

INDIVIDUALIZING INSTRUCTION*

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Viewed historically, education of any sort for the masses is a recent phenomenon. But one measure of the advancement of a civilization is the level of education of the people. As we approach the 21st century "education for the masses" is given a wide range of interpretations throughout the world. In some countries, it means basic literacy training for more people; in others, it means college educations for the "common people."

The United States represents a large scale enterprise of advanced education. Postsecondary education for the masses is a national goal -- and ironically, nowhere else is the move toward "individualized instruction" so strong. Eventually all civilizations will face the reality that the less selective the educational system, the greater the heterogeneity of the learners. The very diversity of the masses renders "mass education" methods less useful when learning needs span the full range of human ability.

Individualized education exists in many forms -- from highly structured to highly unstructured. The learning contract in which student and instructor work out a unique educational plan, geared to the needs and interests of the student, may legitimately be called a form of individualized education, but the term "individualized instruction" is usually reserved for structured learning programs which incorporate behavioristic

*Prepared for the International Encyclopedia of Higher Education

2/26/75

principles of learning. These include clearly defined objectives, small units of learning, and a test of knowledge or skills that provides immediate feedback and reinforcement for the learner. In addition, most individualized instruction provides for individual differences in the rate of learning. Learning units are self-paced, and students may proceed through the unit as rapidly or as slowly as required. Many systems of individualized instruction now incorporate the concept of mastery learning in which a student must learn one unit to mastery before he can proceed to the next one. Three major systems of individualized instruction are in common use today in American colleges. In the chronological order in which they were introduced, they are: programmed instruction, the audio-tutorial method, and the Keller Plan or Personalized System of Instruction (PSI).

Programmed Instruction

Description

Programmed instruction consists of a series of learning "frames" that are carefully arranged to successively shape the desired behavior. Test questions are imbedded in the program, and these provide immediate reinforcement and feedback concerning the desired response. The learner can control the rate of presentation, and the program is carefully sequenced so that basic skills are learned before more advanced concepts are attempted.

Problems

Most of the criticism of programmed instruction has been directed toward the rigidities of the method. The rate of learning

is just about the only thing that is under the control of the learner. In most programmed instruction, all learners proceed through the same materials, and there are few choices that can be made. While recent refinements add "responsive" or "branching" programs in which the response of the student determines which frames will be presented next, the creation of branching programs is an expensive and complicated process. Another problem with present forms of programmed instruction is the boredom experienced by many students after the initial novelty has worn off. And finally, the research on the effectiveness of programmed instruction has been disappointing. While programmed instruction does seem to improve student achievement in some subjects, research findings do not justify the investment of money, time, and personnel that is required to create programs of high quality.

Strengths

Despite the criticisms, programmed instruction can be helpful when it is used for what it can accomplish. There is fairly consistent evidence that students learn the facts and skills presented by programmed instruction in less time than is required by other means. It is probably fair to conclude that at the present time, the teaching of facts and skills are what programmed instruction does best.

At the college level, most programmed material is in fields such as mathematics and spelling where presentations can be made in short sequential units and where there is a "right" answer. The effective use of programmed instruction would appear to involve the following suggestions:

1) Not all students will be helped by programmed instruction, and the instructor needs to check frequently to determine progress and personal reactions to the technique.

2) The effectiveness of programmed instruction, like any other technique, will depend heavily on the quality of the material.

3) Programmed materials are most effective in disciplines where learning tasks are sequential and can be presented in small units which can be reinforced by the "right" answers.

4) Programmed instruction is probably most effectively used as a supplement rather than a replacement for other forms of instruction.

Audio-Tutorial

Description

The Audio-Tutorial (A-T) approach to learning was introduced at Purdue University in 1961 by Samuel Postlethwait, a professor of biology. As an experiment, he decided to tape a "remedial" lecture each week so that students who felt the need for additional help could play and re-play the tape at their convenience. After some experience with the tapes, Postlethwait moved away from the lecture format of dispensing information and into the tutorial format of guiding students' learning. Thus today the "message" on the tape is not a lecture, but rather a guided program of learning activities. The tape may present an introduction to the unit and then direct the student to turn off the tape and read a passage in the textbook or look at some slides or filmstrips or examine some objects that have been placed in the A-T booth or study carrel. The A-T method is not a tool or a technique but might

more appropriately be termed a learning system. It concerns itself with designing a process that will be effective and efficient for the learner. It consists of three components:

1) Independent study session. This session takes place in a learning center open throughout the day and the evening, enabling students to work at their own pace and at their convenience. The center provides learning carrels equipped with various media. Through earphones the student listens to the voice of the senior instructor suggesting a variety of learning activities. Proponents of A-T take explicit note of the existence of the multiple modalities through which students learn, and they also provide in this way for differences in the learning styles of students.

