

# Why Are Individualized Programs More Successful in Industry and the Military?

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Variables in the success of individualized instruction include rewards students receive, student maturity and motivation, and the amount of time spent on task.

Research shows that individualized instruction is effective in military, industrial, and medical contexts, but that it often leads to lower achievement in elementary and secondary schools (see Orlansky and String, 1979; Weiner, 1980; Brophy, 1979, 1981; Rosenshine, 1979). Two panels of researchers recently discussed this paradox, attempting to analyze differences in applications, procedures, and research findings.<sup>1</sup>

## Variability of Applications

While both panels pointed out the wide variety in procedures labeled individualized instruction, it was generally agreed that the term should apply to practices in which students proceed through instructional sequences at their own rates.

In military and industrial contexts materials are prepared according to an instructional system development (ISD) model. Such models involve careful analysis of the content to be taught, followed by specific, often behavioral, descriptions of activities the learner will be capable of when instruction is complete. The final or terminal objective is analyzed so that all its prerequisites are specified. In turn, requirements for lower level objectives are explicitly stated once those at higher levels have been specified. The objectives are then arranged in a hierarchy, and instructional materials developed to enable the learner to master each of the objectives.

In an ISD model, the lowest level in the hierarchy that a student can accomplish prior to instruction is determined. Students then enter the sequence at this level and proceed until all prerequisites of the terminal objective have been mastered. The final objective is then mastered in turn. Typically, students are assessed regarding mastery of an objec-



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tive immediately after completing the material. Those who master objectives are routed to a succeeding segment. Students who fail to demonstrate mastery are looped back to repeat part or all of the preceding instructional sequence.

In elementary schools, the same detailed analysis of the objectives and sequence of instruction is also often evident in individualized instructional materials. For example, Individually Prescribed Instruction (IPI) (Wang, 1980) and the DISTAR (Becker and others, 1981) materials follow such a model. On the other hand, many individualized materials used in schools have not gone through this elaborate and costly development model.

Therefore, research reporting results of individualized instruction should be specific regarding the activities performed by students and the procedures followed in developing and implementing the instructional sequence.

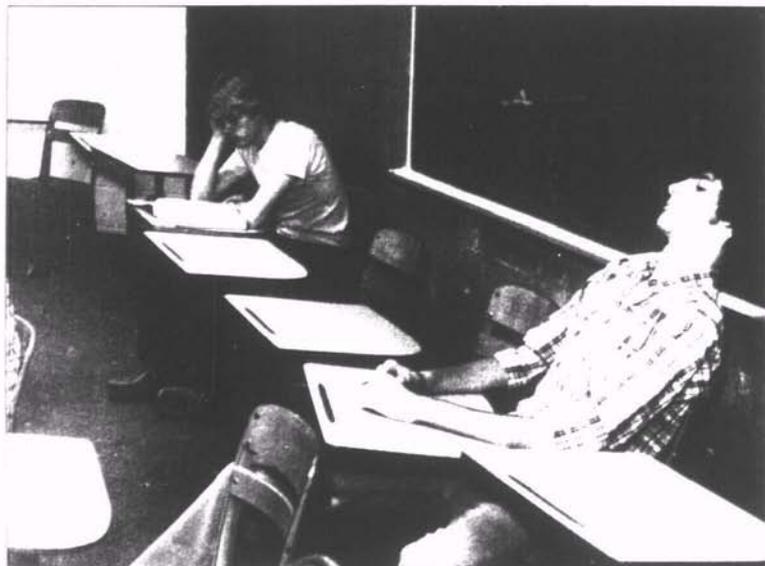
#### **Institutional Contexts and Rewards**

The contexts in which individualized instruction occurs vary greatly. In military and industrial training sites trainees are paid while receiving instruction. It is important to conduct the training as rapidly as possible so that trainees can resume their assigned responsibilities or assume new ones.

In elementary and secondary schools, on the other hand, reducing student learning time is relatively less important because students are not paid for the time taken to achieve mastery.

The payoff for completing instruction is also different. Students in industry and the military are frequently rewarded for accomplishing their objectives by assignment to more important responsibilities for which they typically receive higher pay and more prestige. In schools, however, students who complete an instructional unit are simply assigned additional work. Anderson (1981) found that students invariably indicated that the major motivation for

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studying a sequence was in order to complete it, and presumably to turn to more rewarding activities. One can assume, then, that industrial and military students are more eager to complete courses than students in schools.

