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Microcomputer Aided Instruction

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Introduction

There is considerable literature on the use and success of Computer Assisted Instruction (CAI) based farm management teaching. (1, 2, 3, 4, 5). Some of the more popular CAI techniques are farm management simulators and games, budget generators, and linear programming (L.P.). Boehlje, Eidman, and Walker; Kay; and Menz and Longworth reported positive student acceptance in courses centered around CAI. Kendrick reported similar student acceptance, but warned that too heavy a dependence on CAI can become boring and actually erode student interest.

One point is commonly stressed in the literature: care must be taken that CAI tools are used to teach concepts or analytical procedures. That is, CAI should not be used merely as a gimmick without solid relevance to teaching objectives. In Kay's words, "A course should be built around objectives. . . not around teaching tools."

Most past efforts in farm management CAI have relied on either batch processing (via punched cards) or time sharing. Both are adequate for the uses that have been made, as evidenced by positive reports of student acceptance, but both have shortcomings.

Batch processing has two primary faults. First, it oftens lacks user-orientation. Thus, students - many of whom are unfamiliar with computer use - must learn to punch data onto cards, assemble cards in the proper order for processing, and read cards into the computer. The margin for error and opportunities for student frustration are large. The alternative of providing students with such services is quite costly. Second, batch processing systems frequently have substantial turnaround time (hours in some cases) between data input and output of results, or notification of error. The result is (1) a limit on the amount of CAI students actually receive, and (2) actual student-computer interaction is limited. A slow computer response means the opportunity to reinforce concepts or show errors in logic may be missed.

Time sharing reduces these problems. However, the user-orientation and interactive nature of time sharing services is often accompanied by a substantial "get acquainted period." Kendrick reported that four hours of computer instruction were given to students in one class before a feed ration formulation program could be run. Some systems exhibit slow response times and poor accessability during periods of heavy use. To use the computer a student may have to be available at 10:30 at night or 6:00 a.m. in the morning. System logon and account number protection procedures can also be confusing to students.

Microcomputers have the potential to overcome some deficiencies of both batch processing and time sharing; not, however, without introducing unique problems of their own. Because microcomputers are a relatively untested tool for CAI, their classroom use merits evaluation.

Procedure

Six microcomputer programs were written to be as user-oriented as possible so that students could operate them with a minimum of instruction. The programs were farm management/farm finance-related, dealing with (1) comparison of loan repayment options and finance charges, (2) comparison of the margin over direct cash costs of two crops at various prices and yields (the Minnesota CROPEQUAL program), (3) tax consequences of alternative depreciation methods and useful life, (4) linear programming for whole farm planning or least-cost feed ration formulation, (5) capital budgeting concepts (internal rate of return and benefit cost ratio), and (6) a breakeven analysis of equipment purchase vs. custom hire.

All students were instructed in the microcomputer's operation. The instruction given consisted of less than one hour of group instruction plus, in some cases, fifteen

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or fewer minutes of individualized instruction. Students logged their time on the computer so total use and individual use could be determined.

All students in the farm management class were to (a) determine the repayment schedules for an intermediate term and long-term asset under at least two repayment options and (b) compare the profitability of three crops that might be grown on the same land, including two price levels for each crop.

Data for the analysis, which support the results reported below, was obtained from (a) a questionnaire given at the end of the semester (after approximately 50 students in each of two farm management classes and 70 students in the agri-finance class, so the sample is considered representative of junior-senior agriculture students. An attempt was made to avoid having students from the two classes compete for the computer. Thus, the maximum number attempting to use the microcomputer during any week was 70 students.

Results

Student Use of the Microcomputer

The log of student use indicated a nearly continuous stream of students occupying the microcomputer on certain days, especially as the assignment's due date neared. This probably indicates some student procrastination in doing assignments.

Crowding may have caused the class to make less use of the programs than they would have made under less crowded conditions: 43 percent of the class in farm management felt that use of the microcomputer was sufficiently heavy that it created difficulty in running their assignments. However, only 28 percent of the students in agricultural finance indicated difficulty in completing their assignments. Scheduling student use of the microcomputer would have decreased crowding, but was counter to our objective of giving students totally free computer access. More recently we have gone to a 30 minute schedule and student sign-up. This was necessitated by student use.

We found that students planning to farm after graduation (a) ran more programs than required, and (b) ran more than the minimum assigned number of programs than students not returning to the farm. This may indicate that students planning to farm were self-motivated to experiment with the newly learned techniques because they could see immediate application to their situations. Several had made some major investments in land and/or machinery. Such students often used the capital budgeting program to determine investment profitability of capital outlays already made. Many students with farming interests indicated they wished they had had access to the micro prior to making some major investment decisions.

