

Figure 1. The author, Donald F. Post, keeps photos of each student to better apply individualized instruction programs. Being able to call each student by name helps in the student-teacher relationship. Also, in later years after the student has graduated and when requests arrive for character references, the photos help the professor more readily recall the student, where his name alone may make recall more difficult.

A Continuing Search . . .

Improve Teaching of Basic Soil Science

*By Donald F. Post and Ralph R. Ashby**

Good teaching is readily detected by students.

Good teachers on the other hand strive constantly to train themselves to recognize and practice good teaching techniques on a day-to-day basis.

All proven teaching techniques should be considered and are determined by the teaching conditions at that time. New and old teaching techniques are constantly being discovered or reconstructed, and the authors would like to share their experience in teaching the basic soil science course at the University of Arizona.

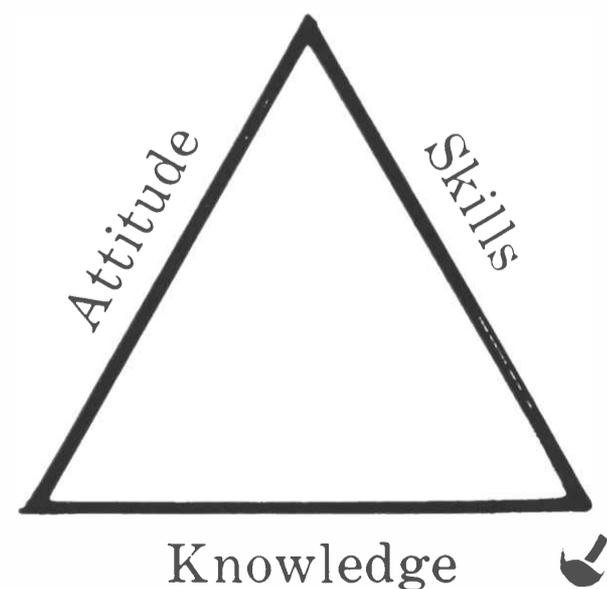
A teacher is successful only if learning by the student has truly taken place. Teaching is much more than presenting knowledge. Student involvement in educational activities

greatly enhances the learning process and ideally a teacher should strive to guide the student to discover knowledge, rather than telling him. This intensifies the learning process.

Frequently it is said a teacher is successful if the student has as much enthusiasm for the subject at the end of the course as the student had the first day of class. This is a good yardstick to use in measuring one's success as a teacher.

The primary goal, or objective, for the basic soils course is to stimulate learning about soil science. To do this

we like to illustrate our approach with the following illustration:



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The Foundation Is Knowledge

A student's ability to achieve success is based on his having adequate knowledge with which to solve his problems. His future success is also dependent upon his ability to successfully develop attitudes and skills. And we strive to help him.

Along with regular course material attitudes by way of example and method are deliberately incorporated into the course. By placing emphasis on attitudes, the instructors demonstrate their importance.

Soil science is a very important and interesting subject. The instructors must show their *enthusiasm* in helping students discover knowledge within the subject-matter area.

A teacher must be consciously *honest, considerate, and friendly* with all students at all times.

One sure way in which a teacher realizes he is being effective is when the student demonstrates he has been encouraged to develop a *thirst for knowledge* . . . a want for information.

When the teacher demonstrates *happiness* with the subject he is teaching and with the students he is working with, he can infectiously transmit attitude with a smile. And, usually they respond in like-kind.

The personal touch of knowing all students in your classes and also *using their names* appropriately and fre-

