Fox Brady, Gehl, Lindsay Brothers, and Vermeer have brought in their respective equipment for presentations. These representatives discuss equipment, economic trends in the farm machinery industry, and career opportunities, and provide excellent answers to students' questions. Further, the industry representatives present up-to-date audio-visual material and distribute product literature. Education, and not sales, is the primary goal of this strategy. By noting this concern with all representatives, industry educates students as well as staff on up-to-date technology and recent design changes. Further, staff are informed and encouraged to attend service schools. Similarly, certain representatives are serving as advisory committee members.

The Challenge Ahead

By no means has the complexity of the problem been explained or solved, but a great stride has been made to overcome part of the dilemma. Still other strategies must be sought to provide the optimum educational offering in farm machinery and equipment classes. The challenge to revise courses to keep them technically current must be continued. Undoubtedly, minicourses must be considered to meet the needs of faculty and practicing farmers, among others. Further, library resources must be closely evaluated and updated. Finally, faculty must be allowed to have release time to keep current with the ever-changing technology. The machinery industry has and is providing the necessary educational support needed for a quality program at the University of Minnesota Technical College at Waseca.

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The Effect of Teaching Method or Student Characteristics On Achievement or Attitudes in an Ag Computer Course

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Abstract

A pretest-postest experimental/control group design was used to test for significant differences in student achievement or attitude in a microcomputer programming course in agricultural engineering at Iowa State University. During two successive semesters, 103 students were enrolled in classes that were randomly assigned to either an experimental or control group. The analysis of covariance revealed significant differences in student achievement when students were grouped by subject in which the students made their highest and lowest grade in high school, average secondary and postsecondary mathematics grade, student classification, student major, video game experience, occupational plans, pretest attitude score, and the person most influencing them to take the course. There was also a significant difference in attitude scores when the students were grouped by typing ability or computer experience.

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Introduction

The computer is a relative newcomer as an educational aid in the agricultural classroom. Until recently, it has been used in classrooms and laboratories, to process large quantities of data. Now many agricultural disciplines are using the microcomputer for other instructional purposes. At the same time, there is a need to train students, educators, and adults already involved in agriculture and agribusiness on microcomputer usage.

> "Just as the producer who knows the principles of tractor operations is in a better position to make tractor-related decisions, so is the computer-literate agriculturalist better able to use the microcomputer. The implication is that as the use of computers on farms and ranches increases, students in Colleges of Agriculture will need to understand how computers can be used in Agriculture." (Legacy et al., 1984, p. 254).

Current research concerning the computer as an agricultural education tool is very limited. If educators are to use the computer effectively and efficiently, this body of knowledge must expand and grow. As noted by Borg and Gall (1983), "The major reason for educational research is to develop new knowledge about teaching and learning and administration. The new knowledge is valuable because it will lead eventually to the improvement of educational practice."

Statement of Problem

Extensive research has been conducted comparing computer-assisted instruction to other types of instruction. In the field of agriculture, Russell (1984) concluded that there was no significant difference between student posttest scores on farm management and agricultural marketing concepts when taught by computer-assisted instruction, and the conventional teaching method.

In the field of mathematics, Friesen (1976) found that students with good prior achievement in mathematics had higher achievement and attitude scores under both lecture-discussion and computer-assisted instruction, and he programmed packets for the concepts taught in a college freshman calculus class. Kockler and Netusil (1974) determined that attitudes toward computer-assisted instruction improved significantly for the students using that method but not for the students taught by the conventional lecture method. They also found no significant difference between the two groups in attitude toward mathematics or in mathematics achievement.

For the field of computers, Rota (1981) found no significant difference in student achievement and attitude toward computers and computer-assisted instruction for students taught by traditional-lecture instruction, computer-assisted instruction, and lecture information supplemented with computer-assisted instruction. Research by Tsai and Pohl (1978) in a university undergraduate computer programming class revealed no significant difference in student learning achievement among three teaching methods, lecture instruction, computer-assisted instruction, and lecture supplemented with computer assisted instruction.

Broh (1975) found no significant difference in achievement in political science, methodoligical concepts, and computer techniques for students taught by lecture and computer-assisted instruction.

