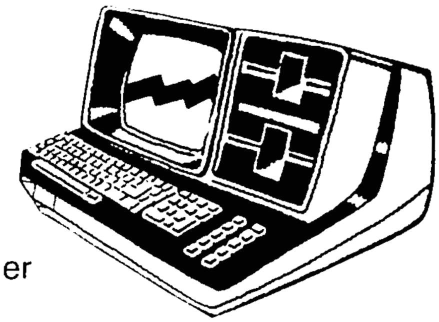
Using the Microcomputer As A Decision-Making Aid In Teaching Farm Management



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Abstract

The purpose of this study was to evaluate the effectiveness of the microcomputer when used as an aid for decision-making in an introductory farm management course. The posttest-only control group design was used with the treatment consisting of one laboratory section using the microcomputer and a program developed to aid in calculating break-even analysis. The treatment did not significantly affect students' knowledge nor attitude concepts towards farm management. It was concluded that the use of the microcomputer was as effective as the techniques normally used in the course to teach farm management.

Introduction

Given the widespread use of computers today, the term computer revolution seems appropriate when considering the impact that computers have had on our lives and will continue to have in the future (Hallworth and Brebner, 1980). The past ten years have seen rapid development of both computer hardware and software. Reductions in size, complexity, and cost of computers have made the field of agriculture more receptive to their application. An increasing number of American farm families recognize that the microcomputer may be the next technological explosion to affect their lives significantly. In fact, Dobbins and Suter (1981) note that the impact of the microcomputer on farming may equal that of the farm tractor of the 1930s. Changes brought about by computer usage will challenge farm operators today and for many years to come.

Farmers are finding that computers can be a profitable investment, and should become an even better investment in years to come (Hinman and Willett, 1981). Three primary kinds of computers noted by Hinman and Willett (1981) for on-farm use were programmable calculators, remote terminals, and microcomputers. It was the development of the microcomputer in the mid-1970s that made possible significant computer applications in agriculture.

The breakthrough of the 1980s in agriculture will most likely occur in the method and efficiency by which computers can aid in making management decisions (Hinman and Willett, 1981). The microcomputer as a tool can make it possible for farmers to analyze the large amounts of information needed for effective decision-making. However, the microcomputer must prove to be a cost effective management tool.

The application of the microcomputer in the agricultural classroom has great potential, especially as a tool in the area of farm management instruction. Yet, the microcomputer remains a relatively untested tool for instructional purposes. The use of the microcomputer in the farm management classroom merits evaluation (Osburn et al., 1981).

The increase in computer use for classroom instruction has been dramatic in recent years. As computer costs continue to decline and better software is developed, we can expect computers to play an increasing role in all education (Broussand, 1981). Computer usage for instructional purposes brings about the necessity to recognize both the positive and negative factors that exist.

Computerized instruction improves student achievement and attitudes, and can reduce instructional time (Chambers and Bork, 1980). Students enjoy working with computers because the computer is patient, wrong answers do not cause embarrassment, and instruction is fitted to the student's own pace (Broussand, 1981). Computerized instruction has proven superior in certain situations to both lecture and programmed text learning. One study found student achievement using computerized instruction was 18 percent higher than lecture achievement and 7 percent higher than programmed text achievement (Deignan et al., 1980).

Computerized instruction may also have a negative impact. Persons (1982) recognized the potential for the computer actually to decrease the understanding of economics. Students do not always have to understand the economic concepts involved to arrive at a solution. One can input the raw data, then allow the software program to translate the data into a solution without any intervention on the part of the user. Persons cautioned (1982, p. 15) "If we have trained only button pushers, chances are great that we have done little to build a better base for economic understanding."

Questions remain concerning the use of computers in the classroom and the application computers can

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have in assisting with decisions made in production agriculture. Instructors need to know how to make effective use of decision-making tools, and those tools in the years to come will certainly be tied to computer use (Persons, 1981).

The primary purpose of this study was to evaluate the effectiveness of the microcomputer as a decision-making aid in farm management.

The objectives were:

1. To determine students' knowledge of and attitude towards farm management principles.
2. To determine if significant differences in knowledge or attitude existed between students using a microcomputer as a decision-making aid compared to those not using the microcomputer.

Methods and Procedures

The sample for this study was Winter Farm Operation Program students enrolled in the beginning farm management course at Iowa State University during 1983. This course is offered to students returning for the second year of the Winter Program. The beginning farm management course consists of two one-hour lectures and one two-hour laboratory each week. Students enrolled meet together for lectures, but the class is divided into two sections for the laboratory.

Students were required to view three audio-tutorial slide-tape presentations containing instructions on using the microcomputer, related software, and the printer. Over a two-week period, each student spent a minimum of one hour viewing the slide-tape sets and using the microcomputer, software, and printer.

After the completion of the two-week instructional period, the experiment was conducted. An assignment was made requiring each student to complete a worksheet on figuring the break-even analysis for buying and finishing feeder pigs. This laboratory assignment was developed by the researcher and critiqued by an agricultural economist. The assignment described a situation and the students were asked to complete the worksheet and answer four "what if" questions relating to the situation described.

