Follow and give the correct output for simple formulas	5.64
Explain the concept of programming	5.50
Evaluate individually developed programs	5.39
Express ideas or problems as formulas	5.28
Describe the use of control statements	5.26
Define terms related to programming	5.18
Program mathematical functions	5.18
Read a flowchart	5.11
Use editing procedures to correct programs	4.98
Link programs together	4.96
Describe standard flowchart symbols	4.95
Identify variations of BASIC language	4.89
Explain simple error messages related to programming	4.86
Translate a formula into a flowchart	4.73
Write a flowchart to represent a solution	4.73
Design assignments requiring progressively greater programming skills	4.53
Develop and apply strategies for debugging programs	4.48
Translate a simple flowchart into a computer program	4.46
Write a program using a structured format	4.25
Predict computer output given a program list	4.14
Translate programs from one language to another	3.48
Program in a language other than BASIC	3.43

* Mean was based on a scale of 0 to 10 with 0 indicating "not needed," 1 indicating "strongly disagree" and 10 indicating "strongly agree."

Conclusions

The data collected and analyzed resulted in the following conclusions:

1. Illinois community college agriculture instructors having access were using microcomputers in their community college agriculture programs.
2. Community college agriculture instructors were using microcomputers to aid classroom instruction, SOEP record keeping, classroom record keeping, agriculture club activities, resource for local agriculturists, independent study, extra credit work and adult education.
3. Community college agriculture instructors desired to learn the basics of microcomputer operation, but they rely mainly on canned programs. Community college agriculture instructors wanted canned programs and basic microcomputer training.
4. Community college agriculture instructors lack adequate instructional materials to teach microcomputer usage in agriculturally related topics, such as agriculture mechanics, agriculture business and economics, and animal science.
5. Eighty-four essential microcomputer competencies were identified as needed by Illinois community college agriculture instructors.

Recommendations

1. Community colleges should continue to develop and update their college classes and inservice training techniques in microcomputer usage in agriculture.
2. Educational and application software should be developed for agriculturally related topics.
3. The 84 microcomputer competencies identified should be incorporated into the training of community college agriculture instructors.

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Computerized Testing of Agriculture Students

Blannie E. Bowen and David M. Agnew

Much of the research about using computers in testing and grading is descriptive in design. Doying, Matheny, and Minnick (1983) discussed a computerized test generation package used with a Principles of Entomology course. Tice (1981) worte that an interactive grade recording package was effective for his agricultural economics course, but a written grade book was still needed. Meanwhile, students who voluntarily took make-up quizzes on videoscopes or typewriter consoles during a Principles of Micro-Economics course had significantly higher averages for all quizzes taken and higher final grades in the course. (Thatch, 1983).

Few researchers have studied the effect that computerized testing has on the cognitive, affective, and psychomotor development of agriculture students. Two related studies were located about this type of testing. Minnesota Multiphasic Personality Inventory (MMPI) scores made by students taking an introductory psychology course were not influenced by three methods Biskin and Kolotkin (1977) used to give the MMPI: (1) paper and pencil, (2) cathode ray tube terminals linked to a mainframe computer, or (3) teletype machines hooked to a mainframe computer. However, a study at the Naval Training Center in San Diego, Cory (1977) concluded that computerized testing will be more effective than paper and pencil methods in predicting job performance in some specialized occupations.

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The Study

Clark (1983) summarized the literature on the effects of media in the classroom and concluded that the instructor, not the media, will bring about student learning. His meta-analyses of five decades of media research suggest that time savings advantages for computers in the classroom might not be believable or practical. Based upon the research by Clark and the studies noted above, the researchers designed a study to determine whether microcomputers could be used to effectively administer a test to agriculture students.

The overall question tested was: What effects will taking a final examination on a microcomputer have upon student performance on the test, student attitude toward microcomputers, and the time needed to take the test? Three hypotheses were developed for testing at the .05 alpha level:

1. **When midterm evaluation scores are used as a covariate, the scores students make on an objective final evaluation administered on a microcomputer will not differ significantly from the scores made by students who take the same test using conventional paper and pencil procedures.**
2. **Immediately after the test is administered, the attitudes students have about computers will not differ significantly for the two methods of administration (microcomputer versus paper and pencil procedures).**
3. **The minutes students need to take the test will not differ significantly between the microcomputer and the paper and pencil administration methods.**

Procedures

To test the above hypotheses, the study was designed and conducted with two replications. This strategy was deemed appropriate since Johnson (1984) cautioned against using computer-based products without adequate testing under carefully controlled classroom conditions. Further, Spector (1981) emphasized that experimental studies should be replicated to minimize external validity threats. The posttest only control group design was used to test the effects of giving students a final evaluation using microcomputers (Campbell and Stanley, 1963).

Subjects for the two replications were enrolled in Agricultural and Extension Education 5203/7203, a three semester hour microcomputer applications course at Mississippi State University. Replication 1 was taught at Carthage (MS) High School during the Fall, 1983, with 49 students enrolled. Each of 15 class meetings consisted of a two hour lecture and a one hour laboratory where students completed a series of microcomputer applications. Each student pair worked on a microcomputer and a printer to complete the laboratory activities. The students were required to complete an additional hour of laboratory activities exclusive of class time.

