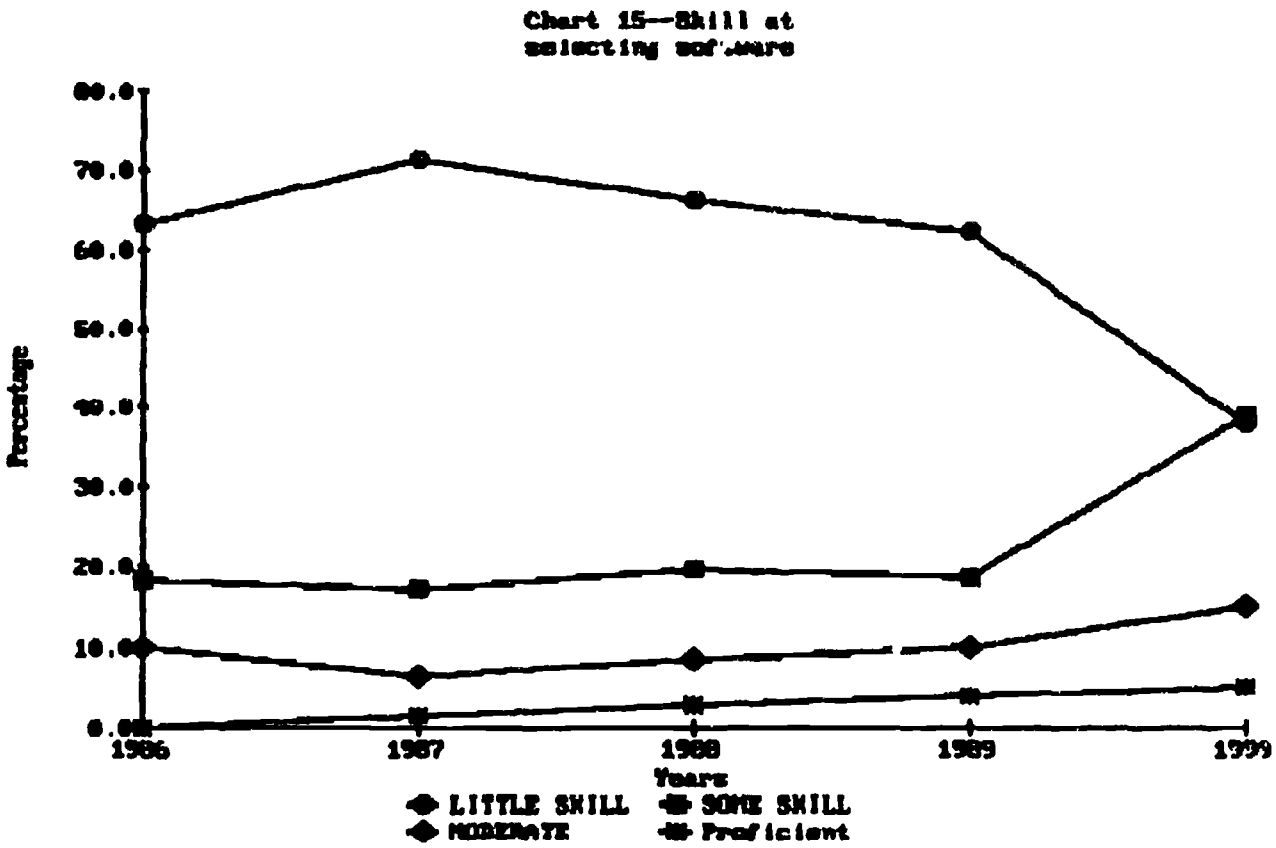


Chart 15--Skill at selecting software
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.00
Percentage
1986
1987
1988
1989
1990
Years
LITTLE SKILL
SOME SKILL
MODERATE
Proficient

