

A REVOLUTIONARY FORM OF TEACHING

In the last eight or nine years a new form of teaching known as automated teaching or programmed instruction has been widely used in the United States. More than any other system or process of instruction introduced in recent times automated teaching has caused a stir in the entire width and breadth of the country among educators, parents, and leaders in industry. The revolutionary effects it is creating have been commented upon in different publications in America. In the Reporter of last July Spencer Klaw writes an article on this subject entitled "What Can We Learn from Teaching Machines?" The Center for Programed Instruction, Inc., in New York issues a bi-monthly publication of news and views on this novel way of instruction, which may be briefly described as follows: The subject to be studied by

means of teaching machines is presented in a sequence of short units which are called "frames." Each frame contains a question that the student must answer before he goes on. Such a sequence is known as a program, which may be administered either mechanically or by a programmed textbook. The mechanical method uses a simple device called a teaching machine, which exposes the program to the student one frame at a time and tells him instantly whether the answers he is giving are correct. There are different kinds of machines. One gives answers to questions by pressing buttons.

But as stated above, this new form of pedagogy can also be administered by means of a textbook, a programmed textbook. This is a sort of workbook which permits a student to move from frame to frame and to

check the correctness of his answers by simply turning to the pages where they are printed.

But whether it is a machine or a text that is used, the function of programmed instruction is to lead a pupil to a faster and firmer grasp of the subject studied. This is the claim of professors, educators, and psychologists who have been working on this form of pedagogy. It is now being actually used in thousand of schools in America today.

With the support of the government and of private foundations, researches have been carried out by psychologists and educators at Harvard, Yale, Stanford, and other important universities. Students have been experimentally instructed by machine or by programmed text, in calculus, geometry, physics, spelling, long division, Russian, psychology, logic, statistics, and other subjects. Mechanics have been taught to read blueprints, engineers to use analogue computers, retarded children to measure with a ruler.

Textbook publishers are

working on many programmed texts for various subjects. Encyclopaedia Britannica Films has announced plans to program practically an entire high-school curriculum. Programs or machines of different makes and subjects are now being sold by a large number of companies. Teaching machines are even being sold from house to house or by mail to anxious parents.

Professor B. F. Skinner of Harvard, a distinguished experimental psychologist, is one of the principal originators of the teaching machine. What he says about it is worth repeating here: "Exploratory research . . . indicates that what is now taught by teaching, lecture, or film can be taught in half the time and with half the effort by a machine." While this might be a bit exaggerated, a good knowledge of the theory of programmed instruction and an observation of the results it is producing in actual use prove that it works and that it will bring about significant changes in educational practices. It is going to affect the organization of school courses and

curricula, the preparation of teachers, the instruction of fast learners, and the way the slow learners are to be handled. The way teachers teach will be affected even when they are not using machines or programmed texts.

Among the different teaching machines designed by Professor Skinner was one consisting of a metal box with two small windows in its upper surface. With this machine, a student reads a short block of text, with a question, framed in one of the windows; he then answers the question by writing on a piece of paper displayed at the other window. By pushing a lever, the correct answer to the question is shown and a new frame containing a new question appears at the same time.

It was in 1957 when Dr. Skinner and James G. Holland, a colleague of his, wrote for use in this machine a program covering part of the subject matter of a course, Natural Science 114. They were giving this course to undergraduates at Harvard and Radcliffe.

When after the Russian Sputnik was launched in

1957, the American people began to complain about the inadequacies of their schools, a deeper interest in Skinner's ideas was aroused and hopes were raised that these ideas could be made to yield spectacular results. An experiment was sponsored by the U.S. Office of Education in teaching spelling to sixth-grade pupils by machine for a period of six months. Although they spent only a third as much time on spelling as their classmates who were being taught in the ordinary way, they scored much higher on standard achievement tests. In Roanoke, Virginia, eighth-graders of average ability learned just about as much algebra in one semester from a programmed text as ninth-graders ordinarily learn in a year. At a school near Philadelphia, mentally retarded teen-agers were made to use machines to give them practice in arithmetic. At the end of the school year, tests showed gains in proficiency two and a half times as great as gains made by students in a closely matched control group not using machines. The use of programmed texts enabled

IBM to reduce from fifteen to eight hours the class time needed to cover certain kinds of instruction and training. In many other instances students getting programmed instruction have often learned more and in a shorter time than those following the conventional methods.

Most practitioners use one of two ways of preparing instructional program. One is the system devised by Dr. Skinner and the other is that invented by a former Air Force psychologist named Norman A. Crowder. Crowder's device resembles a television set, which has a screen onto which the frames of an instructional program are projected one at a time. A frame may consist of two or three hundred words and ends with a multiple-choice question. The student selects one of the answers that have been provided for him instead of making up his own answer, and then pushes a button. If he has pushed the right one, a new frame dealing with a new topic appears. If he pushes the wrong button, however, he gets an altogether different frame, which tells him that he gave the

wrong answer, suggests why he may have done so, and instructs him to punch a button that will send him back for another try.