Medical schools have a variety of features not present in either schools or military/industrial contexts. The costs of medical training are enormous. Development of effective instructional methods that reduce these costs somewhat is, therefore, a much sought-after goal.

Also, in medical, industrial, and military settings it is easier to develop simulations which add realism and excite-

ment to individualized programs. In medical simulations, for example, (Weiner, 1980), material describing the patient's complaints is presented to students who then "order" medical tests ranging from X-rays to blood counts, urine analysis, and the like. The computer responds almost immediately with the results and asks the student to offer a tentative diagnosis. Following the diagnosis the student develops a treatment plan involving medication, diet, exercises, and so on. The student is then informed of the positive or negative outcome of the treatment plan. Students can, in one hour, simulate what they would otherwise learn from a case over a period of days, weeks, or even years.

In a military context, it is possible to simulate by computer the propulsion system of a ship or submarine. Naval lieutenants can learn how a ship moves through water much as they would learn aboard ship, but without the harmful effects or costly expenses that would be caused by real-life mistakes.

It is harder to develop comparable simulations in elementary and secondary schools because a thorough-going knowledge of all elements is not available. That is, a series of if-then propositions are needed so the outcomes of a particular student action can be represented by the instructional sequence. Few areas of knowledge, other than mathematics and science, are substantial enough for that.

Still, more topics could probably be taught by simulation than presently are—the law of supply and demand, for example. Given information about the availability and cost of oil, gold, coffee, and other products, students could experience the effects of changes in supply and demand on prices. Such simulations would add liveliness to individualized instruction and would probably improve student motivation.

#### **Time-on-Task**

Research relating teacher behavior to student achievement indicates that, as might be expected, a major variable accounting for student achievement is time spent on instructional tasks (Brophy, 1979, 1981; Rosenshine, 1979). Elementary and secondary teachers who have a business-like managerial style succeed in having their students spend more time-on-task and, in turn, their students tend to achieve more.

In individualized instruction students are, to a greater degree than in teacher-directed learning, left to their own de-

vices. It is not clear, however, if elementary and secondary students are mature enough to spend the required time-on-task to accomplish instructional objectives. It is, therefore, not surprising that research relating teacher behavior to student achievement indicates that teacher-monitored instruction is associated with student achievement. When teachers monitor students' studying, whether in seat work or other activities, students are unlikely to engage in much task irrelevant behavior.

Research also indicates that students spend less time on a task when many options are available compared to a task with more limited options (Jackson, 1968; Rosenshine, 1979). Since individualized instruction provides students with more choices, this is yet another reason why students in individualized contexts may spend less time-on-task than their adult counterparts.

#### Other Variables

Several other variables that may help clarify the research findings were identified in the roundtable discussions referred to earlier.

*Student preference and attitudes.* In most contexts students do not have a choice of the type of instruction. Whether schools have adopted individualized instruction or a teacher-based method, all students in the class are usually expected to learn in the same way. Weiner (1980) indicated that in the individualized CAI materials developed at the Downstate Medical Center in New York, medical students were given options regarding the strategies they preferred. Among the available methods were CAI, textbooks, videotapes, and a number of others. Over an eight year period, only one-quarter of the students opted for instruction via individualized CAI.

This experience raises interesting questions. If individualized instruction were assigned only to students who preferred that mode, would their achievement be higher? The available data suggest not. For example, Tobias (1972) conducted two studies in which students were given a choice of instructional methods. The first study used alternate CAI strategies and the second used different programmed instruction formats. There was little difference in achievement between students who chose their method of instruction and those randomly assigned to a strategy. Snow also (1980) reports that there is little research supporting the notion that students will

#### Does Individualization Work in Elementary and Secondary Schools?

The question, "Does individualization work?" is far too broad and complex to address; the answer inevitably is yes and no. What do we mean by individualization? What do we mean by working? Only as we narrow the questions can we hope to achieve some reasonable answers.

Does this mean there is nothing we can conclude about individualization? Not at all. The research and experience with individualization over the past decade and more has a great deal to tell us.

1. *Does individualization change classrooms?* Yes, an almost universal finding is that when individualization is well implemented, the schools are different. The environment does become more sensitive to individual differences of students, and both staff and students generally are more satisfied. But this happens only when individualization is truly tried; simply adopting a label, or a new schedule, or some different materials, won't necessarily change anything.

