A CASE STUDY

Using Computers In Farm Management Instruction

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Introduction

If not exactly pervasive, computers used as problem-solving tools in the college classroom have certainly become commonplace. Recent journal articles attest to the increasing use of computers, and particularly microcomputers, in agricultural curricula. The September 1983 **NACTA Journal** contained several reports of classroom computer use (Brown and Peters; Allison; Waldren; and Stitt, Legacy, Reneau, and Patterson). Also, the December 1982 conference proceedings of the American Agricultural Economics Association featured reports of classroom computer use (Litzenburg; Bentley). As early as 1981 there was significant interest among agricultural educators in microcomputers as applied to instruction, and that interest has grown today (Osburn, Schneeburger, Wilsdorf, and Reber).

As at most major colleges of agriculture, Washington State University's Department of Agricultural Economics has been making use of mainframe computers for computer-based problem assignments since the early 1970s. Methods classes such as econometrics and linear programming were a natural early choice for computer-based problem assignments. Certain marketing and production classes also adopted computer assignments for students. Only recently, with the acquisition of a number of microcomputers in the department, have farm management and finance classes routinely incorporated computer use into the course work.

Advanced farm management, a 400 level course reorganized in the spring semester of 1984, was the most recent course in the department to initiate a heavy use of computer problem-solving throughout the semester. One reason for the new emphasis on computer use was the availability of microcomputers. The Department of Agricultural Economics acquired three IBM personal computers in mid-1983. In addition, the College of Agriculture purchased 14 IBM personals in 1984 and established a microcomputing center. Machines were available to students seven days a week both during the day and evenings. The second major reason for emphasizing computer problem-solving was that historically the class had a high percentage of students who would be returning to the family farm; these students had been demanding some type of training on machines that were already part of the farm operation (or soon to be).

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Planning the Course

In early planning for the course, a decision was made to use both microcomputers and the AGNET system, a regional computer network based in Lincoln, Nebraska. This combination would emphasize the practical, hands-on nature of the course. Also, both of these tools are readily available to farmers in Washington, since terminals linked to AGNET are found in every county of the state in cooperative extension offices. Not coincidentally, another computing alternative, the university's mainframe system, was deemed to be cost prohibitive. By using both micros and AGNET, a diversity of software would be available for a variety of problem-solving situations. Most of this software is designed for use in the field, so the students would be gaining skills they could take back to the farm. A final consideration for the micro/AGNET decision was staffing. One instructor and two teaching assistants had to handle over 70 students and it was felt the work could best be allocated by having one assistant specialize on AGNET problems and the other concentrate on microcomputer work.

A second decision was made to let students independently complete problem sets on the computers outside of class time. Most of the students coming into the course had previously been exposed to computing of one type or another. Thus, it was felt the sink or swim approach would have a high probability of success. However, orientation sessions outside of regular classroom time were scheduled on both AGNET and the microcomputers. It was hoped that these sessions would give at least some familiarity with the computers for students who had never before been in a hands-on situation. Attendance at orientations would be strictly voluntary for the students. In general, it was expected that a minimum of classroom time would be devoted to explaining the mechanics of computer use.

As a capstone farm management course, many subject areas were incorporated into the syllabus. Accounting concepts, enterprise budgets, whole farm planning using linear programming, marketing, financial decisions, risk management, and land and machinery acquisition were some of the major topics. Since most of the above list are appropriate computer problem areas, it was decided to formulate eight exercises for which students would have to use either the micros or AGNET to answer. The exercises would be graded and would count for 30% of a student's final grade.

