Biology may be of interest to a student who is also thinking about Animal Science. Again, the chart enables the student to visualize the differences among majors and the degree to which they are related or unrelated.

Our faculty have always considered it desirable to have each major open to any student in agriculture. We have never subscribed to the view that there should be quotas and restrictions on some majors but not others. In some majors we now face increasing numbers of students and the overcrowding of facilities beyond capacity. It is our desire to **advise** rather than **force** students to enter majors that will fulfill their objectives and, at the same time, balance student enrollment in the various majors in the agricultural science program.

Table 1. Selected Employment Activities Compared To Major - 1977 Graduating Class in Agriculture

	Employment Activity					
Major[1]	Farming	Ag. Ext.	Chem Fert/	Feed	Food Proc	Bank/ Credit
Agricultural Economics	X	X		X		X
Animal and Poultry Science	X	X		X		X
Dairy Science		X	X		X	
Crop Science	X	X	X	X		X
Soil Science	X	X	X			
Horticultural Science	X	X	X			
Entomology		X	X			
Plant Protection		X	X			
Environmental Biology			X		X	
Resources Management			X			
Microbiology			X		X	

[1]no graduates in Agricultural Mechanization in 1977.

Table 1 illustrates some of the types of employment activities in which graduates in 1977 are presently engaged. These employment activities are tabulated with reference to the majors from which students graduated. This table illustrates in detail the basis for setting majors "in equilibrium." The chart presents the information with much more visual impact than does the table.

Summary

Students in agriculture often have difficulties in visualizing the interrelationships that exist among various majors as they relate to employment opportunities. A chart outlining the interrelationships among the majors in the B.Sc. (Agr.) program at the Ontario Agricultural College has proven extremely useful in advising students and helping them resolve their academic and professional objectives.

PLATO in Forestry

Dieter R. Pelz and
Donald J. Ware

Abstract

PLATO is a computer based education system that provides individualized student instruction. Presently more than 4000 lessons in over 100 different subject areas are available. The PLATO computer system is being used for instruction in several forestry courses. Forestry lessons include introduction to forestry, tree identification, forest inventory methods, and THREPS, a 3-P sampling simulator. Potential applications in forestry are in college education, training of field foresters, and public information and education.

Several computer systems have been developed that provide a unique learning environment for students. The PLATO system (Programmed Logic for Automatic Teaching Operations) was developed at the University of Illinois.[1] Applications of PLATO to various areas have been reported by Bitzer et al [2], Hyatt et al [5], Grossman-Walter [4], and Smith-Sherwood [8]. This paper describes the present use of the PLATO system in forestry education.

The computer system is based on a central large scale computer with terminals at various locations. The central computer is a Control Data Corporation Cyber series computer with 6500 60-bit words of central memory [10]. Ten peripheral processing units, two central processing units, and several disk storage units complement the system. Finished course lessons are permanently on the disks. PLATO terminals consist of keyboard, a touch sensitive plasma panel, and input/output devices, such as a microfiche selector for slide viewing and an audio device for instant playback of prerecorded messages [9].

PLATO Lessons

Lessons must be programmed in TUTOR, a specially developed language for PLATO. It can be learned easily so that instructors can program their own lesson materials. Manuals for beginners and advanced programmers are available [3], [7].

Presently there are more than 4000 hours of instructional materials available in more than 100 different subject areas [6]. In forestry several courses are using the PLATO system; for others lessons are being developed presently.

Completed PLATO lessons in forestry are Tree Identification and Introduction to Forestry. Subject areas under development include forest inventory methods, and three-P sampling simulation. Planned are

Pelz is Assistant Professor of Forest Biometrics and Ware a student in Forestry at the University of Illinois, Urbana.

1) The PLATO system was developed and is administered by CERL-the Computer based Education Research Laboratory, Donald L. Bitzer, Director, at the University of Illinois, Urbana.

lessons in forest management and decision models. Forestry students also are using a statistic PLATO lesson in the senior level applied statistics course, in addition to lessons developed for non-forestry courses.

Introduction to Forestry

The lesson "Introduction to Forestry" was developed by the authors for display at the Illinois State Fair. It was the contribution of the University of Illinois Department of Forestry to the display of the State Department of Conservation.