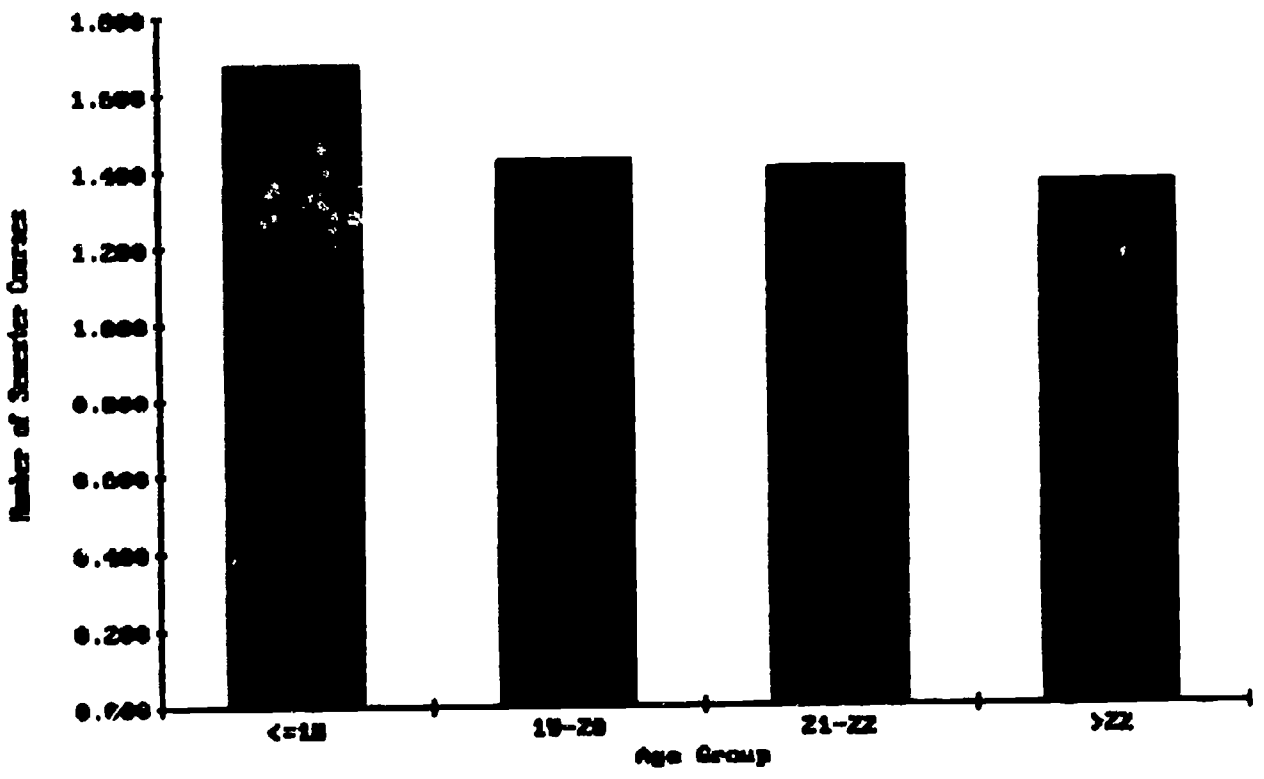
DISCUSSION

The focus of the review of literature was on the strong correlation that has been found to exist between students' attitudes toward computers, along with their perceived computer-related skills, and the extent of their experience working with computers in the past. The general findings of this study confirms that this same correlation is apparent among the students who have taken EDIT 2318 over the past five years.

A significant finding of the analysis of the surveys found that as the years passed, younger students, both in terms of classification and age, were taking the class. At the same time, the number of short and semester courses the average student had taken in the past increased, especially in the areas of programming and literacy.

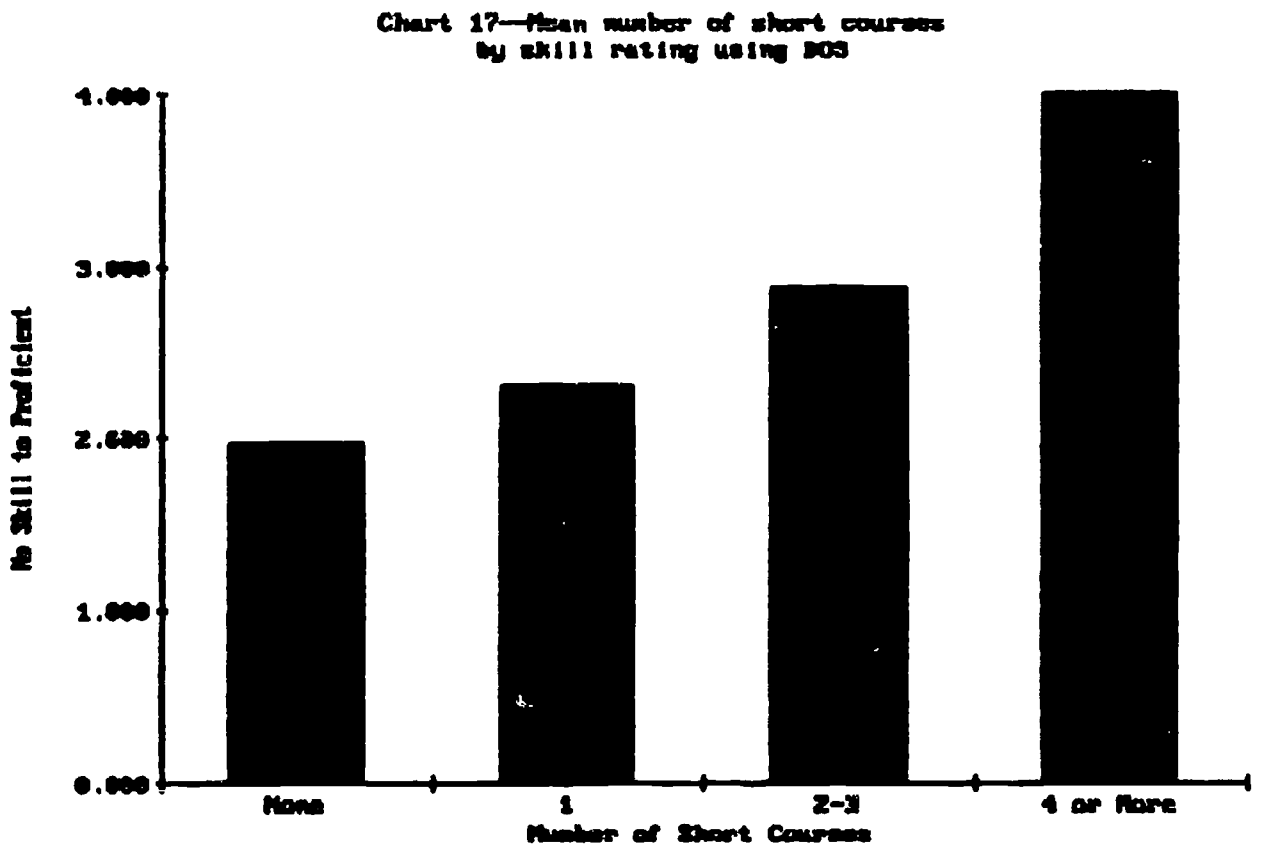
Though limited only to the 1990 survey results, chart 16 clearly indicates that as student age increased, the mean number of semester computer courses previously taken dropped. This finding was especially pronounced in the last two years of the survey. What this result seems to indicate is that the students entering into EDIT 2318 during the past two years are showing the impact of the mandated computer literacy courses that the state of Texas put into effect in

