

## Is Programmed Instruction for Extension?

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*Although programmed instruction (PI) has been around for several years, it hasn't been used much by Extension. Recently, there's been more interest in this instructional approach. McKay discusses the use of PI in Extension from the point of view of using it more effectively. He mentions several examples of how Extension is using PI; then he discusses the advantages and disadvantages of its use. And, he cautions that there are times programmed instruction shouldn't be used at all.*

Have you tried programmed instruction in one of your Extension projects? Some have and have found it an effective tool. The term programmed instruction (PI) has been around quite a while, but recently Extension's interest in it has been increasing.

If you're serious about using the most effective ways to reach your audience, you'll want to know more about this particular facet of educational methodology. Educators outside Extension have researched programmed instruction; industry and the military routinely use the technique. Now, Extension's showing signs of moving in this direction.

### **Programmed Instruction Not New**

Cooperative Extension has used programmed instruction with varying degrees of success. Michigan's use of computer-assisted in-

struction in DHIA and TELE-FARM<sup>1</sup> is currently testing this particular adaptation of PI.<sup>2</sup> Minnesota has used a variation of this technique in determining soil-test results and fertilizer recommendations. A computerized system, used since 1968, recommends fertilizers and yet maintains personalized service. The computer report indicates how to fertilize for two crop seasons, but if a farmer changes his mind about the crops to grow the second year, his county agent has fertility-change information.

Many states are using programmed-instruction units to help the staff improve their communication skills. Pennsylvania has used PI in radio training for several years. The unit consisted of tapes and printed materials.

W. Curtis Reid of Oregon State University developed a photo-

graphic manual on the use of light in photography in the middle '60s, which has been used quite extensively in Extension teaching. This was linear programming in a pocket-size booklet devoted to the use of light.

Minnesota has introduced a unit on making 2 x 2 color slides for Extension personnel. The unit involves a combination of audio tape, about 150 of the 2 x 2 slides, and a short text. It was written primarily for in-service training of state and county Extension staff members.

Illinois has developed a PI unit on preparing artwork. Idaho has a unit on newsletter production and Iowa one on feature article writing. William L. Carpenter, North Carolina State University, developed a PI unit entitled, "Principles of Effective Communication," designed to acquaint a student with the process we go through in communicating.

In the 4-H and youth area, examples of programmed instruction include "A Self-Study Course for Adult 4-H Leaders," produced by Colorado State University with funds from Extension Service, USDA. A similar unit dealing with a program for first-year, 4-H leaders discussing member involvement was written by Gladys L. Boone, home advisor, at the University of California. The success of these units isn't completely known yet.

### Characteristics of PI

There are several different types of programmed instruction.

#### **McKay: Programmed Instruction**

Essentially, however, the technique can be defined as any teaching method that has the following characteristics:

1. Each student works individually on the programmed instruction materials at his own pace.
2. A small unit of information is presented to the student.
3. The student is required to complete the statement or answer the question about a specific bit of information.
4. Then, the student is immediately informed whether his response is correct. If he is wrong, he may also be told why.
5. The student is next presented with the second unit of information and the cycle of presentation-answer-feedback is repeated.

Each unit of information presented is called a frame. A series of frames presenting a logical sequence of information is called a program.<sup>3</sup>

The most important concept of programmed instruction is that the instruction is designed and presented in discrete steps to lead to intended outcomes or behavioral objectives. If these outcomes aren't attained, the instruction will be revised and retaught on the basis of learner feedback.<sup>4</sup>

### History of PI

Programmed instruction has been on the scene in a prominent

way in business, industry, and education for more than 10 years. It had its beginning much longer ago than that, however.

John Locke (1632-1704) is reported to have approached the use of programmed teaching by using steps with manipulative skills. Later Madame Maria Montessori (1869-1952) taught children with principles of programmed instruction by having them trace letters in grooves in wood and put round pegs in various shaped holes.<sup>5</sup>

B. F. Skinner, Harvard experimental psychologist, has been called the father of our teaching machines or programmed instruction because of his work in the late '40s and early '50s. Even before that, Ibert Mellan reported using teaching machines in 1936, although most of his emphasis was on gadgetry and not much on learning theory.<sup>6</sup>

Robert Nordberg, professor of education at Marquette University, who has recently done considerable research in programmed instruction, has pointed out that although the use of teaching machines is on the increase, they're by nature unable to rest on an educational psychology that stresses understanding as against conditioned reaction to "right answers." They're unable to deal with the important factors of organization and expression of knowledge.<sup>7</sup>

In the early '60s, many programs were written by opportunists. Some of these programs were successful. Rather extensive research on PI was done in the late '50s and

'60s. Some of the postulated theory projected during those years has been torn to shreds, but many of the basic principles are still used in other methods. These principles have led the way to computer-assisted instruction and other applications of programmed instruction used in several of the state Extension programs mentioned earlier.<sup>8</sup>

Extension's use of teleteaching, television, and further use of computer programs may result from the work of the earlier educators and pioneering work of some state Extension staffs.

