TEACHING MACHINES AND PROGRAMMED INSTRUCTION

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Abstract

This item intends to present in a few words the benefits represented by programmed instruction as its principles.

It also includes the types of programmes most frequently used in the learning process.

It aims to be a guide for a teacher who wants to his drills and exercises, so as to promote efficient learning.

Teaching machines and programmed instruction represent new self/instructional devices that have attracted a serious interest in the last dozen years. The pioneer in the field of teaching machine was Sidney L. Pressey, educational psychologist at Ohio State University, U.S.A.

Programmed instruction is based on certain psychological principles that have long been known, but their co-ordinated application by Behaviourists supplied new insight into the teaching-learning process. In fact, programmed instruction is a pedagogical consequence of instrumental conditioning. The distinctive characteristic of instrumental learning is the importance of the consequence of responses, i.e., *reward or positive reinforcement,* in determining the strength of those responses. B.F. Skinner considers that positive reinforcement and avoidance of punishment are the key to success in learning. It is punishment or reward that determines whether a particular kind of behaviour becomes habitual.

The characteristic of programmed instruction is that the student must learn by himself. It is the task of the program to help him give the right answer and confirm his response.

Successful programming is a very difficult task. If the student gives a wrong answer, it is the program that has failed to teach the particular point. It is the task of the programmer to reduce the number of errors to a minimum. The advantage of a program over that of a textbook is that it offers constant opportunities to observe what is good and what is faulty. Thus, it can be constantly improved in a way that a textbook can never be.

A problem that is incorrectly answered by a number of students is obviously faulty and has to be rewritten or broken down into additional steps. Some items of skill or knowledge are more difficult than others and require more repetition. Certain difficulties in learning a second language are determined by native language structures. All these considerations have to be observed by the programmer.

What then are the principles of programmed instruction?

1. The material of instruction is carefully graded;
2. It is presented in a broken-up sequence of small, easy steps and practised in as many as possible;
3. Active response is required on the part of the student;
4. Errors made by the students in responding to frames are held to a minimum;
5. It provides for immediate confirmation of response, „reinforcement", by supplying the correct answer after each step;

6. The program is to be used by each student individually, obliging him to respond to every new item at his own speed.

Types of Programs

Although most programmers agree on the basic principles of program construction, there are wide variations in the application of the principles to a specific program. There are, however, two basic approaches: *the constructed-response program,* elaborated by B.F. Skinner and James G. Holland at Harvard University (often called „small step" or „Skinnerian" program) and the *multi-choice program* elaborated by Norman Crowder.

The constructed-response program requires the student to write an answer after each question, that is, to frame his own answer to the question put before him by the programmer. Consequently, this program depends more on the student's ability to recall data. According to Skinner, emission of response is more effective in learning than simple recognition. In order for learning to occur the learner must respond, or be active.

The multi-choice type of program requires the student to select one of a number of alternate answers to a given question; thus it relies more on the ability to recognize.

As to the techinques for programming, there are again two major types: the constructed-response or Skinnerian program is *linear*; the multipole-choice program is *branching* and *intrinsic*.

In the linear program the material is presented in a single ordered sequence, and every student must proceed from the first to the last item. Each correct answer prepares the way for the next item in the program and is indispensable for the understanding of the following steps. If learning takes place by active response, errors must be reduced to a minimum because if the learner makes an error, he learns the erroneous response. Consequently, errors should not only be brought to the student's attention, but he should also find out what the correct answer is. This is achieved by knowledge of results, supplying the correct answer (confirmation and reinforcement) after each step.

In the intrinsic programming a typical item consists of one or two short units to be read by the student, followed by the multiple-choice question. The student's answer choice determines what material he will see next. If his answer choice is correct, he is led to the next step forward, that is to the next mainstream frame. If, however, his answer choice is not the right one, he is led to remedial loops or first-order branches and second-order branches for additional information and practice. This technique offers the possibility of detecting and correcting errors, in other words it is based on the trial-and-error principle.

A program with multiple-choice questions is not an intrinsic program unless each separate answer choice in each question leads the student to material prepared especially for the student who has made that particular choice, states Crowder.

According to Edward B. Fry, „an obvious advantage of this type of program is its capacity for explaining 'why' a response is either correct or incorrect. Since the program always moves according to the predeterminant pattern set for a particular response, it is possible to determine the cause of most errors and to prepare an appropriate explanation and remedial branch for insertion into the program at any point. The student who answers incorrectly can be forced into this remedial program before he is allowed to proceed with the regular program material".

Textbooks and Teaching Machines

Programs may be presented in the form of a „programmed-text" or a „scrambled book" which run on one of the two techinques for programming formerly mentioned. The student either reads the item or writes his response, or makes his choice out of a certain number of responses.

Teaching machines run on the same principles. They may present a linear program or a branching program. A teaching machine may be a very simple box with an opening on the top into which the „frames" containing the program are inserted. The student reads the item through a window, writes his answer on an answer tape through an open slot, then turns a knob on the side of a box and a correct answer comes into view together with his answer. He compares the two answers and marks on the frame his correct or incorrect responses.

Some much more complicated machines make use of an electronic computer, and many of the new mass communication techniques, such as motion pictures, tape recorders, educational television, etc. There are machines, which permit the student to pose questions, to ask for further information or explanation.

However complicated a machine, poor programs remain poor. It is the program not the machine that teaches.

For the time being we cannot fully appreciate the role of programmed instruction in the field of foreign language teaching. To our knowledge, no programs have so far been elaborated for complete language teaching courses. It seems that this is not even desired, and programmers do not strive for complete self-instruction. It is assumed that programmed materials and teaching machines can only cover some of the functions of foreign language instruction. Which functions exactly is still a matter of further investigation. One thing is almost unanimously recognized, namely that programmed instruction is particularly well suited for information teaching rather than skill teaching. The program can determine whether an answer is right but not whether an answer came easily and naturally to the student.

Wilga Rivers, however, considers that „careful programming is very useful in the development of sound discrimination and production, oral and reading comprehension, skill in the automatic manipulation of language elements in closed systems, and ability to write the language accurately at the nonspontaneous level. For foreign-language, the teaching machine or programmed textbook must be accompanied by sound and recording facilities". She considers linear programs to be more suited for foreign-language learning than intrinsic programs. The argument in favour of this conception is that incorrect alternatives are non-pedagogical since students may learn what is incorrect. Besides, „opportunity for students to skip over too many practice exercises can be detrimental to their progress".

Most present-day programmers do not accept the instrumental conditioning model of language learning proposed by Skinner and his strict techniques of linear programming. Many programs contain large steps and permit the student to make occasional errors without immediate correction. Some of the large step programs contain loops for additional practice, others make use of multiple-choice frames occasionally; again others give no immediate confirmation but have answers available, if needed, at the back of the text. Nevertheless there seems to be general consensus that programmed learning is efficient since it presents students with a careful sequencing of the material with a constant view towards well-defined terminal behaviour and is responsive to the needs of individual learners. The teacher who has an insight into programming theory will know how to organize his teaching and how to construct drills and exercises which will promote efficient learning much more than his colleague who has not.

References

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