Chart 16—Mean number of semester courses by age



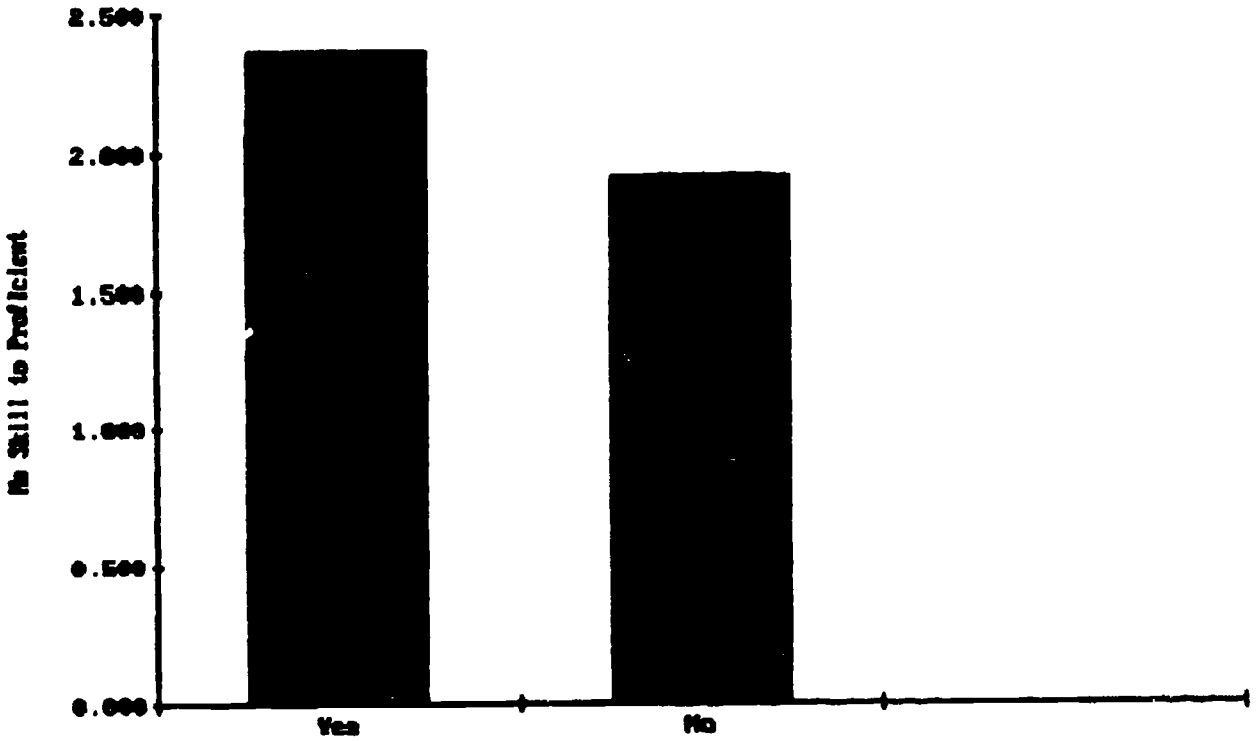
1984, when these students were in the seventh and eighth grades.