2. *Is individualized instruction a great deal of effort?* It can be, and often is—frankly, more than some staff members are willing to put forth. We know a number of instances in which staff members have been "burned out" attempting to practice individualization. The problem is greater when a whole school attempts to individualize, or when a number of subject areas are individualized at once. But even the simpler approaches, such as organizing instruction by objectives for a single class or subject matter, call for additional effort.

3. *Does individualization increase the amount of record-keeping needed?* Inevitably, individualization requires knowing more about the students, regardless of the system employed. Lack of individualization never was due to disinterest on the

part of teachers; they simply didn't have the time to follow every student, or the materials and procedures to collect the information any other way. But having the potential for gathering more information requires more recording and interpreting if it is to be used. And no completely satisfactory solution has yet been devised for addressing this problem. Perhaps in the future the computer will be able to do much of this, but as yet, we have only partial solutions.

4. *Do students achieve more under individualized instruction?* This is a very difficult question to answer as it must be related to what actually occurs in the classroom and how we go about measuring achievement. Certainly there have been many examples of achievement gain when what is tested reasonably reflects what has been instructed; for more generalized measures, the results have been less positive.

One conclusion seems quite certain, however. There have been very few instances in which students in individualized classes have done less well than those receiving traditional instruction. The finding of "no difference" is often interpreted in a negative manner, but this isn't necessarily true. There are many potential benefits from individualization: the staff may be happier in their jobs, or students may be more positive about their educational experiences. These are worthwhile outcomes, and the evaluations argue that these can be obtained without sacrificing achievement.

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learn more when they choose their instructional methods. It should be noted that many of the investigations of student preference were conducted in research settings, and those in classroom situations tended to be of very brief duration. Results might be different over a longer period of time.

**Student level.** Another variable of importance in assessing the effectiveness of individualization is the skill level of the student. Most individualized instructional materials require students to read both instructions and the content to be learned. Individualized systems using audio and videotapes tend to be the exception.

In view of this reliance on reading it is not surprising that many research studies suggest that elementary and junior high school students learn more from traditional instruction, which probably relies less on the written page than does individualized instruction. When students have difficulty reading directions for the use of learning materials, they obviously will not learn a great deal from them. It remains for further research to clarify whether individualized instruction in school contexts is more effective for students who have solid mastery of the basic skills than those lacking such competence.

**Instructional Adaptation.** Much of what passes for individualized instruction at present enables students to complete instruction at a variable rate. In truly individualized instruction, the method of instruction would be suited to student *characteristics* in addition to the rate. Such individualization of method requires a data base of well replicated interactions between student individual difference characteristics on the one hand and instructional methods on the other (Tobias, 1981a). For example, one might reason that students who suffer from high anxiety while engaged in learning activities should be instructed by different methods than their low anxiety colleagues. Such conjecture can become a scientifically-based prediction only if research consistently demonstrates a statistical interaction between anxiety and different instructional methods. Unfortunately, the research literature shows few such relationships dealing with anxiety (Tobias, 1979) or other individual differences (Tobias, 1981b; Snow, 1977; Cronbach and Snow, 1977).

### More Successful Programs

Many variables account for differences

in research results dealing with individualized instruction in school settings and in military, industrial, and medical contexts.

Administrators determined to improve individualization in elementary and secondary schools should be aware that effectiveness seems to depend somewhat on adequacy of design of the instructional materials, provisions for student motivation, liveliness with which the content is presented—which might include more use of simulation, the skill level of participants, and other relevant student characteristics. Attention to these factors, plus additional re-

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search clarifying some of these variables, may lead to more successful individualized programs. ■

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<sup>1</sup>"Individualized Instruction." Roundtable discussion held at the annual meeting of the Northeastern Educational Research Association, Ellenville, N.Y., October 1980. Participants were Jere Brophy; Fred McDonald; Harold F. O'Neil, Jr.; Sigmund Tobias, Chair; and Max Weiner. "Contradictory Research Results on Individualized Instruction." Roundtable discussion held at the annual meeting of the American Educational Research Association, Los Angeles, April 1981. Participants were: William W. Cooley; Barak Rosenshine; Jerry Short; Sigmund Tobias, Chair; Max Weiner; and Wallace Wulfeck.

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