though they are available on free loan from the college library. However, students prefer live plants for studying plant identification, for lab demonstrations, and for lectures on plant groups. Overwhelmingly, students preferred the new teaching strategy over the old with most indicating the value and helpfulness of the stated learning objectives and sample exam questions provided in each learning module.

Pre- and posttest results and individual questions on tests and quizzes suggest that in general the printed modules and manuals perform well. Results of testing of material covered in modules or manuals, but only peripherally covered in class, indicate that students were able successfully to study material on their own and to learn from this self-study material.

Analysis of tests and quizzes in comparison to learning objectives and sample questions as well as student evaluation, questionnaires, and interview responses have indicated a few specific weaknesses.

1. A few errors and ambiguous areas in module texts have been pinpointed.
2. While learning objectives and testing are generally in agreement, discrepancies exist.
3. Students find illustrations in modules useful but not as valuable as photographs, slides, or live examples.

While minor flaws were discovered in the new teaching strategy, overall, this format using graduate teaching assistants and printed modular learning aids is successful. Student learning and acceptance of this new strategy was highly uniform between sections. The success of this project establishes the feasibility of using GTA's to release faculty members to design and teach more advanced courses. To assure the quality of instruction, faculty will supervise the course each term and revise materials as required. It is expected that students will benefit from the availability of advanced courses made possible by this use of GTA's while students enrolled in this Indoor Plants course will be assured of uniformly high-quality instruction.

Literature Cited

1. Gogue,G.J. 1978. Professional dilution and horticulture. *Hort Science* 13(2): 130.
2. Popham, W. James. *Evaluation Guidebook.* 1972. Instructional Objective Exchange. Los Angeles, CA.
3. Mager, R.F. 1962. *Preparing Instructional Objectives.* Fearon Publishers, Palo Alto. 53 P.
4. Russell, James D. 1974. *Modular Instruction.* Burgess Publishing Co., Minneapolis. 142 P.

Grade Recording And Statistics Program For Microcomputers

Thomas F. Tice

Introduction

The calculation and dissemination of grades to students and administrators can be a time consuming component of teaching. If a computer program is used effectively, it will not only reduce the time involved in calculation of grades, but it will also reduce the time involved in disseminating the information since the grades can be printed by the computer's line printer. If grades are disseminated periodically, it will virtually eliminate student inquiries concerning grades and increase the effectiveness of the non-teaching function of the professional. The purposes of the grade recording program described in this paper are threefold:
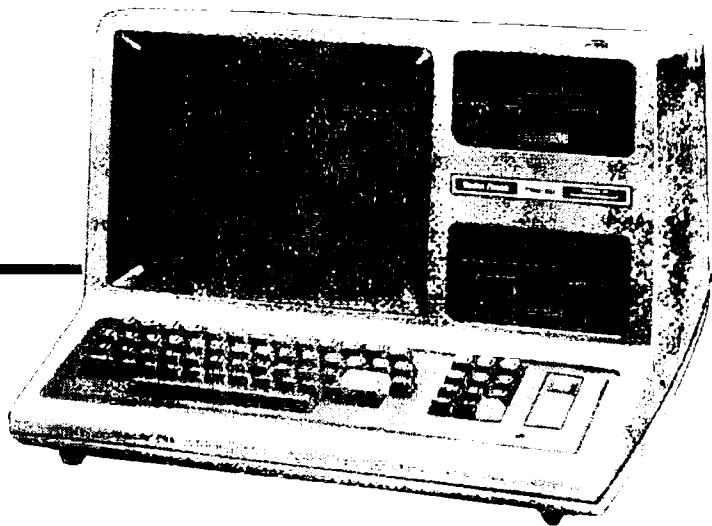
1. To minimize the amount of professional (teacher) time used to calculate student and course grades.
2. To allow the student to verify the grades recorded for each assignment.
3. To inform or update students of their course grade throughout the semester.

Tice is assistant professor in the Department of Agricultural Economics, Oklahoma State University, Stillwater

The grade recording program is written in the BASIC programming language compatible with the TRS-80 Model II Radio Shack microcomputer. The TRS-80 Model II uses an eight inch magnetic diskette. For the grade recording program, a line printer is used to display the student scores and grade statistics.