This study also found that student usage of the computer on a regular basis has increased over the past five years. When this finding is combined with the increased computer-course background of the students, it comes as no surprise that the net effect has been an increase in the overall positive attitude among the students toward computers and a rise in their perception of their computer-related skills. Examples (based on the 1990 survey results) of this increase in perceived computer-related skills can be



seen in chart 17, when a contrast is made between the results of the number of short courses the students have taken, and the mean rating of their perceived skill in performing computer operations using a disk operating system; and in chart number 18, when the students' responses about their regular use of the computer is contrasted with the same skill area.

Chart 18—Mean skill rating of using DOS by regular use of a computer



RECOMMENDATIONS

The major finding of this study was the continuing presence of a wide range of computer-related knowledge and skills among the students entering EDIT 2318. Though there is evidence that an increasing number of the students who enroll in EDIT 2318 have a basic knowledge of computer technology and some skills in using computer hardware and software, a significant minority (approximately 40%) of the students may be labeled as computer illiterate. It is therefore recommended that the present content of the course be maintained in order to provide all of the students with the opportunity to obtain a basic level of computer-related knowledge and skills.

The second recommendation is based on a proposal made by Fulton (1988). She suggested that the use of computer technology be integrated in subject matter methods courses. A more broadly based recommendation would be to incorporate into all upper level education courses (with EDIT 2318 as a prerequisite), multifaceted use of the computer. This would enhance the chances of strengthening the students' positive attitudes toward computers, along with their skills in using this technology, and aid in the development of an ever-increasing core of Texas teachers comfortable with using computer technology in their classrooms.

One final finding that was discovered as the results of the surveys were analyzed is that there is a significant correlation between gender and perceived computer-related skills and attitudes toward computers. One recommendation would be to research this finding more extensively and to attempt to incorporate within EDIT 2318 strategies to alleviate this difference.

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Appendix A

EDIT 2318 ENTRY LEVEL SURVEY

1. What is your classification?
   A=Freshman B=Sophomore C=Junior D=Senior E=Graduate

2. Sex: A=Male B=Female

3. Age: A=18 or under B=19-20 C=21-22 D=over 22

4. How many full semester course(s) dealing with computing have you completed?
   A=none B=1 C=2 D=3 E=4 or more

5. How many short courses (less than one semester) which deal with computing have you had?
   A=none B=1 C=2 or 3 D=4 or more

6. If you have had previous computer courses, what type of courses were they. (More than one answer ok.)
   A=computer literacy B=computer math
   C=business applications D=programming E=other

7. Have you worked directly with computers, other than in courses you have taken, at home, work, or school for more than 40 total hours?
   A=yes B=no

8. If you answered yes to #7, what was the primary activity in which you used computers?
   A=data entry B=word processing C=programming
   D=business applications D=programming E=other

9. Do you now personally use a computer on a regular basis (once per week or more?)
   A=yes B=no

10. Do you believe that you will need or wish to use computers on a regular basis in the future?
    A=yes B=no

11. What things would you most like to learn about computing?
    A=nothing B=educational applications
    C=business applications D=programming E=other

12. How would you like to learn about computers?
    A=don't want to learn
    B=teach myself
    C=take a course in Computer Science or business
    D=take a course in educational computing
    E=other

    Which is a computer more like?

13. A=friend B=foe

14. A=hard B=soft

15. A=threat B=savior

16. A=pleasure B=pain

17. A=puzzle B=solution

18. A=work B=hobby

19. A=person B=machine

20. A=monster B=messiah

Please rate yourself on your PRESENT ability level in the following skills. Use the scale below for questions 21-37:

A=little or no skill B=somewhat skilled
C=moderately skilled D=proficient

How well can you:

21. Describe the ways that computers can be used by teachers for classroom management and teaching.

22. Plan and carry out activities to ensure successful use of the computer in school settings.

23. Communicate instructions to the computer in BASIC.

24. Communicate instructions to the computer in Logo.

25. Communicate instructions to the computer in Pilot.

26. Perform computer operations using a disk operating system.

27. Describe the impact of technology on your career options.

28. Discuss the positive as well as negative consequences of computer technology's impact on society.

29. Demonstrate how computers work and how they are used for information storage.

30. Demonstrate how computers work and how they are used for simulation and modeling.

31. Demonstrate how computers work and how they are used for process control.

32. Demonstrate how computers work and how they are used for decision making.

33. Demonstrate how computers work and how they are used for processing information.

34. Locate the information that you might need regarding computer use.

35. Select the computer(s) and related hardware that best meets your needs.

36. Select the software that best meets your needs.

37. Describe the history and development of the computer.