

An Evaluation of Farm Management and Agricultural  
Marketing Microcomputer-Assisted Instruction in  
Training Vocational Agriculture Instructors

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Advances in microcomputer technology have caused a resurgence in interest in the use of computer-assisted instruction (CAI). CAI requires a student to interact with a computer; this can be accomplished in a variety of ways--drill and practice, tutorial lessons, simulation activities, and problem-solving situations (Foster & Kleene, 1982).

Few studies have been conducted in agricultural education comparing computer-assisted instruction to lecture-discussion methods of teaching. However, some studies have been conducted outside of agricultural education. Computer-assisted instruction may improve student attitudes and achievement and can reduce instructional time according to Chambers and Bork (1980). Deignan, Horowitz, Kimball, and Seager (1980) found student achievement using computerized instruction was 18% higher than lecture achievement and 7% higher than programmed text-learning. Alderman (1978) found that students using CAI in English performed significantly higher on achievement tests, but the dropout rate for these students was higher. In contrast, Ellinger and Frankland (1976) could find no difference in student achievement when using CAI to teach geography. Similarly, Johnson (1983) found that the microcomputer as a decision-making aid did not significantly improve students' knowledge of farm management principles.

With the seemingly rapid growth in the use of CAI, Persons (1982) gives educators a warning. The computer solutions to a problem are not a substitute for knowledge. One should not assume that because a student is able to obtain the correct answer that the student knows and understands the material. In reality, the student may not grasp the principles which allow that individual to obtain the correct solution using the computer.

### Objectives of the Study

The primary objective of this study was to determine if there is a significant difference in student achievement when teaching farm management and agricultural marketing concepts and problem solving with microcomputer-assisted instruction as compared to the lecture-discussion teaching method. A secondary objective was to determine if there is a difference in achievement when comparing teachers' knowledge and use of computers and selected demographic characteristics. This study was conducted as part of Project 2617, Iowa Agricultural and Home Economics Experiment Station, Iowa State University.

### Methods and Procedures

The sample for this study consisted of 112 secondary and post secondary Iowa vocational agriculture teachers attending a microcomputer workshop during the spring or summer of 1983. The enrollment represents 42% of the total population of the Iowa vocational agriculture instructors.

The research design was a pretest-posttest control group design as described by Mason and Bramble (1978). Teachers were randomly assigned to either a control or experimental group at the beginning of the workshop. Workshop instructors were randomly assigned to either group and counterbalanced to reduce instructor differences.

Information was collected on demographic characteristics of the teachers, their knowledge of computers, and their level of computer expertise.

Subject matter taught at the workshop included concepts and problem-solving in the areas of farm management and agricultural marketing, computer orientation, and instructions for the electronic spreadsheet program VisiCalc (a registered trademark of VisiCorp Personal Software Corporation). The workshop spanned a total time of 6.2 hours with nearly 4 hours devoted to teaching.

Two instruments were developed. A pretest covering farm management and agricultural marketing concepts was developed to determine student understanding of the topics. A pretest on farm management and agricultural marketing problems was developed. Pretest problems were solved manually with pencil, paper, and calculators. The posttest was identical to the pretest except that the order of questions was changed. The instruments were reviewed for content validity by Agricultural Education staff members and former vocational agriculture instructors.

After the pretest was administered, the teachers were divided into their respective control and treatment groups. The experimental treatment was then administered. That is, the control group was taught with the conventional method while the treatment group was taught with the CAI materials. A posttest was given to both groups.

Reliability estimates were calculated for the pretest and posttest using Cronbach's Alpha Model (1951). Reliability estimates varied from .48 to .87. Reliability estimates were somewhat lower for concept questions than problem-solving. All coefficients were considered adequate to proceed with grouping of test question responses.

A t-test was used on the two groups (spring and summer) to test for significant differences in mean scores for questions related to concepts, farm management problems, and agricultural marketing problems. Significant differences at the .05 level were noted between the two groups; hence, the summer workshop was treated as a replication of the spring workshop.

### Findings

Table 1 lists the pretest and posttest scores by selected characteristics of the vocational agriculture instructors. The number of hours that the teachers had used a microcomputer varied widely with a mean of slightly more than 36 hours. Approximately one-fourth of all the teachers had no computer experience while over half had more than 10 hours of computer experience. Very little computer-assisted instruction had been used during the preceding year with nearly half of the teachers reporting no use. Likewise, very few teachers had used the electronic spreadsheet program VisiCalc during the preceding year.

Table 1 also shows that the mean test score for all 112 participants increased by 22.08% from the pretest to the posttest. The mean pretest score for all sections of the test combined together was 54.3% compared to 66.3% on the posttest.

The data in Table 1 did not show a consistent trend when comparing the pretest and posttest scores to the number of years of teaching experience. However, those instructors with less than two years of teaching experience improved their test scores more than those with more teaching experience. When grouped by hours of computer usage, posttest scores improved from 18.37% to 24.28%. Likewise, test scores improved when grouped by the number of hours of CAI used during the preceding year.