The grade recording program is interactive; that is, program options are selected from a list and information is typed on the keyboard and stored in response to questions from the computer. The program is written to allow nonprofessional and nontechnical personnel to enter all the necessary grading information from the teacher's written records. Thus, in the author's opinion, the grade recording program is complementary to the written grade book and not a substitute for it.

Program Features

Course Information

There is some information about the course which must be stored before the class roll is entered. The items include an eight character abbreviation for the course title, the number of class sections, the number of lab sections, and the number of each type of assignment — class assignments or quizzes, lab assignments or quizzes, hour exams, semester projects or papers, and the final exam. Multiple assignments may be given except for the final exam. The maximum score for each assignment is also entered. The collective weight for class assignments and lab assignments is stored and the weight of each hour exam, class project or paper, and the final exam is also stored. Once this information is stored on the diskette, the program will read it from the diskette each time the program is run.

A maximum of 59 scores can be recorded for each student. There is no realistic limit to the number of lab or lecture sections which the course may have. Also, the number of students is limited only by the storage capacity of the eight inch diskette (easily in excess of 1000).

Entering, Correcting, or Adding to the Class Roll

The class roll consists of the student's name, identification number, lecture section and lab section, if appropriate. The identification number can be any real or integer number the instructor wishes to assign. Immediately after the information for each student is entered, the program will print the information on the screen to be verified. If the information is wrong, it can be corrected at that time. If an error is found in the class roll at a later time, it can be corrected using an option for that purpose within this program feature.

Entering Grades

A similar procedure is used to record the scores for each type of course assignment (class, lab, hour exam, semester projects, or final exams). The program asks for the assignment number being recorded. The student's identification number and his or her score is entered in response to the appropriate command. Immediately after the score is entered for a student, his or her ID number and score will be reprinted on the screen for verification and can be corrected if it was entered incorrectly. If an error is found or the score is changed later, there is a special program feature available to change the score.

Listing an Individual Student's Scores

The scores for all assignments given up to any point or for the entire semester can be listed for a single individual. The number of assignments which have been recorded and the student's identification number are the only required information.

Listing Scores for the Entire Class

The scores recorded for all students can be listed on the line printer by either class or lab section. The student's name and identification number are printed at the top of the page. Each type of class assignment is identified by an appropriate heading followed by the number and score of each assignment. The current cumulative score is printed at the bottom of the page. This feature allows the instructor to inform students of their performance periodically throughout the semester, and it requires very little time. Each student's score sheet can be handed out as an assignment is returned.

Corrections to Student's Grades

If a recording error or an error in grading is caught after the scores have been recorded, a program option allows the correction to be made to the diskette record. The student's identification number, class assignment type, assignment number, and correct score are required information.

Calculating Statistics

The instructor is often interested in the mean and standard deviation of the class on either specific assignments or on all the assignments. Comparison of performance of different lab sections or lecture sections may also be of interest.

The program calculates several different means and standard deviations. One option is to calculate the average score and the standard deviation of a specific assignment. These statistics are reported in raw terms unless percentage scores were recorded. Another option is to calculate the mean and standard deviation of a set of assignments for the entire class. When these statistics are calculated, the mean and standard deviation for the same set of assignments for each lecture and lab section are also calculated. The statistics for the entire class are reported in both raw and percentage terms, while the statistics for each lecture and lab section are reported in percentage terms. All the statistics are printed by the line printer.

The program also has the option of printing a ranked list of the students' cumulative scores. This list is printed by the line printer and the scores are ranked from the highest score to the lowest score. Either raw scores or percentage scores can be listed. In either case, the students' identification numbers are not printed with the ranked listing.

Miscellaneous Features

There are two additional features of this program which have not been mentioned. An individual's record may be deleted from the class roll and the course information may be changed.

When a student drops the course, his or her record should be deleted from the class roll. The student's identification number is the only information required. The program will display the student's name and identification number for verification before it is deleted. If a mistake is made while entering the identification number, you can correct your error before any record is deleted from the roll. When an individual's record is deleted from the roll, his or her scores will not be used to calculate any of the statistics reported by the program.