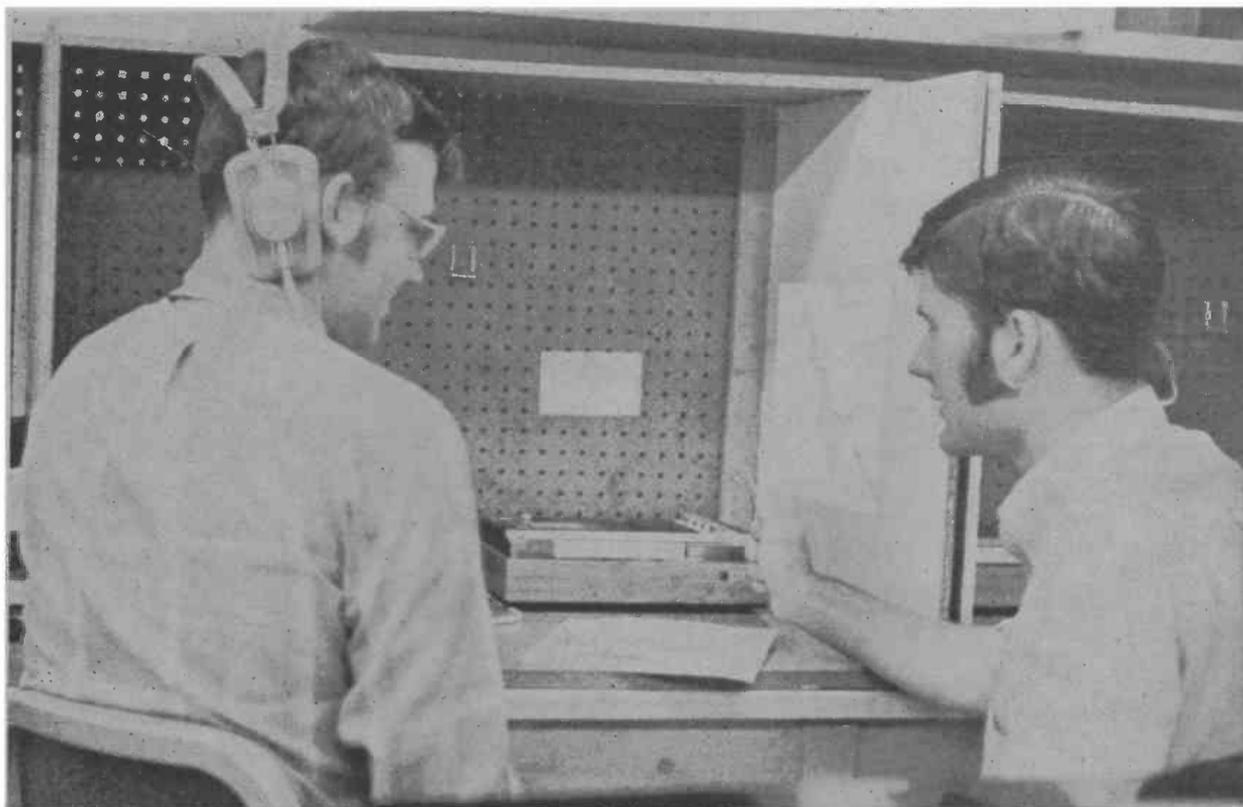


Figure 3. While students are left to their own resources to obtain class notes there is always an instructor available to students for clarification of points in the lesson which are not understood. In the above photo an undergraduate teaching assistant at right, Kenneth Barbarick, Cottonwood, explains part of the lesson to Don Kimble, Douglas.

quently further enhances their attitudinal development.

Putting *emphasis on the positive* aspects of classroom interrelationships while helping him through the rougher moments has a telling effect on the student's attitude.

And, when he is *recognized* for his achievements in developing not only knowledge, but also his attitudes and

skills, he feels a sense of achievement.

Instruction Methods Used

Method of instruction used in attaining our goals is called the Auto-Tutorial approach to learning. This system was discussed in . . . (S. N. Postlethwait, J. Novak, and H. Murray, 1969. *Audio-Tutorial Approach to Learning: Through Independent Study and Integrated Experiences*. 2nd edition. Burgess Publishing Company, Minneapolis, Minn.)

Postlethwait et al refers to this as the Audio-Tutorial approach because instructions for the learning program were conveyed to students by audio tape. The word auto-tutorial is used in this paper because instructions are presented in other ways besides the audio.