Microcomputer exercises included a cash flow problem, a farm planning optimization problem, a financial problem, and a risk management problem (see Table 1). The cash flow problem was designed and executed on Visicalc spread sheet software. Students were expected to pick up the operation of Visicalc independently based on handouts distributed as a part of

the assignment. The optimization problem was designed for the LINDO linear programming package. For the financial problem, which involved capital asset acquisition and evaluation, a departmental finance program was used. The risk problem dealt with crop insurance decision-making, and could be solved with a departmental Visicalc risk template.[1]

AGNET exercises included an income tax calculation problem, a crop enterprise budget problem, a commodity program participation decision problem, and a buy or lease machinery issue. These assignments were designed to work, respectively, with AGNET programs PLANTAX, CROPBUDGET, FARMPROGRAM, and BUYORLEASE. Students were expected to sign onto AGNET, run the appropriate program and answer questions. In the case of a couple AGNET programs, quite a lengthy learning curve to become familiar with the AGNET program was expected; others were more readily understandable.

Table 1. Abbreviated course outline and computer assignments for advanced farm management, Spring 1984.

I.	Introduction
II.	Use of accounting concepts
	• Assignment 1: Tax plan (AGNET)
	• Assignment 2: Cash flow (Micro)
III.	Enterprise budgets
	• Assignment 3: Crop budget (AGNET)
IV.	Role of economic concepts in farm planning
V.	Whole farm planning
	• Assignment 4: Optimizing resources (Micro)
	• Assignment 5: Farm Program (AGNET)
VI.	Marketing
VII.	Financial decisions
	• Assignment 6: Finance (Micro)
VIII.	Risk and uncertainty
	• Assignment 7: Crop insurance (Micro)
XI.	Land and machinery acquisition
	• Assignment 8: Buy or lease machinery (AGNET)
X.	Business control procedures

Teaching the Course

As the course unfolded, much of the intent of the planning was realized. There was strong desire on the part of the students to use the computers; over 30% took advantage of a mid-semester offer to trade one of the exams for completing a comprehensive term paper that utilized a computer model. (This model did not necessarily have to be one of those used for a class assignment.) In general, there was a sturdy bridge built between the textbook world of farm management and the application of those principles via the computer.

Of course, the class was not an error-free production. There were logistics problems with the large number of students using the AGNET system. All students operated with a common identification number, for example, so that when the number changed, there was temporary mass confusion. Also, the department had a shortage of telephone modems, so there really were only two reliable terminals that could be used to call AGNET throughout the semester. This caused the usual waiting-lines. A couple of the programs proved tedious at best for the students to use, the AGNET CROPBUDGET program being one such example.

[1]For information on program availability, contact Douglas Young, Agricultural Economics Department, Washington State University, Pullman, WA 99164-6210.

But perhaps the largest overall challenge proved to be integrating the computer assignments with the overall flow of the class. Unlike hand calculated problems, estimates of the time a student would need to complete an assignment were much more tenuous. On a couple of occasions, deadlines for assignments had to be extended to reflect the reality of time needed to complete the work. As a result, some assignments were being completed after the lectures were well into the next section.

Also, at times it was too easy for students to become lost in technical computer details and forget what the thrust of the assignment was supposed to teach them. This was a problem in particular during the accounting concepts phase of the class. Computers, it appears, can generate income and cash flow statements so efficiently that students may forget what the principles actually are behind the construction of these statements.

Logistics became more of a burden on instructors than in a non-computer type of class. Designing computer problems that are easy to grade is tricky, at least for the first time. It is pointless to have a student turn in mounds of printout, yet something to show how the numbers were obtained is essential. There is also much more time involved in preparing a computer assignment than a hand written one. It is ill-advised to release an assignment that hasn't been pre-run on the machine several times with different data. Murphy's Law is in existence in the computer world, and a large group of students can be very skilled in demonstrating that. Finally, there invariably will be a myriad of administrative details that need to be addressed, usually by the instructor: providing supplies of diskettes and program handouts, keeping one step ahead of the computer technicians that always seem to be modifying hardware or software, and trouble shooting problems related to sign-on procedures, program call up language, and computer hardware problems. With a class of 70 students, these problems will usually entail telephone calls on evenings and weekends as well as during office hours.