Replication 2 met at Petal (MS) High School once per week for 10 meetings during the Spring Semester of 1984. There were 28 students enrolled in this replication. Each meeting consisted of a 2½ hour lecture and a 1½ hour laboratory. An additional 1½ hours of laboratory activities were required of the students during hours exclusive of class meeting times. Both replications consisted of the same lecture content and laboratory activities. The same professor and teaching assistant taught both replications.

The Treatment

During the next to last lecture meeting, the professor reviewed with the students the content for the objective final examination. The students were told that the final evaluation would be given the following week during the laboratory session. The professor told the students that half of them would take the final using test booklets and optical scan sheets while the other half would take it on the microcomputers the students had used throughout the course.

Two stage random assignment was used to get the students into the treatment (microcomputer) and the control (conventional paper and pencil) groups. First, the students were randomly assigned to either group 1 or group 2. The treatment was then assigned at random to one of the two groups. The professor administered the final examination in the laboratory with one student per microcomputer while the teaching assistant gave the final to the control group in the lecture meeting room.

The testing package used in the study presented only one item on the screen at a time and did not advance to the next item until the student entered the correct answer for an item. However, only the first response a student entered was considered right or wrong when computing that student's score on the examination. The commercially prepared package told the students their scores on the examination were based on 35 multiple choice items with four choices per item.

To acquaint the microcomputer group with the testing procedures, a sample three item quiz was completed by each student before the examination was started. The professor then answered student questions about the testing procedure. Meanwhile, in the lecture hall the teaching assistant explained the testing procedures and handled questions students had about the process. Both instructors recorded the number of minutes each student took to complete the examination. Immediately after they finished the examination, all students completed an instrument to measure their attitudes about computers.

Instrumentation and Data Analysis

Three dependent variables were measured in the study. Dependent variable 1 consisted of the number right students made on the 35 item objective final examination. This evaluation was constructed by the professor and refined through 10 prior times the course had been offered. The Cronbach's alpha reliability coefficient for Replication 1 was .80 while in Replication 2 it was .78. Dependent variable 2 was student attitude toward computers immediately after taking the examination. A 10-item attitudinal instrument was content validated by a panel of experts and yielded Cronbach's alpha coefficients of .74 for Replication 1 and .78 for replication 2. Dependent variable 3 was minutes students took for the evaluation. The professor and the teaching assistant used their watches to record the minutes each student required.

The data were analyzed by replication using descriptive statistics to portray the subjects. Oneway analysis of covariance was used to analyze Hypothesis 1 (Score on the Final Examination). A t-test for independent groups was used to test both Hypothesis 2 (Attitudes Toward Computers) and Hypothesis 3 (Minutes for the Examination).

Student Data

The mean age for Replication 1 was 33.8 years. The treatment group was 34.9 while the control was slightly younger at 32.5 years. In Replication 3, the average was 38.4 years (42.7 for trestment versus 34.1 for the control group).

Eleven of the 49 students in Replication 1 were males, 7 in treatment and 4 in control group. The 38 females in this replication consisted of 18 in the treatment group and 20 in the control group. For Replication 2, nine of the 21 males were in the treatment group and 12 were in the control. Five of the 7 females in this replication were in the treatment and two were in the control group.

The objective midterm for the course was administered using paper and pencil procedures and computed on a 125 point scale. For Replication 1, the treatment had a midterm mean score of 98.4 while the control group's midterm score was 98.8 while the control group's midterm was 103.9. No significant difference in midterm score was noted at the .05 alpha level for the treatment and control groups in both replications (Replication 1: $t(47)=-.74$; Replication 2: $t(26)=1.04$).

Test of Hypothesis 1

The midterm examination was highly correlated with the final in Replication 1 ($r=.77$). In Replication 2, the midterm and the final were moderately related ($r=.43$) The midterm was judged to be of sufficient strength to be used as a covariate in testing Hypothesis 1. In Replication 1, the treatment group had an adjusted mean score of 28.4 while the control group had an adjusted mean of 28.9. When these scores were subjected to a oneway analysis of covariance, no significant difference was noted for the two methods of testing ($F=30$, d.f.$=1$, 46). Similar results were noted in Replication 2. The treatment group had an adjusted mean score of 26.5 while the control had a mean of 26.3. A oneway analysis of covariance indicated that the method of testing did not significantly influence the scores on the final evaluation ($F=.02$, d.f.$=1$, 25). Hypothesis 1 was not rejected in either replication since scores students made on the 35 item examination were independent of the method of testing.

Test of Hypothesis 2

The instrument designed to measure student attitude toward computers had a range of 10 (negative attitude) to 50 (positive attitude). Students participating in both replications had positive attitudes toward computers. In Replication 1, the treatment group had a mean of 40.9 while the control had a mean of 41.0. The treatment group had a mean of 39.3 in Replication 2 while the control had a mean of 41.4. The t-test for independent groups indicated that in neither replication was a significant difference observed between the treatment and control groups. Thus, hypothesis 2 was not rejected in either replication since the treatment and control groups had similar positive attitudes about computers immediately after the examination.