The design for the experiment was the posttest-only control group design, as described by Campbell and Stanley (1971). One laboratory section served as the control and was allowed to use pocket calculators. The other laboratory section used the microcomputer and a program developed by the researcher to aid in calculating a break-even analysis for buying and finishing feeder pigs. This served as the only difference between the two laboratory sections.

Upon completion, assignments were submitted for evaluation. Each student was then asked to complete two instruments developed to measure the dependent variables relating to knowledge and attitude. Ample class time was provided for students to complete both instruments. These instruments were developed based

Table 1. Reliability coefficient alphas for knowledge and attitude concepts

Instrument	Coefficient
Knowledge	0.593
Attitude concepts	
Enterprise budget	0.918
Break-even analysis	0.935
Making mathematical calculations	0.890
Understanding economic concepts	0.880
Making decisions	0.909
Managing a farm	0.847

on the break-even analysis laboratory assignment and reviewed for content validity by Agricultural Education staff members.

Results

Reliability estimates were calculated for the Knowledge Inventory and each of the six attitude concepts. As illustrated in Table 1, the reliability coefficient for the Knowledge Inventory was .593, while the coefficients for the attitude concepts were all above .800. These estimates were considered adequate to provide a realistic assessment of knowledge and attitude measures for the students involved in the study.

The Knowledge Inventory consisted of a 25 item, multiple choice test intended to measure students' understanding of the laboratory assignment. One point was given for a correct response and no points were given for an incorrect response. Results related to the Knowledge Inventories are presented in Table 2. The Knowledge Inventory was subdivided into three categories to provide further analyses. Knowledge 1 consisted of questions 1-5 of the Knowledge Inventory and pertained to the enterprise budget and the

Table 2. Knowledge score means and standard deviations by treatment groups

Knowledge		Experimental N = 20	Control N = 17	t-value[a]	Probability
1	M[b]	1.95	2.47	1.49	.145
(Questions 1-5)	SD[c]	1.15	.94		
2	M	6.05	6.29	.43	.671
(Questions 6-15)	SD	1.47	1.99		
3	M	7.30	7.59	.48	.632
(Questions 16-25)	SD	1.84	1.77		
Overall	M	15.30	16.35	.95	.348
(Questions 1-25)	SD	3.33	3.39		

[a]Degrees of freedom were 35. [b] = group means. [c]SD = group standard deviations.

worksheet portion of the laboratory assignment. Questions 6-15 comprised Knowledge 2 and applied to the worksheet and the break-even calculations needed in completing the assignment. Knowledge 3 consisted of questions 16-25 and related to "what if" applications of the questions asked in the laboratory assignment. Overall Knowledge included all questions (1-25) on the Knowledge Inventory.

The null hypothesis tested for the knowledge inventory was: There is no significant difference between the knowledge scores for the experimental and control groups. The results indicated that there was no significant difference at the .05 level between the mean knowledge scores of the two groups; therefore, the null hypothesis failed to be rejected. It was concluded that the use of the microcomputer did not significantly affect students' level of knowledge of farm management principles.

Students' attitudes toward farm management principles of the laboratory assignment were assessed using the Attitude Inventory, which measured grand mean scores for six different concepts using a seven-point sematic differential scale. Individual bipolar adjective scales were summed and means were computed for each of the concepts.

The data presented in Table 3 illustrate the attitude concept score grand means by treatment groups and were analyzed by computing t-statistics to determine group differences.

Table 3. Attitude concept grand means and standard deviations by treatment groups

Concept		Experimental N = 20	Control N = 17	t-value[a]	Probability
Enterprise	M[b]	5.86	6.08		
budget	SD[c]	.93	.82	.76	.453
Break-even	M	5.92	6.01		
analysis	SD	.79	.90	.34	.739
Making mathematical	M	5.86	6.12		
calculations	SD	.95	.79	.89	.377
Understanding	M	5.87	6.19		
economic concepts	SD	.90	.72	1.17	.249
Making	M	6.28	6.63		
decisions	SD	.72	.49	1.71	.096
Managing	M	6.51	6.68		
a farm	SD	.53	.47	1.01	.317

[a]Degrees of freedom were 35. [b]M = grand means. [c]SD = group standard deviations.

The null hypothesis involving the attitude scores was: there is no significant difference between the attitude scores for the experimental and control groups. Similar to the results of the knowledge scores, the data indicated that there were no significant differences detected for any of the six attitude concepts at the .05 level. Therefore, the null hypothesis failed to be rejected. It appears that the use of the microcomputer did not significantly affect students' attitudes concerning farm management principles.

Conclusions and Implications

Conclusions drawn from the findings of this study are limited to the Winter Farm Operation Program at Iowa State University. The results indicated that the microcomputer can be an effective decision-making tool in farm management. The use of the microcomputer in learning farm management principles was as effective as traditional techniques which used pocket calculators.

The students' level of knowledge and attitudes were not significantly affected by the treatment, which indicated that other factors should be considered in deciding whether or not to use the microcomputer. For example, a microcomputer program would allow students to change input variables and explore cause and effect relationships. The computer would complete needed computations allowing students to concentrate upon the concepts used in decision-making. This allows students to consider more variables simultaneously without time-consuming calculations.