Each instructor who uses the Auto-Tutorial method adapts it to his situation as we have done for our basic soils course:

Agricultural Chemistry and Soils Course 11R (Basic Soils Course) was originally taught with traditional three one-hour lectures per week. Currently the course consists of a 50-minute general assembly on Monday where the introduction and content of the week's work is discussed. A handout is distributed to each student on Monday and in this handout 10 to 20 educa-



Figure 2. Students above are listening to prepared audio tapes and are viewing illustrations as projected on the screen from slides. From left are Rick Jessen, Tucson; and Carla McConnonel, Los Angeles. Students are given a wide range of time in which to obtain class notes in this manner as contrasted with the classical lecture approach to teaching.

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tional objectives for the week are listed.

The general assembly is necessary to give instruction for the week, to show movies or materials unavailable in quantity and to present the professor's philosophy and feelings. Students are "conditioned" to the lecture type instruction and because of this research has shown lecture-type contacts are needed.

Preparation of education objectives are a necessity. (Robert F. Mager, 1962. *Preparing Instructional Objectives*. Fearon Publishers, Palo Alto, Calif., 60 p.) Listing the week's objectives forces the instructor to evaluate his course content and its importance. Also, the student will know your ob-

jectives and need not ferret-out what is important. Examination questions are written within the context of the course objectives, which helps to assure that important material is learned.

Objectives are accompanied by a "quote-of-the-week" directed toward the development of attitudes. An example is one which reads, "As a man thinketh in his heart so he is. A man is literally what he thinks, his character being the complete sum of all his thoughts."

Then handout also serves as notes and contains difficult diagrams and charts. This material supplements the textbook which is required for the course.

At the second class period for the

week, students listen to the lecture on a tape recording in a learning center. This facility includes a partially enclosed booth containing a tape recorder with headphones, slide projector, as well as reading material. Students have access to the learning center for many hours where they hear the tapes and study the demonstration materials. An instructor is always available for personal consultation. The instructor makes it a point to personally greet each student by name and exercise an opportunity to influence attitudes.

Since the learning center is open for many hours, the student may take whatever time he needs to understand the subject material. Usually the dif-

