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THE PROJECT FOR INDIVIDUALLY PRESCRIBED INSTRUCTION. THE OAKLEAF PROJECT.

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THE OAKLEAF PROJECT WAS A COOPERATIVE STUDY OF THE PROBLEMS INVOLVED IN MAKING PROVISION FOR INDIVIDUAL DIFFERENCES WITHIN THE CONTEXT OF REGULAR SCHOOL OPERATIONS. THE OAKLEAF ELEMENTARY SCHOOL IN SUBURBAN PITTSBURGH WAS USED AS A LABORATORY FOR THE DEVELOPMENT AND TRIAL OF A PROGRAM FOR INDIVIDUALLY PRESCRIBED INSTRUCTION (IPI). THE IPI PROCEDURE CONSISTED OF ANALYSES OF PUPIL PROGRESS AT CERTAIN SEQUENTIAL STEPS IN LEARNING AND THE DEVELOPMENT OF PERSONAL PRESCRIPTIONS TO SPECIFY THE LEARNING EXPERIENCES REQUIRED TO MEET THE INDIVIDUAL NEEDS OF EACH STUDENT. STUDENTS PARTICIPATED IN THE IPI PROGRAM FOR LESS THAN ONE-HALF HOUR EACH SCHOOL DAY. DURING THE REST OF THE DAY, THE STUDENTS ENGAGED IN STUDY IN THE CONVENTIONAL MANNER. THREE BASIC CONTENT AREAS WERE USED WITH THE PROGRAM--READING, MATHEMATICS, AND SCIENCE. AT THE TIME OF THIS REPORT, THE STUDY EFFORT WAS STILL IN PROGRESS AND NO CONCLUSIONS WERE PRESENTED. POSSIBLE RESEARCH STUDIES TO BE UNDERTAKEN IN THE FUTURE AS PART OF THIS CONTINUING PROJECT WERE OUTLINED. RELATED REPORTS ARE ED 010 205 THROUGH ED 010 211 AND ED 010 519 THROUGH ED 010 523. (JH)

THE PROJECT FOR INDIVIDUALLY PRESCRIBED INSTRUCTION
(THE OAKLEAF PROJECT)

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A major challenge facing persons responsible for public education is the problem of how to provide for the great differences in pupil aptitude and interest within the context of a school program necessarily geared to mass education. Extensive research has served to substantiate that which all teachers know, within any classroom there are great differences among pupils on many qualities which affect their ability to learn. (1, 5, 9) Also, many studies have shown that when provisions are made for some of these differences, the effectiveness of classroom instruction can be increased. These studies include such early efforts as those of Burk and Washburne (8), of Jones (4), and of Peters (6) as well as the more recent studies of classroom use of programmed instruction (2, 3) and Suppes' (7) work on the teaching of elementary school mathematics.

While the problem of individualizing instruction is a formidable one, many recent innovations in instructional materials such as programmed textbooks, cartridge-loading tape recorders, and simplified film projectors now provide some encouragement for those concerned with individualization. Also of promise here are possibilities in using computers for a variety of purposes such as record keeping, and data analysis, scheduling and program planning, and serving as the basic unit in a programmed instructional system.

Because of the importance of this problem and the opportunities associated with it, the Learning Research and Development Center at the University of Pittsburgh has chosen for one of its major concentrations of effort to make a study of the problems and possibilities involved in making provisions for individual differences within the context of regular school operation. To provide for this study it has established a cooperative relationship with the Baldwin-Whitehall School District in suburban Pittsburgh under which the Oakleaf Elementary School together with its regular student body and teaching staff serves as a laboratory school for the development and trial of a program for Individually Prescribed Instruction (IPI).

The IPI project represents an investigation of the problems encountered in the individualization of instruction and involves the development of one type of program for achieving this goal. In a development effort of this type it is probable that several years will be needed to refine the program of the laboratory school to the point where the project staff feels that it is operating in such a way as to offer the intended individualization. It will then be ready for rigorous comparisons with control groups. In the meantime, such experiments as will be conducted will be those carried out within the school itself for the purpose of making decisions among alternative refinements of the individualization procedures.

Assumptions Underlying the IPI Project

In a development study it is planned that many aspects of the program will be modified as work progresses. It is the essence of this method that the persons conducting the study learn much from the

day-by-day results and then use what they learn to change and develop procedures so that the program will more closely approximate what is desired. At its inception the IPI project was defined within certain broad limits and certain specific procedures and materials were adopted for initial use. However, as the study progresses persons responsible for the various aspects of the work are encouraged to be creative in seeking better methods for achieving over-all goals.

In the initial planning of the project and in making decisions regarding the various modifications being made as it progresses, the staff is guided by certain assumptions. These include the following:

1. One obvious was in which pupils differ is in the amount of time and practice that it takes to master given instructional objectives.

2. One important aspect of providing for individual differences is to arrange conditions so that each student can work through the sequence of instructional units at his own pace and with the amount of practice that he needs.

3. If a school has the proper types of study materials, elementary school pupils, working in a tutorial environment which emphasizes self-learning, can learn with a minimum amount of direct teacher instruction.

4. In working through a sequence of instructional units, no pupil should be permitted to start work on a new unit until he has acquired a specific minimum degree of mastery of the material in the units identified as prerequisite to it.

5. If pupils are to be permitted and encouraged to proceed at individual rates it is important for both the individual pupil and for the teacher that the program provide for frequent evaluations of pupil progress which can provide a basis for the development of individual instructional prescriptions.