2) General assembly session. The general assembly session meets once a week and is used for activities best done in a large group -- guest lectures, long films, major exams, etc. Attendance is not required except for special occasions.

3) Integrated quiz session. The integrated quiz session endeavors to integrate and test the student's knowledge in a small group consisting of 6-10 students and an instructor meeting once a week. In preparation for the session, each student is expected to prepare an explanation about each of the items in the study unit.

Strengths

The strength of A-T lies primarily in its individualization along several dimensions. The student may proceed at his or her own pace, and there is a sufficient variety of learning activities -- laboratory experiments, slides, printed materials, discussion

groups -- so that students are rarely bored or locked into a learning mode that is disadvantageous to them. The fact that active physical activities -- experiments, handling of objects, etc. -- can be inserted into the learning program at the point where they will be most meaningful is also an advantage of the A-T program.

Problems

Most of the criticism of A-T is directed toward the inadequacies of implementation rather than inadequacies of the method. The failure to prepare good objectives is, of course, critical to all individualized instruction. The program of A-T will be no better than the program.

There are, however, also some criticisms directed against the A-T method. Some claim that the step-by-step procedures of A-T rob students of the initiative for learning how to plan their own study. Another criticism directed against A-T is the impersonalization of the audio-tape but this charge seems tenuous at best. Indeed, one of the merits of A-T may be that it helps to break down the anonymity of huge lecture classes.

One of the criticisms that probably should be directed at A-T is the lack of the evaluation and research on the method. There is little attention given among A-T proponents to research and theory on learning, and the research that has been conducted is at a fairly simple conceptual level. There is evidence that most students prefer the A-T approach (Doty, 1974; Morman, 1971; Richason, 1971; Wilson, 1972). And there is fairly good evidence that students learn as well or better than in conventional classes

(Morman, 1971; Richason, 1971; Wilson, 1972). What we do not know after 15 years of existence of A-T is which students profit most, which students are not helped, and how A-T can be improved and made more broadly applicable.

Personalized System of Instruction (PSI)

Description

The Keller Plan, more recently known as the Personalized System of Instruction or PSI, was introduced at the University of Brasilia in 1964. Typically a PSI course is broken into 15 or 20 self-paced learning modules with learning objectives clearly spelled out by the instructor in a study guide. Using the guide and the traditional materials of education such as textbooks, articles and other printed materials, the student masters each learning unit, taking as much or as little time as needed, studying wherever and whenever convenient. When the student feels prepared, he presents himself to a student proctor, typically an undergraduate student who has already mastered the material, for testing. The test is a 15-20 minute short-answer quiz which the student must pass at a high level of competence, indicating mastery of all of the objectives of the learning unit. The test is graded immediately in the student's presence. If he fails to pass, a student proctor may quiz him further to determine areas of difficulty, may help him with special problems, or may refer him for further study. There is no penalty for failing to pass the mastery test, but the learner may proceed to the next unit only after demonstrating mastery of prior units. Lectures and demonstrations are not required, but are used to inspire and motivate.

There are five fundamental characteristics of the PSI system:

- 1) The emphasis is on the written word.
- 2) The student must demonstrate mastery of one learning unit before proceeding to the next. True to the principles of reinforcement theory, positive reward is a more powerful motivator for learning than punishment, and the learning of complex behaviors consists of mastering and shaping prior behaviors.
- 3) Self-pacing is an obvious and necessary accompaniment of mastery learning.
- 4) Lectures are used for motivation rather than for information.
- 5) The use of student proctors is an important feature. Proctors are usually undergraduate students who serve as peer tutors. This emphasis on the personal-social aspects of learning distinguishes PSI from most other systems of individualized instruction.