The research cited and conducted to date has dealt with differences in student achievement and attitudes relative to different teaching methods. However, very little research has been conducted on other factors that directly affect the development of computer skills, achievement, or attitudes. In other bodies of knowledge, such as mathematics, chemistry, history, and English, there are known unique factors that affect attitudes, achievement, or skill development. These factors have not yet been identified for computer usage or programming in agriculture. In order for agricultural educators to use the computer as a learning tool, these factors need to be identified.

Purpose and Methodology

This study was done to identify factors affecting student achievement or attitude in a BASIC computer programming course, Agricultural Mechanization 180X, in the Agricultural Engineering Department at Iowa State University. The course is designed to familiarize the student with a microcomputer and BASIC computer programming. The specific objectives were:

1. To determine if there is a significant difference in student achievement when using computer-assisted instruction as compared to conventional instructional methods.
2. To determine if there is a significant difference in student achievement or attitude when comparing teaching methods and 28 different student characteristics.
3. To determine if there is a significant difference in student achievement when comparing student attitude.

The research involved the study of these characteristics and their significance to two dependent variables: student achievement and student attitude toward computers and computer use. Student achievement was measured with a pretest-posttest knowledge examination; student attitude was measured with a pretest-posttest attitude inventory. Student characteristics were obtained using a demographic survey administered at the beginning of the course.

A pretest-posttest experimental/control group design was used for this study with the degrees of freedom determined by the number of categories for each test. The experimental group used computer-assisted instruction; the control group used the conventional lecture. All instruments were pilot tested during summer semester, 1983. The population consisted of the students in the College of Agriculture, and the sample was the students enrolled in the Agricultural Mechanization 180X course during two successive semesters (fall, 1983 and spring, 1984) at Iowa State University. The classes were randomly assigned to experimental and control groups, for a total of 61 students in the control groups and 42 students in the experimental groups. The instructors taught experimental as well as control groups.

An analysis of covariance was used to measure statistical differences with the pretest mean score as the covariate.

This study was conducted as part of Project 2617 of the Iowa Agricultural and Home Economics Experiment Station.

Instrument Reliability

Cronbach's Coefficient Alpha was used to determine internal consistency of the knowledge test and attitude inventory. An item analysis on the individual test questions for each instrument was made. The reliability coefficients ranged from .79 to .90.

Student Characteristics Findings

The following statements summarize the academic characteristics of the students:

a. mean years of vocational agriculture at the secondary level was 0.84 years
b. mean semesters of mathemtics at the secondary level was 5.64 semesters
c. mean postsecondary semesters of mathematics was 2.46
d. mean average mathematics grade at the secondary level was 2.97 (2 = C; 3 = B)
e. mean postsecondary average mathematics grade was 3.73 (3 = C; 4 = B)
f. highest grade subjects at the secondary level were mathematics, science, and vocational agriculture
g. lowest grade subjects at the secondary level were mathematics, history, and English
h. best liked subjects at the secondary level were science and vocational agricutlure
i. least liked subjects at the secondary level were mathematics, English, and history
j. mean typing ability was 2.78 (2 = 11-20 wpm; 3 = 21-30 wmp).

The major computer-related characteristics were:

a. over 70 percent had computer experience
b. over 70 percent had no mainframe or microcomputer formal instruction
c. less than 2 percent owned a computer
d. less than 8 percent of the students' parents owned a computer
e. mean years basic calculator experience was 7.26 years
f. mean years programmable calculator experience was 0.24 years
g. mean hours on video games was 1.36 (1 = 1-10 hours; 2 = 11-15 hours). Almost 14 percent of the students had more than 50 hours of experience playing video games.

Effect of Teaching Method or Student Characteristics on Student Achievement

An analysis of covariance was used to determine if students' posttest knowledge scores (achievement) were significantly affected by the teaching method or student characteristics. The pretest knowledge score was used as the covariate in both cases. Table I shows the F value and F probability for each.

The analysis of covaraince failed to reveal a significant difference in the posttest knowledge scores when students were grouped by teaching method (computer-assisted instruction versus traditional lecture). This suggests that computer-assisted instruction is neither superior nor inferior to a traditional lecture as a teaching method when teaching BASIC computer programming. According to the literature, the success of computer-assisted instruction as a superior teaching method appears to be dependent upon the subject matter being taught. Computer-assisted instruction gives the instructor more time in class for individualized instruction and other classroom activities. The disadvantage is that it requires a great deal of time for the initial preparation of the materials.