Course parameters may also be changed if desired; however, there are two precautions which should be

taken. If the number of assignments is changed, it may be necessary to reenter the scores for some assignments since the format of the student's record is affected by the number of assignments. If you change the weights of the assignments, the sum of the weights must add to 100 for the percentage scores to be calculated correctly. The program warns the user of these characteristics if changes are made.

Experience with the Program

The program was written and used during the fall semester of the 1980-81 academic year; therefore, experience with the final product is rather limited. Seventeen scores for a class of 90 students were recorded by the author. Approximately 15 minutes were required to store the grades for one assignment for the entire class. To obtain a list of all the scores for all the students in the class required approximately 30 minutes. The final grades were determined using the list of ranked cumulative scores. Approximately 10 minutes were used to calculate and list the statistics and ranking of the cumulative scores. The grade distribution was easily determined from the printed information.

The program was used by a colleague the following spring semester with a class of 170 students. His secretary ran the program; therefore, he did not spend any time operating the microcomputer. The author spent approximately one hour training the secretary to operate the microcomputer and run the program. She had no previous experience with the operation of microcomputers or other types of computer terminals. Since the program is interactive, minimal supervision is required once the keyboard operation is mastered.

Currently, the author is using the program with a class of 85 students. His secretary runs the program; therefore, no instructor time is involved in recording scores. Since the secretary had previous experience with computer terminal operations, the author spent very little time (approximately 15 minutes) explaining the operation of the program.

Comparison of Alternative Programs

Other grade recording programs have been developed for macrocomputers and microcomputers. Some of these programs have not been published in the literature while others have, e.g., Crouse, 1981; Teoh, 1981; and Strang, 1980.

The author is familiar with an unpublished grade recording program in use at Oklahoma State University, which is written in the Fortran language and runs on a macrocomputer. Its major limitation is the time required to enter data and receive the output. Scores must be written on forms which are used by keypunch operators to punch the data onto computer cards. The cards are then added to the program cards and read by a card reader. The output is printed by the lineprinter after the program is processed by the computer.

The program written by Teoh is limited to recording 20 scores for up to 50 students. The program does not allow for different lecture or lab sections for a given course; therefore, the statistics to compare lab or lecture sections are not given. The students' score sheets are printed in alphabetical order, thus if there is more than one section, the output must be handsorted. The final grade can be assigned by the computer based on a range entered for each grade. The program requires the microcomputer and a disk drive. Use of a line printer is optional.

With Strang's program, a maximum of 12 scores can be recorded per student. The course can have up to nine lab or lecture sections and is limited to 500 students. The program also assigns final grades. This program requires the microcomputer, a disk drive, and a line printer.

The program written by Crouse is designed for primary or secondary educational use. It has the capability to record daily scores for four, nine-week periods. It also is capable of grading assignments, therefore, a scanning device is required in addition to the microcomputer, line printer and disk drive.

Commercially available data processing programs (e.g. Visicalc, Target, Sectacubtor) can be used for grade recording purposes. Their major limitations are purchase cost and the time required to learn their program commands.

Concluding Comments

Beside the advantages listed earlier, there are several other characteristics which make this program attractive. First is the advantage of security. Some macrocomputer programs store student data on disks which are accessible to all users. However, grading information is not permanently stored in the microcomputer, thus "tampering" with grades is not possible without the diskette. The diskette can be kept secured in the same manner as the handwritten grade book.

Second, many private colleges and smaller public institutions may not have access to large computer facilities which are required of programs written in compiler languages. The microcomputer technology is more likely affordable by these institutions. In addition, teachers at these institutions could take advantage of other teaching aids developed for use on microcomputers.

To obtain more information about the program, interested parties may contact the author by writing to the following address:

Department of Agricultural Economics
Oklahoma State University
Stillwater, OK 74078
(405) 624-6084

References

Crouse, D.B. May 1981. "Computerized Gradebook as a Component of a Computer Management Curriculum." **Educational Technology**, Volume 21, pp. 16-20.

Strang, H.R. October 1980. "Microcomputers and Academic Grading." **Educational Technology**, Volume 20, pp. 58-59.

Teoh, W. October 1981. "Grades: A Class Record Updating System." **Creative Computing**, Volume 7, No. 10, pp. 166, 168.