Strengths

One of the important advantages of PSI is its enviable record of research on the process of teaching and learning. After a careful review of the literature Kulik and Kulik (1975, p. 231) concluded that the research "points strongly to the conclusion that PSI is more effective than conventional college teaching methods." Students in PSI courses do better on final examinations than students in lecture courses; PSI students retain their learning longer; they do better in the next course in the sequence; and they like PSI courses better than conventionally taught courses.

These results cast doubt upon the charge of some critics that PSI learning is rote learning. If that were the case, retention and transfer of understandings to more advanced courses should suffer.

Problems

One of the disturbing problems of PSI and other individualized learning methods as well is related to a strength -- the self-pacing feature. Procrastination, and ultimately withdrawal and dropout, are perpetual problems when immature learners are given responsibility for managing their own learning time. There are suggestions in the literature for dealing with student procrastination. Most advise inserting more instructor control into early learning sessions. Roth (1973) suggests requiring supervised study until the third unit is passed; Dessler (1974) suggests setting an early deadline for completion of the first unit so that everyone gets started. Keller and Sherman (1974) advise that the first units should be short, interesting, and fairly easy. The notion behind all these suggestions is that the student who experiences success in the early units will continue to work for success in later units.

Another problem for PSI teachers is a result of imposing a non-traditional approach to learning on a traditional system of education. Ideally, PSI students should be able to master each unit in their own time. But American education has a strong tradition of equal time segments for all students but variable grades. All students study for the standard time period of a semester, but they receive variable evaluations of their work -- from excellent to failing. Conceptually in PSI, the student

should study until he masters the unit and receives a grade reflecting an excellent knowledge of the subject matter. In practice, the PSI ideal is rarely achieved because the traditional educational system cannot handle either variable time units or non-variable grades.

A related problem for PSI advocates lies in the definition of "mastery". Most advice, some based on research study, is that mastery should be defined as a very high level of accomplishment -- 90 percent correct on a short-answer quiz.

Conclusion

Strangely enough, the more education is made available to the "masses", the more "individualized" it needs to be. The individualization of instruction is strongest where selectivity for educational opportunity is lowest. The community colleges in the United States do not select their students, and the use of self-paced learning is especially prevalent in these open-admissions colleges. But the change from group learning to individualization has been a recent phenomenon. In 1970 a minority of the community colleges were using self-paced learning methods; by 1975 a majority had adopted some form of individualization (Cross, 1976). It is highly probable that individualized learning systems will play an increasingly important role as the world seeks to educate the masses.

February, 1976

REFERENCES

- Cross, K. P. Accent on Learning: Improving Instruction and Reshaping the Curriculum. San Francisco: Jossey-Bass, 1976.
- Dessler, A. J. "Teaching Without Lectures." In J. G. Sherman (Ed.), Personalized System of Instruction: 41 Germinal Papers. Menlo Park, Ca.: W. A. Benjamin, Inc., 1974.
- Doty, R. B. "Personalized Laboratory Instruction in Microbiology: The Audio-Tutorial Approach." Educational Technology, Jan. 1974, 14, 36-39.
- Keller, F. S., and Sherman, J. G. "Afterthoughts and Leftovers." In F. S. Keller and J. G. Sherman, The Keller Plan Handbook. Menlo Park, Ca.: W. A. Benjamin, Inc., 1974.
- Kulik, J. A., and Kulik, C. L. C. "Effectiveness of the Personalized System of Instruction." Engineering Education, Dec. 1975, pp. 228-231.
- Morman, S. J. "An Audio-Tutorial Method of Instruction vs. the Traditional Lecture-Discussion Method." Two-Year College Mathematics Journal, Fall 1971, 4, 56-61.
- Richason, B. F., Jr. "Independent Study in Geography." In R. S. Weisgerber (Ed.), Developmental Efforts in Individualized Learning. Itasca, Ill.: F. E. Peacock, 1971.
- Roth, C. H. "Continuing Effectiveness of Personalized Self-Paced Instruction in Digital Systems Engineering." Engineering Education, 1973, 63(6), 447-450.
- Wilson, P. M. "Do Students Learn from and Like an Audio-Tutorial Course in Freshman Mathematics?" Two-Year College Mathematics Journal, Fall 1972, 3, 37-41.