The analysis of covariance revealed a significant difference in posttest knowledge scores for some student characteristics when the students were grouped by individual characteristics.

Grouping students by the subjects in which they earned their highest grades at the secondary level showed a significant difference. The students with the highest grades in physical education, English, and mathematics also had the highest knowledge scores. This complements research by Friesen (1976), who found that students with good prior achievement in mathematics achieved the best in a university mathematics course in which computers were used.

Grouping students by their lowest grades at the secondary level was also significant. Students earning

Table 1. F-values and F-probability for Posttest Knowledge Scores (Achievement) with Pretest Knowledge Score (Covariate) and Teaching Method on Student Characteristics.

Variable Description	F Value	F Probability
Teaching Method	.34	.56
Student Characteristics:		
Setting where you were raised	0.80	0.45
Semesters of vo-ag in grades 9-12	3.00*	0.06
Subject of highest grade in grades 9-12	1.85*	0.10
Subject of lowest grade in grades 9-12	4.29**	0.001
Best liked subject in grades 9-12	1.43	0.21
Least liked subject in grades 9-12	1.35	0.25
Semesters of math in grades 9-12	1.38	0.22
Average math grade in grades 9-12	3.49**	0.02
Words typed per minute	1.56	0.16
Father or male guardian occupational computer use	0.00	0.97
Mother or female guardian occupational computer use	0.24	0.63
Student classification	3.04**	0.02
Student major	1.86*	0.08
Computer experience	1.61	0.19
Microcomputer instruction	1.86	0.18
Mainframe computer instruction	0.01	0.91
Microcomputer ownership	1.35	0.25
Parent or guardian computer ownership	0.20	0.65
Basic calculator experience	1.50	0.20
Programmable calculator experience	0.73	0.40
Post-secondary semester of math	1.56	0.17
Post-secondary average math grade	2.36*	0.08
Video game experience	3.68**	0.02
Computer interest from employment	0.98	0.33
Occupational plans	2.35**	0.02
Factor influencing you to take course	1.34	0.25
Person influencing you to take course	3.53**	0.03
Command of English language	1.44	0.23

*Significant at the .10 level ($P < .10$).
**Significant at the .05 level ($P < .05$)

their lowest grades in mathematics, science, and history scored lower on the knowledge test.

Grades earned in mathematics at the secondary and postsecondary level yielded a significant difference. As the average mathematics grade rose, the knowledge scores rose almost correspondingly. The ability to achieve in mathematics is the same type of ability required to achieve in computer skills and programming. The amount of mathematics in secondary or postsecondary schools produced no significant differences; only the grade earned made a difference.

A significant difference was found in knowledge scores when grouping students by the number of years of vocational agriculture. Students with no vocational agriculture scored significantly higher than students with vocational agriculture. At least two possible explanations exist. Instead of taking vocational agriculture, these students enrolled in courses that affected their level of achievement. Or some secondary schools may not have offered vocational agriculture.

A significant difference was also found when grouping students by student classification, student major, and occupational plans. Limited observations for these categories make it difficult to draw any specific conclusions.

When grouping students by the hours of video game experience, there was a significant difference in knowledge scores. The group with no video game experience had the highest means. It was observed during the study that students with more video game experience entered the class with unrealistic expectations of immediate computer performance or usage. When they realized that the computer is totally dependent on their communicative ability and expertise, their confidence and attitude greatly diminished, which in turn, affected their attitude.

When grouping students by the person influencing them to take the course, a significant difference was found. The "myself" category had the highest mean score. Thus, student desire is a good motivator to achieve in a BASIC programming course. Most students enrolled to learn how to use a computer even though it was not part of their program of study. Wanting to be enrolled in the class rather than having to be there made a difference.

Effect of Teaching Method or Student Characteristics on Student Attitude

To determine if student attitude was significantly affected by the teaching method or student characteristics, an analysis of covariance model was again used. The results are found in Table 2. There was no significant difference in attitude scores when grouping the students by the teaching method. Therefore attitude was not affected by the teaching method. The same student characteristics were analyzed individually to determine their effect on student attitude. Only two characteristics were found to be significant.

A significant difference was found in typing ability. Generally, the students that could type faster had higher posttest attitude scores.