Crowder's kind of program is also presented in a form known as the scrambled textbook. It has one frame to a page. When a student comes to the multiple-choice question, he picks what he thinks is the right answer and turns to a page whose number appears next to the answer he has chosen. If he has chosen correctly, he will find a new block of information on the designated page; if not, he will get more explanation.

The Skinner program is different. It proceeds in very small steps and considers the answer of the student at each step as an essential element in the learning process. On the other hand, the Crowder program gives relatively large units of information and then presents questions intended to find out if the student has properly understood or learned a particular unit. Another difference between the two systems is that in the Holland-Skinner psychology program at Harvard, there is but one sequence of

steps that everyone must follow. Every question is answered correctly. In the Crowder program a student could commit a mistake and, if he does, he is led out of the main line into a branch where he gets additional instruction. Crowder maintains that his program is better adapted to students of different learning ability. Skinner claims that when every question is answered correctly, the student learns best. To teachers who follow the principle of "learning by doing," that feature of the Skinner program that students should be required to write their own answers has a strong appeal. It is also said that multiple-choice questions are not desirable for it may lead a student to remember one of the wrong answers instead of the right one.

Also, it is probably easier to write a good program of the Skinner variety than to write one like Crowder's. In America programs are being written by teachers, psychologists, college students, authors of conventional textbooks, and housewives with college degrees and time on their hands. But the consen-

sus is that a program must be given an extensive and intensive trial before it should be given final approval. It seems that the Skinner style program is easier to write than Crowder's.

Questions should not, of course, be made too easy, otherwise students may go through them rapidly answering every question correctly but learning very little. It is necessary that the programmer should know the students well and what they are supposed to learn. Then the program could produce effective teaching. The collaboration between teacher and his test subjects is one of the most significant aspects of this new pedagogy.

Programmed instruction benefits not only school children and but also adults who prefer to study at home by themselves. It is also useful in private industry where rapid changes in technology force workers to learn new processes as quickly as possible. But it is the schools which constitute the large users of programmed instruction, and it is on them that the new pedagogy will have its most significant im-

pact. Fear is, however, entertained by some people that education administered through programmed instruction may become a process of grinding up subject matter into a kind of baby food and spooning it out to students who will never learn to eat for themselves. In this connection, George F. Keller, professor of educational philosophy at the University of California, L. A., said: "If we seek exact responses and reward those who conform to the demands of the machine, we are likely to snuff out the precious spark of revolt that is necessary to healthy growth and creativity." Some have also expressed concern that teaching machines may convert America into a nation of robots.

On the other hand, there is no established basis to support the argument that programmed instruction is necessarily detrimental to creativity. Moreover, there are very few persons who think that the entire curriculum of the school should be best programmed. "Programmed instruction cannot teach the entire curriculum for the simple reason that it cannot edu-

cate a person," Kenneth Koski of the Center for Programmed Instruction has written. "We can instruct a pupil to spell, to punctuate, to use words properly. . . . However, no method of instruction can teach a person how to write or think creativity, for such things depend on far more subtle types of reinforcement than a program alone can provide."

Programmed instruction, however, can teach certain subjects effectively, thus giving both teacher and student more time to read books and to study questions that challenge and improve the mind. It does not eliminate teachers but permit teachers to study their subjects, to help students, and to make better use of their learning.

A teacher in a New York school is reported to have said: "As I look back on the few months of teaching the idea of step-by-step programming in my head, I realize that programming not only helps the kids learn but it helps me learn *how* the kids learn."

Programmed instruction, if adopted in the schools in the Philippines, is likely to im-

prove the learning ability of elementary children and secondary school and college students specially in such subjects as English, arithmetic, and algebra. It will give teachers the assistance that they all need in a very marked degree. But before this could happen, the officials of the Department of Education should first investigate carefully the materials for its effective use and should be ready to sacrifice existing interests that are almost certain to fight for the continuance of old or conventional methods and materials notwithstanding their failure to improve our educational standards. Workshops, seminars, and study groups need to be organized in order that proper understanding and direction may be given for the right preparation and use of lessons or texts. The need for this preparatory activity is well expressed in one

of the bulletins of the Center for Programmed Instruction as follows: "Programs used in teaching machines and texts have captured the imagination of many members of the lay public, and more than the usual number of extreme statements have been made. For professionals the fascination lies in the issues raised by this new teaching tool. We have forced to critically concern ourselves with the effectiveness of our techniques, clarify our view of the role of the teacher and the functioning of the student.

"Many people in the educational and commercial communities wish to assemble a set of absolutes regarding the development of and use of programs. But programing by its nature demands constant revision and updating. We have scarcely scratched the surface of the needed research."