Its main objectives were to give an introduction to multiple-use forestry with many illustrating slides and to demonstrate one aspect of the use of computers in forestry education. After a short introduction the program can be accessed at multiple entry places. Items that can be addressed directly include timber management methods, wildlife, recreation, forest inventory, wood products, forest flowers, and Christmas tree growing. For each subject a number of pictures (from a microfiche) is shown with a brief description.

Communication with the main computer at the Universty of Illinois was established via a voice grade telephone line. In general, visitors seem to be more interested in PLATO than in traditional displays. We believe that PLATO can be an excellent medium for public information and education. People seem to become interested in the computer displays very rapidly. Once they are attracted by the transmitting medium they can be exposed to the message itself (to which they have probably become more receptive).

The tree identification lesson has been used in the forest dendrology course at the University of Illinois since 1975. It allows students to study trees and their geographical distribution. There are 130 different tree species illustrated with at least one slide each.

The student selects a forest region and PLATO provides information on soil, climate, and vegetation characteristics common to that region. In a given region a family may be selected, and its major characteristics will be displayed. The following part of the program allows selecting individual tree species. For each species selected, a slide or set of slides is displayed showing crown form, twigs, leaves, flowers, and fruits. With each slide a brief description of that species is given in print. Students may ask for information on species in any order they wish and study each species as long as they think it necessary.

A quiz section allows the student to test his knowledge of tree identification. A randomly selected slide is shown and the student is asked to identify the illustrated tree species. A number of hints are given if the student is unable to identify the tree immediately. Up to 3 trials are allowed after which the tree is identified by the program. Student response to the use of PLATO during the last three years was in general favorable; most students considered the program a valuable learning aid.

2) Three-P sampling is a forestry sampling method where the probability of selection is proportional to prediction (i.e. estimate of the variable of interest).

Forest Inventory

A lesson presently under development is the forest inventory lesson. Upon its completion the student will be able to plan and execute a complete forest inventory.

Sampling methods such as fixed area sampling, circular and rectangular plots of different sizes, and point sampling are illustrated in the first section. Alternative allocation methods such as simple random, systematic, cluster, and stratified sampling are shown in the second section. After completion of the first part each student can review sampling methods and plan a complete inventory of a generated forest. Plots may be selected randomly or systematically by indicating their location on the touch-sensitive plasma panel. The student must determine the sample size. A preliminary sample may be taken for estimating the variation of the sample population.

With PLATO a student can experience the planning of an inventory and perform alternative sampling methods without spending a large amount of time collecting data in the field and doing tedious repetitive calculations.

Sampling Simulator

A separate sampling method simulator is THREPS, the Three-P Sampling Simulator.[2] It provides the student with the opportunity to study and practice this sampling method.

The efficiency of Three-P sampling depends on the ability to predict the variable of interest (often tree volume) consistently. In the first section of the simulator, graphs of trees are generated on the screen and their diameters, heights, and volumes are given to allow the user to develop his individual estimation ability.

The second section tests how accurately the user is able to estimate tree volume from graphs. If the estimates are sufficiently close the user may proceed to the actual sampling program. The simulator displays a tree graph and indicates its diameter. The user estimates its volume, calls for a random number, and compares the two values to decide whether to include the tree in the sample. If he makes the wrong decision THREPS corrects him instantly and asks for reevaluation. After all trees have been reviewed THREPS prints the relevant sampling information, number of mistakes, and compares the efficiency to a set standard.

We plan to replace computer generated tree graphs with slides of trees, thus making the simulator much more realistic. This will afford users the opportunity of practicing the estimation of actual tree volumes in addition to learning the principles of the sampling method.

Access to PLATO Lessons

Completed PLATO lessons are available to other PLATO users, since the copyright of all material rests with the University of Illinois. Although the tree identification lesson is the only forestry lesson available for distribution, additional lesson material will become available in the near future.[3]

3) Information on these lessons can be obtained from the senior author.

Summary

Several PLATO lessons in forestry have been developed to provide students with an additional learning resource. The tree identification lesson helps students to study different tree species and their distributions. The lessons in forestry inventory will allow students to plan and conduct forest inventory on the computer; they can perform an entire inventory gaining valuable experience.