A significant difference was also found when comparing computer experience. As the amount of computer experience increased, the posttest attitude score increased correspondingly. The fear or intimidation of using a computer dissipates as students become more in control of the computer and their attitude becomes more positive.

Effect of Student Attitude on Student Achievement

An analysis of covariance was used to determine if students' posttest knowledge scores were significantly affected by attitude. The pretest knowledge score was used as the covariate and the analysis revealed a significant difference (**P** $<$ .10) with an **F** value of 1.84 and **F** probability of 0.07. There was a definite positive relationship between pretest attitude scores and posttest knowledge scores. These results indicate that student attitude entering a class may be a barrier to achievement.

Table 2. **F**-values and **F**-probability for Posttest Attitude Scores with Pretest Attitude Scores (Covariate) and Teaching Method or Selected Student Characteristics.

Variable Description	F Value	F Probability
Teaching Method:	.17	.68
Student Characteristic:		
Setting where you were raised	2.05	0.13
Semesters of vo-ag in grades 9-12	0.64	0.53
Subject of highest grade in grades 9-12	0.72	0.63
Subject of lowest grade in grades 9-12	1.21	0.31
Best liked subject in grades 9-12	0.59	0.76
Least liked subject in grades 9-12	0.99	0.43
Semesters of math in grades 9-12	0.83	0.58
Average math grade in grades 9-12	0.69	0.56
Words typed per minute	2.42**	0.03
Father or male guardian occupational computer use	0.52	0.47
Mother or female guardian occuptional computer use	0.00	0.96
Student classification	1.39	0.25
Student major	1.52	0.16
Computer experience	3.03**	0.03
Microcomputer instruction	0.30	0.58
Mainframe computer instruction	0.01	0.91
Microcomputer ownership	0.00	0.95
Parent or guardian computer ownership	0.54	0.47
Basic calculator experience	1.34	0.26
Programmable calculator experience	0.79	0.38
Post-secondary semester of math	1.71	0.13
Post-secondary average math grade	0.48	0.70
Video game experience	1.37	0.26
Computer interest from employment	0.09	0.76
Occupational plans	0.77	0.64
Factor influencing you to take course	1.38	0.24
Person influencing you to take course	0.81	0.45
Command of English language	1.03	0.40

Significant at the .05 level (F** $<$ .05)

Implications

Mathematics ability appears to be one of the prime indicators of achievement in computer skills. Since agriculture is already involved with computers and is likely to become more so in the future, agricultural programs, including vocational agriculture, should place more emphasis on mathematics-oriented skills. At the same time, these programs should introduce their students to the rigors of computer skills and help them overcome the fear and intimidation of the computer. This would improve their attitude toward the computer and computer use.

Students in agriculture need to develop typing skills to use the computer efficiently.

Advisors, teachers, parents, and others need to impress upon students the advantage of possessing computer skills to improve student motivation to enroll in computer classes rather than having the student take the class to fill a program of study.

Teachers in agriculture adopting the computer as a teaching aid will need to develop or procure the software to meet their needs. At the same time, the computer should not be viewed as a tool to replace the teacher, but rather to supplement and enhance the lesson material, allowing the teacher more time for individualized instruction or other classroom activities.

Prerequisite mathematics courses or specific levels of mathematics achievement will allow students to maximize their potential upon enrolling in post-secondary computer classes.

Because computer-assisted instruction has been proven to be at least as effective a teaching method as conventional lecture, course structure can be changed to accommodate this new teaching aid.

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Utilizing A Microcomputer Grade Recordkeeping Program To Forecast Course Score

Richard J. Patterson and Fred W. Reneau

Despite an instructor's effort to explain the basis for course grades on the first day of class, many students do not entirely comprehend at that time the effect those future assignments will have on their grades. And as the semester slips by, with the accumulation of quiz, homework, and exam scores, students may lose sight of the amount of course work remaining and the effect that their level of achievement on that work will have on their course scores and letter grades. Students are often surprised to learn too late that the letter grade they had anticipated is beyond realization or differs from what the instructor's gradebook indicates. With the help of the microcomputer and by applying the concept of course-score forecasting, the authors attempted to generate information that would help keep students informed as to scores received on completed work, course work remaining, and the impact that various levels of achievement on the remaining work would have on their final course scores.

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