Test of Hypothesis 3

In both replications, the control group needed 27 minutes for the examination. However, in Replication 1 the treatment group needed 32.7 minutes and in Replication 2 the treatment group needed 10 fewer minutes (22 versus 32.7). The independent t-test indicated that in Replication 1 the treatment group needed significantly more minutes: $t(47)=2.36$, p►.05. No significant difference was observed in Replication 2. Hypothesis 3 was rejected in Replication 1, but not in the first replication.

Conclusions

Two conclusions were drawn based upon the findings of this study:

1. Students tested using microcomputers scored as high and had as positive attitudes toward computers as students who were test by conventional paper and pencil procedures.

2. Time requirements for the paper and pencil method of administration appears constant, but the time needed for the microcomputer method may be the same or even less than that needed for conventional testing methods.

Recommendations

Two recommendations are offered based upon the findings of this study:

1. College agriculture instructors should consider using microcomputers to administer objective examinations when their students have the skills needed for this method of testing.

2. The time required for the microcomputer administration method merits further study since this method produced inconsistent results in this study.

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Using a Commercial Spreadsheet Package for Grading

Norman D. Reese

The traditional instructor's gradebook has been on the way out since the first computer was introduced in the educational environment. The advantages of using a computer for this data-handling task are obvious and do not have to be repeated here after so many articles have already been written describing various gradebook packages available to educators today.

There is a tendency in this field, however, to concentrate on highly-specific programs written in BASIC that reflect only the author's needs for grade recording and calculating. Grading is a subjective task that is usually handled in as many ways as there are educators. In addition, there are many of us who simply are not programmers and who do not care to be programmers, but would also like to be able to tailor a grading program to our particular needs and prejudices. Fortunately, there is a way out.

Background

At Michigan State, we have introduced a course, Introduction to Microcomputers, which is a basic "computer literacy" course, aimed at our two-year students in the Institute of Agricultural Technology. In this course, we assert that 80-90% of the student's computing needs may be met through the use of one or more of the three generalized software packages: the word processor, the spreadsheet, and the data base. The advantage of using these menu-driven programs in place of individually-written software is that no knowledge of programming languages is required.

This distinction is important. We feel that the term, "computer literacy" does not necessarily, nor should it, imply a knowledge of BASIC or any other programming language. Using these languages effectively is a special art that is not easily mastered unless one decides to devote considerable time to the effort. Due to the great number of professional programmers in the world today who are writing new and easier-to-use software, it becomes less and less necessary for a computer user to know programming. Instead, the user may, today, choose among a wide range of easy-to-learn, interactive, menu-driven programs, that can be quickly tailored to a specific application, thus finally placing the computer in its proper niche as a TOOL, rather than a novel toy.

For these reasons, the gradebook used in our introductory course is not a special purpose grading package, but a template for a commercially-available spreadsheet, SuperCalc2 (TM), tailored to fit the grading requirements of the course. The same spreadsheet template is used in other courses as well, with eaily-made modifications to adapt it to the specific course requirements.

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A Spreadsheet Template for Grading

Figure 1 shows the spreadsheet template with student numbers and grades. The spreadsheet itself may be thought of as a large piece of paper marked off with vertical and horizontal lines to create a great number of "cells", which may contain data, formulas, or text. The rules for creating various templates for performing different chores are much easier to learn than are programming languages, due to the much smaller number of these rules.

On the template, all that is entered is the individual scores for each exercise, the student names and numbers. Everything else on the sheet, all averages and grade points, are calculated automatically. Each time a new exercise is completed, the scores are entered, new averages calculated, and a new spreadsheet printed and posted, all in about ten minutes' time. Normally, all that is posted is everything shown except the student names and disk numbers, which are either cut off manually or omitted in the print. The weighting factors can be changed as the term progresses and the "final average" column automatically reflects the new weights, as does the "grade" column.

Most grade posting spreadsheets, such as this one, are too wide to print in one pass. For this reasons, we have also purchased another inexpensive commercial program, called Sideways (TM), that, in effect, turns your dot-mattrix printed 90 degrees to print wide spreadhseets in a single pass. Super-Calc3 (TM) includes this useful utility automatically. Adding a macro processor, such as Prokey (TM) or Superkey (TM), makes it feasible, as we are doing at MSU, to post weekly summary grade sheets for a class with over 150 students. That particular class has 10 homework assignments, 9 lab exercises, two tests and a final exam. With 150 enrolled, that makes a staggering total of 3300 grades to record, weight and average! Each week, however, it is only necessary to enter the weekly scores, and, a Prokey (TM) - generated macro then prints seven spreadhseets (one per section) while the grader does something else.

Many readers will immediately ask, "Why didn't they include ________?" The reason is that it didn't seem important to us. If it does to you, it is the work of a few minutes to change the spreadsheet template to include ________, or whatever else you desire.