The use of the lesson Introduction to Forestry showed the potential of the PLATO system for public education and information.

References

1. Alpert, D. and D. L. Bitzer. Advances in computer-based education. **Science** 167:1582-1590 (1970).
2. Bitzer, Donald L., Richard W. Blomme, Bruce A. Sherwood, and Paul Tenczar. **The PLATO-System and science education.** Computer Based Education Research Laboratory-Report X-17 (1970).
3. Ghesquiere J., C. Davis, and C. Thompson. **Introduction to TUTOR.** Computer Based Education Research Laboratory, University of Illinois (1970).
4. Grossman, M. and D. Walter. PLATO: Computer-assisted instruction in animal genetics. **NACTA Journal**, Vol. XVIII, p. 23-29 (1974).
5. Hyatt, Gary W., David C. Eades, and Paul Tenczar. Computer-based education in biology. **Bioscience** 22:401-409 (1972).
6. Lyman, Elisabeth R. **PLATO-curricular materials.** Computer-based Education Research Laboratory-Report X-41, No. 3 (1975).
7. Sherwood, B.A. **The TUTOR language.** Computer-based Education Research Laboratory (1975).
8. Smith, Stanley G. and Bruce A. Sherwood. Educational uses of the PLATO computer system. **Science** 192-344-352 (1976).
9. Stifle, Jack. **The PLATO IV student terminal.** Computer-based Education Research Laboratory-Report (1974).
10. Wood, N. **The PLATO system.** Computer-based Education Research Laboratory-Brochure (1975).

CASE STUDY

Grain Marketing Game

Ward E. Nefstead

Abstract

An instructional grain marketing game was developed to illustrate the trading environment facing producers and local elevator operators. A number of marketing principles are uncovered through student interaction.

This paper describes the experience of the author in the development and use of a specialized agricultural marketing game at a two-year technical college. The game was originally developed to simulate grain merchandising by country elevators. The game itself is a manual exercise involving a limited aspect of total elevator management. As a unit, it is similar to the grain division in a large country elevator and does not interact with the feed and other operating divisions of a modern elevator. The Purdue Farm Supply computer game would address this total situation much better (1).

The fact that the game is limited to one aspect of a total management situation does provide some direct advantages. First of all, losses in the grain enterprise cannot be offset by gains in another enterprise. Second, the activities performed will be less numerous and more well-defined. Finally, the activities can be tied to an ongoing set of real-world markets.

The Market Administrator

The market administrator must coordinate the entire operation of the game. This includes monitoring group activity to insure that rules are being adhered to and selecting a room which is conducive to maximum interaction. The optimum room arrangement is to have all market teams in one section of the room and the agricultural production teams in another section of the room. The market administrator can be located between the two areas, along with the appropriate materials. This location gives a good view of the operation of the game. An advantage of the game as presently developed is the small number of formal procedures which must be followed.

Students are generally responsible for filling out the required forms. One member of each market team - the Grain Accountant - performs the necessary financial calculations in each round. One member of each agricultural production team reconciles sales and expenses. These records are checked between rounds by the market administrator and available secretarial or student workers.

Each market team begins with an identical balance sheet for a typical grain elevator in South Central Minnesota. They must also reconcile the cash account with the opportunity of borrowing money available to them. Money is borrowed at the current market rate for the game, but the credit line is at the discretion of the market administrator.

Since the game is a manual simulation, a computer is not used as an integral part of the procedure. With a larger class size the financial records could be transferred to the computer with students doing the data input. Secretarial assistance is needed for the preparation of the data forms and also for validating the results of each round. The cost of conducting the game is approximately $50. This includes additional assistance in carrying out the game and the printed materials used. The time required of the instructor is approximately 20 hours with an additional 10 hours of in-class time to conduct the game.

The game is designed to be completed over a five-week period. This may be extended to the entire quarter (three months) if students have a working knowledge of the subject at the start of the class. Since students rely on a real-world set of markets, this length of time can produce considerable price variation.

Nefstead is an instructor at the University of Minnesota Technical College, Waseca, MN.