### Advantages of PI

Using PI packages offers certain advantages to Extension professionals. These include:

1. Extension workers' efforts can be spread further because their learners will work individually.
2. Students can proceed at their own rate and at times convenient to them. A slow learner isn't embarrassed.
3. Members of 4-H Clubs, women's groups, and others can study subjects of their choice. This offers a method of teaching project leaders and others in local communities.
4. PI offers a way in which state Extension offices can provide in-service training to state and county staffs who want information in special fields.
5. Those who set up programmed instruction units may be

motivated to plan their efforts more deliberately and more thoroughly than with traditional teaching.

6. A wider variety of teaching methods will be used. Thus, the Extension worker can, in a sense, provide repetition of messages without monotony.
7. It may be less complicated to keep materials in a PI unit current than it is to update a textbook.
8. Programmed materials can be prepared for and/or adapted to fit almost any local situation related to nationality, economic, or cultural variations in a community.
9. Materials may be exchanged from county to county and from state to state giving flexibility and variety to Extension's offerings.

### Some Disadvantages

Programmed instruction has disadvantages, too. Among them are:

1. The preparation of PI materials is quite demanding. Many hours are usually required to produce a unit.<sup>9</sup>
2. There aren't many PI units suitable for Extension on the market.
3. If programs are purchased, the cost frequently is high.
4. Motivation is necessary for students, whether they're staff members or laymen, to complete units of programmed in-

struction. It may be that job promotion in their own organization would be sufficient enticement. Possibly an item in the individual's personnel record would motivate him to complete a unit. Some way to recognize personal achievement must be provided.

5. If there's to be a high rate of completion, the Extension teacher must keep in touch with his students working on units and let them know he's interested in their progress and is keeping in touch. This may be difficult to do in some cases.
6. The technique may be new to the particular students and they may not complete units satisfactorily because they don't adequately understand PI.
7. Programmed instruction done on an individual basis at students' homes or offices would likely have to be limited to the linear type. While this could be effective, it may not have the potential that more sophisticated computers would have.
8. The problem of teacher motivation, one of the human factors in programmed learning, must be given attention if this method is to succeed.<sup>10</sup>

The ultimate effectiveness of programmed instruction will depend on a teacher who can plan work with a high degree of creativity and on getting both the teacher and student to accept the method. As more

people use this technique, their reluctance may disappear. Learners must be motivated to work this way and be rewarded in a tangible way. This may be through college credit, job promotion, increase in pay, or other recognition.

When learners have trouble doing the work of a programmed unit, help must be available without a great deal of inconvenience. In other words, there must be a channel open between teacher and learner if communication is called for. Some follow-up, such as a traditional class where learners can exchange ideas, might be helpful in bringing participants together.

Another problem could be in supervising the distribution of materials and equipment to the users after they've been selected. Extension agents should be in a position to handle this detail.

At times programmed instruction shouldn't be used. Here are a few guidelines suggesting when *not* to try PI. Don't use it if:

- There's no one to supervise or get people started on learning units.
- You don't have materials (software) that fit the immediate situation in which training is needed.
- You haven't established mutually understood behavioral objectives. The student as well as the one responsible for training must agree on these objectives.
- There isn't time available over a reasonable period to finish any units that may be started.

We should realize that programmed instruction is just "instruction per se" and as such, it's one phase of the total process of education in the broadest sense of that term.<sup>11</sup> Since Extension has always been and will continue to be interested in possible ways to achieve educational results, programmed instruction seems to offer some hope.

### Footnotes

1. The DHIA project is a computerized record system for dairy farmers who provide regular information and in turn receive monthly evaluations of each cow in their herd. TELEFARM is a farm records program in which farmers send in data from their operations and receive quarterly reports.
2. Dennis A. Caul, *New Directions in the Michigan Automated Forward Planning-Consulting Program* (East Lansing, Michigan: State University, 1970).
3. John L. Hughes, *Programmed Instruction for Schools and Industry* (Chicago, Illinois: Science Research Associates, 1962), pp. 2-3.
4. Robert M. Morgan, "A Decade of Programmed Instruction," *Educational Technology*, X (July, 1970), 30.
5. Richard Burns, "The Practical Educational Technologist—Programmed Instruction and the Process Approach," *Educational Technology*, IX (October, 1969), 92-96.
6. *Ibid.*
7. Joseph S. Roucek, *Programmed Teaching* (New York, New York: Philosophical Library, Inc., 1965), pp. 5-6.

8. *Extension Program Report: Computer Analysis Highlights Soil Testing Program*, Report No. 21 (St. Paul, Minnesota: University of Minnesota, 1969).
9. Francis Mechner, "A Notation System for the Description of Behavioral Procedures," *Journal of the Experimental Analysis Behavior*, II (April, 1959), 133-50.
10. M. J. Tobin, *Problems and Methods in Programmed Learning* (Birmingham, England: National Center for Programmed Learning, 1967), pp. 113-14.
11. Lawrence M. Storurow, "Implications of Current Research and Future Trends," *Journal of Educational Research*, LV (June-July, 1962), 519-27.