Post-Teaching Evaluation

In order to help evaluate the use of computers in the class, an end of the term survey was conducted (see Table 2). This survey addressed itself primarily to student experiences with the computer assignments and was separate from the regular quality-of-teaching evaluation. The survey was completed by 56 students, or 78% of those taking the class. In addition to direct answer and scaling type questions, there was also room for students to write in comments and suggestions.

Over 89% of those that responded thought that the use of computers helped with their learning of the material. A similar percentage recommended that both AGNET and the microcomputers be used in the course in the future. The bulk of the respondents, 96%, thought that these computers would be beneficial on their own farm. A majority of those surveyed, 62%, thought that the amount of time spent on computers during the course was just about right, with the remainder being split evenly between too little and too much

Table 2. Selected responses from post-class survey of students on computer use.

(1)	Did computers help in learning the course material?	
	Yes	89%
	No	4%
	Undecided	7%
(2)	Should AGNET or the micros be dropped in future classes?	
	Drop AGNET	16%
	Drop Micros	0%
	Drop both	2%
	Keep both	82%
(3)	Were you able to cover more material by using computers?	
	Yes	68%
	No	16%
	Undecided	16%
(4)	Would you feel these computers would be useful on a farm?	
	Yes	96%
	No	2%
	Undecided	2%
(5)	How would you rate the overall computer assignment difficulty?	
	Much too easy	2%
	Too easy	21%
	About right	66%
	Too hard	11%
(6)	How was the amount of time spent with computers in the course?	
	Much too little	2%
	Too little	16%
	About right	63%
	Excessive	17%
	Very excessive	2%
(7)	Would you recommend completing computer runs individually or in teams?	
	Individually	57%
	Teams	43%
(8)	Would you recommend completing the interpretive questions individually or in teams?	
	Individually	46%
	Teams	56%

time. Finally, the group was largely indifferent as to whether future classes should require assignments to be completed individually or in teams of two or three. (This class required work to be done individually.)

Written comments and discussions with students during the semester showed that the use of computers was well received. As could be expected from a large class, the skills and abilities of the students in handling analytical material varied considerably. But it was the background that the students brought to the class that largely influenced their opinions. For example, those who had mainframe and programming experience were likely to see the shortcomings of micros in handling some sizable real-world problems. These same students became familiar with micros and AGNET quicker and also became frustrated quicker.

During the second year the course was taught, the mix of AGNET and microcomputer assignments was changed based on the first year's experience. Microcomputers were used for all required assignments the second year. However, all students continued to receive an orientation to AGNET which was also used for two optional assignments. Only two available AGNET telephone lines, which were sometimes busy due to use by university faculty and staff, were judged to be inadequate for required assignments with a class of 70 students. Cooperative extension had made AGNET lines available to students for free on a pilot basis the first year. By restricting AGNET use to an orientation and optional assignments, it was possible to continue this free arrangement in future years. Charging a $15 lab fee per student in AGNET use was considered, but rejected because waiting lines would continue to be a problem with just two telephone lines available. Also, with expanding availability of microcomputer software, it was possible to find good substitutes for the required assignments which had been run on AGNET the first year.

Conclusions

In this case, homework problems using both microcomputers and the AGNET system were successfully integrated into a single applications-oriented farm management course. Since these tools are used at the present in many farm operations and will continue to be used in the future, their use enhanced the applied nature of the class. The amount of material that can be covered, the depth that problems can be studied, and the apparent level of understanding that students reach were all enhanced by the use of computers in this class.

Our experience was that a formal instructor-monitored laboratory setting for the actual use of the computers need not be established. To be sure, students will always have computer-related questions for the instructors and adequate office hours time must be allotted to adequately handle these questions. Detailed orientation sessions held outside of class lectures early in the semester helped ward off many basic questions on the operation of the micros or the AGNET system. In addition, preparation of a handy hints sheet for each assignment helped most students overcome the most immediate obstacles in running a model.

As has been observed by others, the size of the class will dictate the required level of equipment needed in order to minimize machine access problems. In our case, the 17 micros were more than adequate for the 70 students; the two AGNET terminals were inadequate to handle the load.

