

# IMPROVING AGRICULTURAL INSTRUCTION USING PERFORMANCE BASED INSTRUCTION

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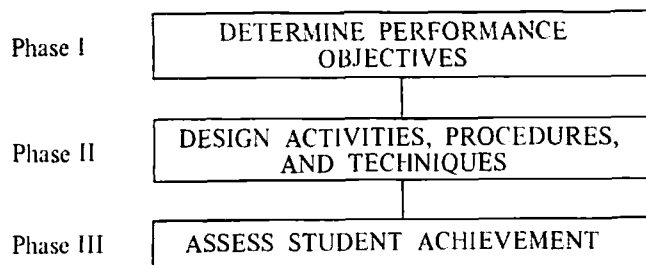
Improvement of the instructional process is an "in" phrase in today's colleges and universities. Students, administrators, alumni, and others are emphasizing the need to improve the quality of instruction in our institutions. Schools of agriculture are not spared from these expressed needs to improve the quality of their instruction. Gardner<sup>1</sup> in 1971, addressing a symposium on instruction held by the North Central Region Colleges of Agriculture stated, "... all of us here (faculty) are concerned about the caliber of instruction, and even more important, about the amount of learning that takes place in our colleges." Students also are expressing their feelings concerning poorly organized and ineffectively presented courses.

This paper is written to provide insight into one idea (the instructional model) which can improve the quality of instruction in colleges of agriculture and is referred to as Performance-Based-Instruction.

## PERFORMANCE BASED INSTRUCTION

This model has three basic parts: (1) performance objectives, (2) classroom instruction, and (3) student assessment. Figure 1 provides a graphic illustration of the model. The rationale for such a model is simple. First, the instructor asks himself the question, "What do I want my students to be able to do at the end of the course?" This question, once answered, is worded in expected student outcomes, referred to as performance objectives.

FIGURE 1:  
PERFORMANCE BASED INSTRUCTIONAL MODEL



The second step is for the instructor to decide what activities, procedures, and techniques can be used to bring about the changes in the students set forth in the performance objectives. The final phase is to determine if the students have achieved the objectives. The following sections provide an explanation of each part of the performance-based-instructional model.

### Performance Objectives

In this paper the term performance objective will be used and defined as: "clear, concise statements of expected student outcomes." This definition shifts the emphasis from teacher processes to student outcomes. Teacher processes imply the activities of the teacher in the classroom; student outcomes relate to the expected student performance at the end of the instructional sequence.

If we are to focus our courses on student performance, that is, student learning, we must be concerned with specific items they learn. Is this the case in our courses? In many instances the answer is NO. We commit ourselves to covering a book or to simply presenting as much material as can be done in the amount of time available. This emphasis on quantity of output often disregards the learning desired of the students. The question becomes, "Does the instructor cover as much as possible," or

"Does the instructor focus upon expected student outcomes and gear his strategy toward this end?" Clearly in a performance-based model one would be concerned with expected student outcomes.

### Levels of Objectives

The term 'levels of objectives' refers to the degree of specificity required to develop the objectives that cover a segment of instruction. Common to most instructional activities are the terms courses, units, and lessons. Each one of these terms refers to an instructional level. One may, and probably should, develop objectives that transmit expected student outcomes at each level. The balance of the discussion on performance will center on the lesson level of instructional planning.

A performance objective at the lesson level should have three basic characteristics as stated in 1971 by Mager<sup>2</sup>. First, the performance objective should be measurable. Second, performance objectives should contain a statement of the conditions under which the student can achieve the objectives. Third, a performance objective should specify the minimal criteria necessary for a student to have achieved the objective. The following objectives are presented to illustrate the basics of performance objectives.

"To teach students the importance of controlling weeds in corn."

This objective relates to a teacher process. It says nothing concerning the learning expected of the student. Now let's rewrite the objective to include Mager's criteria as described in the previous paragraphs.

"Given a list of ten weeds commonly a problem in corn, the student will list the steps involved in controlling each weed."

Is it measurable? Yes, it would be very simple to measure this objective. What are the conditions? The student will be given a list of ten weeds. This implies that the conditions will be on a written test. What are the minimum criteria for acceptable performance? The student will list the major steps of control.

Quite clearly, the objective has been improved. Written in the Magerian form it communicates to the student what he must do.

### Instructional Activities

Once the instructor has stated the expected student outcomes, the next step is to organize the instructional strategies. In this phase of the performance-based-instructional model, the instructor identifies the vehicles used to present the subject matter to the students so that the student can perform each objective. Coordination between the expected student outcomes and the instructional processes is necessary.

To illustrate this, the following example is provided. Assume that one is dealing with the objective previously mentioned concerning weed control in corn.

"Given a list of ten weeds common to corn, the student will list the steps involved in controlling each weed."

If the student is expected to list the steps in controlling weeds in corn, the instructor should provide the environment for the student to obtain those facts. This environment may be varied and will include such items as audi-visual techniques, lectures, field trips, laboratories, exercises, etc. This instructional environment should be designed so that the student can meet the criteria set for him in the objective.

Planning a course is made easy by writing the performance objectives and then outlining the necessary content and the methods of presentation to be used to provide the student the materials needed to achieve that objective.