Based on related literature and findings of this study, the determining factor relates to the degree of practical application of microcomputer programs. If the programs can be used in production operations, then the microcomputer would seem to have merit in teaching the concepts and principles as well.

Literature Cited

Broussand, Roland L. 1981. **Computer assisted instruction in adult basic education.** Commission on Adult Basic Education, Providence, Rhode Island. 11 pp.

Chambers, Jack A., and Alfred Bork. 1980. **Computer assisted learning in U.S. secondary/elementary schools.** Association for Computing Machinery, New York, New York. 50 pp.

Deignan, Gerald M., Neil S. Horowitz, Michael Kimball, and Brent R. Seager. 1980. **Computer assisted, programmed text, and lecture modes of instruction in three medical training courses: Comparative evaluation.** Final Report. Air Force Human Resources Laboratory. Lowery AFB, Colorado. 33 pp.

Dobbins, Craig L., and Robert C. Suter. 1981. **A microcomputer for the farm family?** Purdue Cooperative Extension Service Bulletin EC527, Purdue University, West Lafayette, Indiana. 19 pp.

Hallworth, Harold J., and Ann D. Brebner. 1980. **Computer assisted instruction in schools: Achievements, present developments, and projections for the future.** University of Calgary, Alberta, Canada. 243 pp.

Hinman, Herbert R., and Gayle S. Willett. 1981. **Farming with computers: What are the alternatives?**

Washington Cooperative Extension Service Bulletin 0953, Washington State University, Pullman, Washington. 12 pp.

Osburn, D.D., K.C. Schneeberger, M.R. Wilsdorf, and E.S. Reber. 1981. Microcomputer aided instruction. **NACTA Journal** 25(2):24-26.

Persons, Edgar A. 1982. A man ought to know. **Agricultural Education Magazine** 55(3)14-16.

Classroom Use of Computers — Some Observations

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Introduction and Historical Perspective

The use of the computer in all phases of agriculture has increased tremendously during recent years and will likely continue to increase as more agricultural software is developed. A survey of agricultural lenders and agricultural consultants indicates that in five years one producer in six will own a computer, compared with one in thirty-six which these two groups believe presently exists (Agri. Finance). Consequently, students in agriculture need and demand training in the use of the computer.

Computer use in agricultural courses is not new. Computerized management games have been used since the early sixties as a training device to duplicate the environment in which a business firm operates. The computer has also been instrumental in reducing student time required to solve algorithms to obtain solutions to programming and statistical models. In addition, computer programming courses, while frequently not taught in Colleges of Agriculture, have been required in many agricultural curricula for several years.

Thus, the computer has been part of agricultural curricula for quite some time. Why, then, this sudden interest and focus on the use of computers in the classroom? Litzenberg (p. 970) suggests three reasons: 1) the availability of computers, 2) the need and/or demand for computer skills by employers of agricultural students as well as agricultural producers, and 3) increased computer capabilities for classroom activities such as interactive processing. Another contributing factor might be the increasing availability of agricultural software.

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Objectives

In general, the objective of this paper is to identify how Colleges of Agriculture are satisfying the demands and needs of students in the area of computer instruction. Specifically, the objectives are to determine: (1) the types of computer facilities available for teaching in Colleges of Agriculture; and (2) the extent to which course content incorporates use and application of computers. The emphasis is not so much the enhancement of teaching activities through the use of the computer, but identification of the need for computer training by graduates of Colleges of Agriculture and how Land Grant Institutions are meeting this challenge.

Procedure

A mail survey of the Land Grant Institutions, designed to obtain information on the availability and configuration of their College computer teaching laboratories, was sent to Deans of Resident Instruction in Colleges of Agriculture in April, 1983. Additional questions focused on the extent to which the use and application of computers is being incorporated into existing courses.

Results and Discussion

The results of the questionnaire sent to Colleges of Agriculture in Land Grant Institutions are summarized and described below. Questionnaires were received from thirty institutions, a 60 percent return. Since nonrespondents were not contacted, no information is available regarding the nature of nonresponse bias. Thus, the reader is cautioned against making inferences from the results reported below regarding the population. Nevertheless, given the objective of this study to identify types of computer facilities and how they are used in teaching, the survey respondents provided a good base of information which would be useful to those planning to install, or modify existing computer teaching laboratories.

Laboratory Facilities and Configurations

Fourteen of the institutions responding to the questionnaire reported that a computer teaching laboratory was in place. Most have been installed during the past two years, particularly those with microcomputers. Sixteen indicated that the College of Agriculture did not have such a facility. Two of these institutions indicated that computer laboratories were available in selected departments within the College, and there were no plans to centralize a computer laboratory. Seven of these sixteen universities have computer facilities for student use within individual departments. Nine indicated that such a college computer teaching laboratory was planned. Seven of these are scheduled to be installed within a year. These results suggest that the majority of Colleges of Agriculture have provided or plan to provide facilities to be used to enhance computer training of students.

The configuration of the computer teaching laboratories which are already in place is quite varied. Two