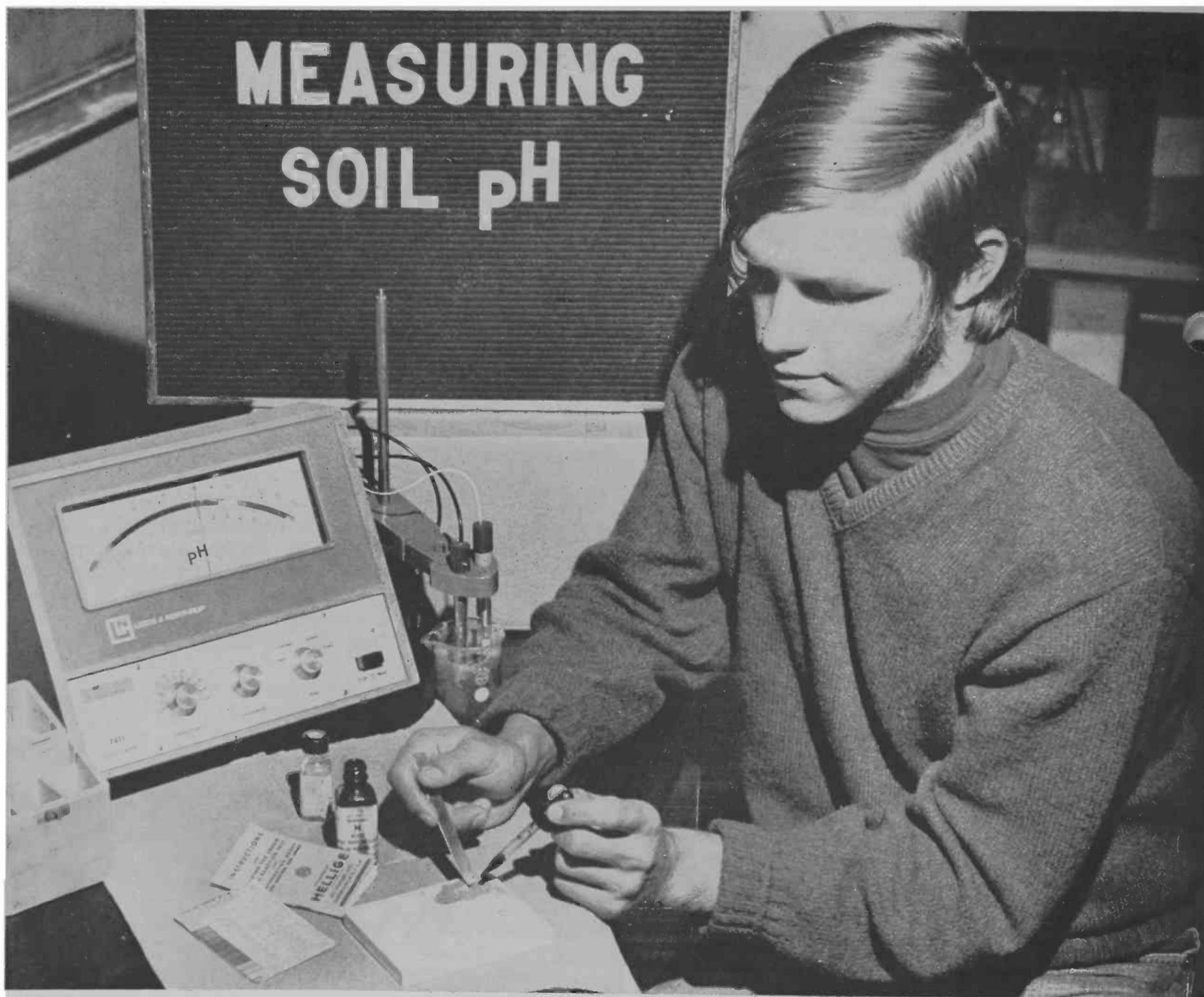


Figure 4. Students are encouraged to be actively involved in soil investigations to better comprehend the lesson for the week. Mike Berg, Tucson, is measuring soil pH of a sample.



Figure 5. Ralph Ashby, lower left, Glendale, as a teaching assistant discusses plant nutrient deficiency symptoms with Don Kimble, upper left, from Douglas, and Charles Ziegler from Leesport, Pa. This is another form of actively engaging students in practical application of the lesson, and stimulating discussion between students.

difficult subject matter is purposely presented on tape permitting each student to repeat the tapes if necessary and as often as is needed. The benefit to this approach is that the instructor is available for longer periods of time for personalized tutoring. The unhurried study of the demonstration material is designed to appeal to all the senses in the learning process and appears to be quite effective. A clay or sand particle can be touched and examined closely under the microscope. Some demonstration material may be tasted or smelled. The earthy odor of the actinomyces soil organisms can be identified through smell as they carry out their life activities. Investigations can be performed, such as determining the textural class of a soil sample, or testing the pH of the soil.

A part of the demonstration material includes a large collection of soil profiles so that certain of these are featured each week. Those that are featured are selected to illustrate some aspect of that week's subject matter.

Any time a student does not under-



Figure 6. Mike Campbell, right, undergraduate teaching assistant from Yuma, is pointing out a soil horizon to Mike Timmer, Rockford, Ill., and Alan Forkey, Charlton, Mass. The authors feature each week a variety of soils selected from throughout the U.S. Such examples help visibly demonstrate the characteristics of soil profiles.

stand, he is encouraged to consult with the instructor. Students are kept current with frequent written examinations.

Advantages Summarized

The advantage of this type of teaching utilizing the Auto-Tutorial method include:

Students prefer it over customary lecture and labs.

The approach is more individualized and uses the multi-sensory orientation.

Repetition of difficult material is possible.

The instructor becomes a personal tutor to each student when he needs it.

It is possible to have more direct association and active involvement with soil.

More opportunity exists to stimulate better attitude development.

There also are some disadvantages:

This method of teaching is extremely time consuming for the teacher if the teaching schedule is laid out properly.

Initial cost of and maintenance of equipment is greater.

This method of instruction is being continually tested and evaluated each semester. It is not the answer for all types of courses, nor is it suitable for all instructors. However, the method to date has been successful with basic soils instruction.