The use of objectives provides a guide by which a course can be developed. Without the use of performance objectives, course organization and presentation is often based solely on quantity of output by the instructor in a given time period.

## Student Assessment

The third phase of the model involves the use of assessment tools to determine if the students meet the criteria for the objectives. The nature of the assessment may be as varied as the environment used to transmit the subject matter. Common assessment tools such as paper-pencil tests, performance tests, oral tests, etc., are used. Regardless of the technique used, the overriding emphasis should be on determining if each objective is measured.

If the instructor has outlined in careful detail the objectives at the lesson level, valid student assessment is made easy — each objective specified as expected student outcome. Within each objective is written the conditions upon which the student is expected to perform the skill. Also, within each objective is the minimum criteria you will expect as evidence of satisfactory performance of that objective. Questions can be constructed to measure each student's ability to perform each objective; however, questions are not the only means of measuring objectives.

This procedure has an added incentive to the instructor, as it provides a framework from which to evaluate students' performance. Likewise, it insures that assessment instruments (tests) are based on the objectives of the course. If students are cognizant of the objectives and the test is designed to measure the objectives, considerable improvement can be made in many courses.

## SUMMARY

The Performance Based Model was discussed in three segments: (1) performance objectives, (2) classroom instruction;

and (3) student assessments.

Performance objectives were defined as clear, concise statements of expected student outcomes. A distinction was made between the levels of objectives: the discussion was centered on the lesson level. The Magerian method of writing performance objectives was presented. Magerian objectives have three characteristics: (1) they are measurable, (2) they specify the conditions under which performance is to take place, and (3) they state the minimum criteria necessary for successful achievement of the objectives. Examples were presented to illustrate this type of objective.

Classroom instruction, the second phase of the model, was discussed. It was noted that close relationship exists between the performance objective and the instructional activities needed to help each student achieve the pre-stated objective.

Finally, a case was made for using performance-based-instruction to improve the assessment of student outcomes, i.e., to determine student progress.

Performance-based-instruction will provide a tool whereby the instructional process can be improved.

## References Cited

- 1 Gardner, Karl E. "Mission of the Symposium." Symposium on Instruction, North Central Region Colleges of Agriculture. University of Illinois, June 1971, p. 1.
- 2 Mager, Robert F. *Preparing Instructional Objectives*. (California: Feron Publishers, Inc. Palo Alto, 1962).

# PLATO: Computer-Assisted Instruction in Animal Genetics

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Increasingly, students are using computers in science education, both as computational tools and in computer-assisted instruction (CAI). Computer-based education is founded on the premise that learning is facilitated by immediate feedback. CAI offers a unique opportunity for combining the computational capabilities of a computer while individualizing student instruction. Perhaps the most versatile CAI teaching system is PLATO (Programmed Logic for Automatic Teaching Operations), developed at the Computer-based Education Research Laboratory of the University of Illinois.

## The PLATO System

With the PLATO system, the teacher, student, and computer form an interactive team. The teacher prepares the instructional material, the student responds to this material as it is presented by the computer, and the computer evaluates and monitors the student's performance. PLATO is effective for teaching because it permits large numbers of students to interact with the computer on an individual basis; it permits the students to progress at their own rate of comprehension; and it gives the students a patient tutor that can simulate complex phenomena, drill basic concepts, and diagnose and treat weaknesses.

PLATO maximizes the time the teacher has to handle individual differences in the students' mastery of the subject matter. This is an advantage over most conventional pedagogic methods. In addition, by allowing the student to interact on a one-to-one basis with the computer and the teacher, to take an active role in learning, to learn by discovery, and to progress at his own rate, PLATO has led innovatively in improving the effectiveness, efficiency and quality of education at the college level.

The most recent version of the PLATO teaching system is known as PLATO IV. The system includes terminal equipment

(hardware) and computer programming (software). Lesson writing for PLATO uses a programming language based on the English grammar and syntax. The language is called TUTOR and is designed for teachers with no previous knowledge of computers. The instructional material is authored and edited "on-line" from any terminal while "time-sharing" the system with other authors and students. Thus, the lesson material can be easily revised by the teacher to update and improve instruction.

Development and testing of the PLATO system has been in progress since 1960. About half of the 400 PLATO IV terminals presently being used are on the University of Illinois campus at Urbana-Champaign. The remaining half are in nearby locations in these towns and scattered throughout Illinois, the rest of the United States and even in foreign countries.

At this time, there are about 1500 hours of lesson material available on PLATO for student use, with an additional 1200 hours of instruction in preparation. Approximately 3500 lessons are available for use on PLATO, ranging from Accountancy to Veterinary Medicine (1, 6, 7).

## PLATO IV Equipment

Through dramatic departures from the traditional system of education, PLATO IV allows the student to assume an active role and to learn by discovery. Each student console consists of a keyset to transmit the student's input (or response) to a central computer, and a plasma display panel which can show computer-generated graphic information and computer-selected photographic color slides to the student (Fig. 1).

The keyset has the same characters and arrangement as a standard typewriter with the addition of several special function keys, e.g. NEXT, HELP, LAB, DATA, BACK, etc. The visual display is a 8½" square, transparent, flat glass plasma panel. The plasma panel consists of a grid of fine gold wires on two transparent, glass plates. One plate has 512 horizontal wires and the

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