A more consistent trend was noted when test scores were grouped by the number of hours that VisiCalc had been used. Posttest score means improved as the number of hours of VisiCalc increased. Those instructors with more than 10 hours of use improved their test scores more than the other two classifications.

Table 1

*Pretest and Posttest Scores and Selective Characteristics of the Vocational Agriculture Instructors*

	N	Pretest score	Posttest score	Percent change
Mean test score	112	54.3	66.3	22.08
Years taught				
Vocational agriculture				
0-2 years	32	47.2	63.0	33.54
3-10 years	49	58.7	69.8	18.82
> 10 years	31	54.5	64.0	17.48
Hours of computer use in last year				
0 hours	27	49.2	61.1	24.28
1-10 hours	24	55.2	65.3	18.37
> 10 hours	61	56.2	68.9	22.64
Hours of CAI in last year				
0 hours	52	52.4	64.8	23.54
1-10 hours	30	57.2	68.1	19.13
> 10 hours	30	54.5	67.0	22.89
Hours of VisiCalc used in last year				
0 hours	73	53.7	64.9	20.77
1-10 hours	28	55.2	68.2	24.13
> 10 hours	11	53.4	70.5	32.05

Analysis of covariance was used to test for significant differences in the posttest scores between the treatment and control group using the pretest score as the covariate. *F*-values were used to measure the level of significance at the .05 level. The respective pretest score was used as the covariate. The results are found in Table 2.

No significant difference in the posttest scores could be found between the control and experimental group when teaching concepts. For both workshop groups, the treatment means were slightly higher than control group means. This would suggest that the microcomputer-assisted instruction method of teaching concepts is equal to the conventional method.

Table 2

*Comparison of Means, Standard Deviations, F-values for the Control and Treatment Group for Concepts, Farm Management Problems, and Agricultural Marketing Problems*

Testing area	Control group	Treatment group	F value
Farm management and agricultural marketing concepts			
spring workshop			.19
N	75	75	
Mean	72.93	73.47	
Standard Deviation	19.50	19.49	
Summer workshop			.01
N	37	37	
Mean	67.57	68.11	
Standard Deviation	19.06	19.06	
Farm management problems			
spring workshop			5.41*
N	40	35	
Mean	48.65	62.42	
Standard Deviation	31.37	27.59	
Summer workshop			5.09*
N	18	19	
Mean	47.43	64.37	
Standard Deviation	23.04	17.73	
Agricultural marketing problems			
spring workshop			4.07*
N	35	40	
Mean	65.71	78.21	
Standard Deviation	23.55	25.06	
Summer workshop			.28
N	19	18	
Mean	66.91	73.01	
Standard Deviation	21.32	28.10	

Note. \*  $p < .05$

There was a significant difference in the farm management problems posttest score between the control and experimental groups in both workshops. Therefore, the null hypothesis of no significant difference between the two teaching methods when teaching farm management problems was rejected. The treatment group scored higher than the control group. This finding suggests that microcomputer-assisted instruction is superior to the conventional teaching method when solving problems in farm management.

The treatment means for the posttest scores on agricultural marketing problems were higher for both the spring and summer workshop groups as compared to the control group. The treatment mean for the spring workshop group was significantly higher than that of the control group; however, this result could not be replicated in the summer workshop.

The number of years of teaching vocational agriculture, the number of hours spent on the computer, the number of hours of CAI used in prior years, and the hours using VisiCalc were also included in an analysis of covariance model using the pretest score as a covariate. At the .05 level of significance, the only significant difference found was the interaction of the covariate and the number of hours on the computer for the farm management problems in the spring workshop group. All other combinations were not significant.

### Conclusions and Recommendations

The results indicate that the microcomputer can be an effective tool in teaching farm management and agricultural marketing concepts and problems. While teaching farm management or agricultural marketing concepts by microcomputer was not significantly better than the traditional method of teaching, the microcomputer can be more effective in teaching work problem applications where mathematical calculations are required.

Posttest scores for farm management problems were significantly affected by the treatment. Hence, microcomputer-assisted instruction for this subject matter area may be superior to the conventional teaching method.

The teachers' level of use of VisiCalc did not significantly affect posttest scores. Hence, using microcomputer-assisted instruction for beginning VisiCalc computer users is as effective as with more experienced users. Teacher educators planning to use microcomputer-assisted instruction could plan one program delivery model regardless of the level of computer expertise of the students. This would reduce staff time and cost in program delivery for inservice training.

Teaching experience did not affect posttest scores between the control and/or treatment groups. This would suggest that experience is not a barrier when developing microcomputer-assisted instruction.

Microcomputer software is becoming more available as the computer industry expands and grows. Agricultural software programs vary widely in format and design. Additional studies are needed to determine which types of software are best suited for teaching subject matter in vocational agriculture.

Based upon other research and this study, it appears that microcomputers have a place in teaching vocational agriculture, particularly in problem-solving situations. The role that microcomputers will take in the future will be shaped largely by the development of appropriate software and adequate training of agricultural educators.

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