Nearly half the students ran our repayment schedules for a new auto or pickup truck, in addition to the assigned problems. At least 20 percent used the L.P routine to estimate the income their parents were getting from farming. Students also tried to determine a profitable plan that would allow them to work into the family farming business. Others looked at possibility of farming on their own. These students often required substantial help from the course instructor or graduate assistant. Most learned more about enterprize budgets, enterprize competition, and resource constraints than they would ever have learned without the computer experience. However, such a learning experience is not limited to the microcomputer.

Student Evaluation

Slightly over half of the class indicated that their perception of what a microcomputer was had changed as a result of their exposure to it in class. Comments on how their perceptions had changed centered around three ideas: (1) before this exposure they had no real conception of what a microcomputer was or what it could do, (2) it was easier to use than expected, or (3) it had greater capabilities than expected. In addition, about 80 percent related they felt the experience would be of value to them in their employment after graduation.

Several students had difficulty believing that questions were being asked and instructions given by "that little box" (the microcomputer). Student feelings of remoteness from the computer, common with batch processing and time sharing, seemed to diminish when they realized the computer they were using was right beside them and they were providing the information for it to process. Also, highly interactive programs and nearly instantaneous feedback seemed to lower student apprehension of microcomputer use. The students could run their problems, then change a number or two and have the alternative answer to their problem in seconds.

Our micro is one floor above the course instructor. It was common for students to come by to show their results as soon as they got some output. We did not keep a count. However, there was evidence of real excitement with the results.

These subjective observations are supported by responses to a question on use of the microcomputer versus the large campus computer. Nearly half the class said that previous to their exposure to the microcomputer they would have choosen to use the main campus computer rather than the microcomputer, if given the same assignments. After their exposure to the microcomputer though, only 4 percent of the class indicated they would rather use the campus computer for their assignments. These results indicated how well students accepted microcomputer use after they had an introduction and limited experience, i.e., had run at least three of the programs.

Limitations in Classroom Use

To this point primarily positive comments have been made regarding microcomputer use. However, there are some potential problems.

1. The micro must be supervised and individualized instructions provided for computer use. Sometimes the student needs help for a minute or less, but someone must be available. We have a small computer and statistical staff who answered many questions in assisting students in implementing their program - even some weekend assistance was provided. Without this kind of assistance and resource, usage would have been curtailed and/or professorial time requirements increased several fold.

2. The types of problems addressed may be limited by available memory. The microcomputer used in this classroom situation could process a 900 element (30 x 30) linear programming matrix, but nothing larger.

3. Security of some microcomputers and their programs may not be adequate for classroom use: students with sufficient knowledge of microcomputer language could tamper with programs available to an entire class.

4. Microcomputers are not supported by campus computing administrations on some campuses. Computer programming for special purposes (operating system changes, etc.) may have to be done within the instructional unit; this requires computer programmers proficient in assembly language programming.

5. Maintenance could be a problem. If not carried out by a responsible, reliable organization, serious downtime problems could result. Losing a microcomputer's services for even two weeks could be a serious blow to a teaching plan - especially if intensive use of the microcomputer was planned.

Another area of concern is the paucity of microcomputer programs available for farm and financial management CAI. Because of language incompatabilities, few microcomputers can use the CAI programs already developed for time sharing and batch systems. Rewriting those programs involves considerable expense. Moreover, language incompatability between microcomputers often precludes the transfer of programs from one microcomputer to another. Thus, programming language incompatabilities contribute to the scarcity of financial/management microcomputer programs.

Finally, use of the computer is not a substitute for teacher preparation, nor is it necessarily a saver of teacher time.

Summary

In summary, use of the microcomputer, for whatever reason, appeared to increase motivation among students. Use increased dramatically the number of "teachable moments." Also, a number of other desirable teaching benefits are associated with use: (1) sensitivity analyses of several types were more readily achieved and observed by students as they changed input data, (2) students were able to approximate the real world with greater ease, and (3) students could put theory to a test in the models.

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Resources for Teaching and Learning

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Net-works for Teaching — Learning?

The concept or form of a net-work is being used to discuss instructional resources support systems, especially by large and complex educational institutions. Anything resembling a net in concept or form and dispersed with intersecting lines of communication such as a broadcast network or electronic network is a net-work by definition. Probably the best definition by example is the electronic network, a group or system of electric components and connecting circuitry designed to function in a specific manner.

The instructional resources support net-works are a group or system of instructional support components with connecting lines of communication and operational