The large course enrollment combined with a student workload of eight major computer assignments, three exams, and an optional computer project term paper kept two TAs and the instructor very busy during the initial preparation semester. Special funding had been obtained for the second TA which is unlikely to be available in the future. Hopefully the workload in future semesters will be commensurate with the time availabilities of one TA and one instructor, both of whom have many other responsibilities.

As more colleges and programs acquire micros or gain access to a regional computer network such as AGNET, these tools will likely be an important component of agricultural instruction. To that end, then, we offer the following handy hints on using computers in your classroom:

Plan the course in as much detail as possible.

Start work early on preparing the assignments. Run them several times and try to anticipate students' questions or foul-ups.

Be prepared to spend time with your local computer bureaucracy in order to schedule needed time for the students on the machines, obtain software and other needed supplies.

Resist the temptation to become too computer-oriented in the lectures. Computers are a means in farm management, not the ends.

When Murphy's Law rears its ugly head, be prepared to smile and recoup what you can gracefully.

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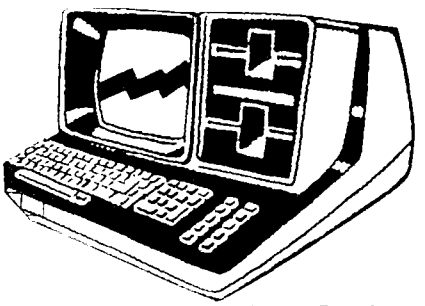
AN ASSESSMENT

Teaching Computers In Agriculture



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Introduction

Computing courses offered in Agriculture have become increasingly popular since microcomputers have the promise of becoming such a powerful force. Since the University of Missouri's College of Agriculture was one of the first institutions to offer a computing course, it seemed reasonable to assess the early results. We felt that it could result in some meaningful information for us and serve as a guide to others who are beginning to develop such a course.

Background

About four years ago, the University of Missouri's College of Agriculture Computer Committee recognized a growing need for a computing course that emphasized computer applications in the food and agricultural sciences. The administration agreed that such a course should be created and it was offered to agriculture students for the first time in Winter 1980. Both the students and teaching staff felt that the course met their main objectives but that using the University's main frame computer to run their programs was cumbersome. More important than the system's deficiencies was the realization that the computing tool of most benefit to the agriculture student was a microcomputer. As a result, the Computer committee proposed to the college administration that a room be equipped with microcomputers to serve its students, staff and faculty. The proposal was accepted and the project was jointly funded by special equipment dollars from the campus administration and the Agricultural Experiment Station.

Microcomputer Facility

The computer committee formulated the preliminary plans for equipping the facility. These included 12 stand-alone Apple II Plus microcomputers and assorted peripheral devices. In the process of preparing the equipment order, it became apparent that there were improvements in both software and hardware that should be considered. Advancements provided the opportunity to try a multi-user network where each station had full computer power, yet had the ability to share costly peripherals such as mass storage, printers, plotters and graphic displays. The Corvus Constellation Network System was chosen after seeing it in operation at Springfield High School in Springfield, Illinois. Because of the ability to share peripherals using the network concept, we were able to equip the room with 14 Apple II Plus microcomputers (instead of 12), two dot matrix printers, a plotter, two analog to digital converters (Versawriter and Apple and Graphics Tablet), two floppy disk drives, a 20 megabyte Winchester disk and a DC/Hayes micromodem. In addition, several software packages were purchased including VISICALC, FORTRAN, PASCAL, CCA (data base management system), Superwriter, etc.

Initial Course Format

In the Fall 1981 semester, the computing course was taught using the newly purchased Apple II plus microcomputers. The original objectives of the course were:

1. To gain "hands on" computing experience.
2. To learn a computer science vocabulary.
3. To gain an understanding of computers and of computing.
4. To write simple agricultural application programs in the programming language BASIC.

Eighty students enrolled in the three credit course; they were split into three sections. Each group was taught both lecture and lab in the microcomputer facility. Lecture and lab were each taught for two hours per week.

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