6. Professionally trained teachers are employing themselves most productively when they are performing such tasks as instructing individual pupils or small groups, diagnosing pupil needs, and planning instructional programs rather than carrying out such clerical duties as keeping records, scoring tests, etc. The efficiency and economy of a school program can be increased by employing clerical help to relieve teachers of many non-teaching duties.

7. Each pupil can assume more responsibility for planning and carrying out his own program of study than is permitted in most classrooms.

8. Learning can be enhanced, both for the tutor and the one being tutored, if pupils are permitted to help one another in certain ways.

Using these assumptions as a basis for planning, the project staff developed a program centered on certain specific innovations in instructional practice.

The Focus of the Individualization Effort

In the IPI program a major goal is to permit pupils to proceed through a carefully sequenced set of objectives for a given subject at a pace that is determined by individual abilities and interests. This provision for differentiations in rate involves more than letting each pupil work as fast as he can or wishes. The procedure involves an analysis of a pupil's progress at each step in the sequence and the development of an individual prescription specifying the learning experiences that will best meet his needs.

The projects concern for the individualization of rates of progression should not be taken as a judgment that this represents an attack on the most important aspect of individual differences. It represents a decision to make a rather intensive study of a school program which concentrates on this one aspect. Other aspects such as differences in interests and in other personal qualities may be equally

important or even more important, but this project, at least for the present, will concern itself largely with the differentiation of rates.

At the same time, it should be emphasized that this concentration on one type of provision does not mean the elimination of the rather unstructured provisions for individual differences that characterize typical good teaching. That is, teachers in the IPI project have many opportunities for personal or small group conferences with pupils in which they can take into account, to the extent that a good teacher can do this in a more conventional classroom, observed differences in such things as pupil interests, aptitudes, and physical and emotional condition. In fact, since the Individually Prescribed Instruction program involves frequent and regular private conferences between pupil and teacher, it might be argued that it should involve a greater degree of this informal provision for pupil differences than does the conventional classroom.

The Instructional Program

As presently operated in the Oakleaf School the IPI project involves students for less than one-half of each school day. The program is used with study in three basic content areas: (1) reading, (2) mathematics, and (3) science. During the rest of the day students are engaged in study under procedures used in the conventional elementary school.

The task involved in setting up a program for individualizing instruction is one of formidable proportions in terms of the teaching materials and evaluation instruments that must be developed, the details of instructional procedures that must be spelled out, and the reorientation of personnel involved. For this reason, the staff gave

some thought to involving only one grade level in the initial effort. However, for a number of reasons it was decided that it would be better to start immediately with a program involving all grades, K through 6. For one thing, individualization of rates of progress means the elimination of grade levels. For example, it means that a pupil in his third year of school must have the opportunity for studying topics ordinarily offered at such other levels as the second grade or the fourth or fifth grade if these are more appropriate for him. It was felt that this flexibility was most feasible only if the entire elementary school curriculum was involved. Also, since the Oakleaf School was a new school, it was felt that in the long run it might be simpler to orient the entire staff immediately to the IPI procedure rather than to involve only a part of the school at this time and then have to reorient and reorganize the other part at some later time.

The Curriculum Materials

The IPI project is not designed to study any particular curriculum materials or any curriculum theory. The procedure used in developing the curriculum was to first define the sequence of objectives for grades K through 6 and beyond for each of the three content areas. These sequences were developed after members of the project staff had examined carefully a great variety of possible curricula and to that extent the sequences that were developed can be described as representing somewhat of a consensus of recent thinking concerning what should be taught in each of the three areas. An important reason for adopting this eclectic procedure was to maximize the opportunity of identifying the great variety of materials and procedures necessary

for achieving the flexibility involved in individually prescribed instruction.

A first step in the development of the IPI program was the specification of a sequence of behaviorally defined objectives for each subarea in the subjects involved. In a program in which pupils work through a learning sequence with a minimum of teacher direction it is important that one lesson build on another and that there be no gaps to hinder pupil progress. For this reason, careful attention was given to the sequential nature of the objectives. Also, since the program is definitely "pupil centered" all objectives are defined in terms of what the pupil should be able to do after he has mastered the given goal. It is felt that this step also helps to insure that lesson materials will be directed toward specific pupil competencies and that evaluation efforts will provide exact evidence concerning present pupil abilities.

Following the careful development of these sequences of objectives in each subject, lesson materials were selected or developed to teach each objective. For the most part these were self-study materials, that is, materials that a pupil could study by himself with a minimum of assistance from the teacher. This means that there is considerable reliance on worksheets, on individual readers, on programmed books, and on taped lessons played on cartridge-loading tape recorders and disc record players. It does not mean, however, the abandoning of materials that are to be presented by the teacher. The total plan involves some small and large group instruction as well as individual instruction by a teacher.

Instructional Procedures

At the beginning of the academic year at Oakleaf School that portion of the school day devoted to Individually Prescribed Instruction was spent largely on placement testing. It was essential to find out exactly what abilities each pupil had in each of the many areas in reading, mathematics, and science. To take mathematics as an example, since sequenced materials had been developed in each such area as numeration, measurement, addition, subtraction, etc., it was necessary to know where a pupil should start in each of these areas. Because of the number of areas involved several days had to be devoted to this type of diagnosis of pupil abilities.

On the basis of this diagnosis a "prescription" was developed for each pupil. This prescription, one for each subject, listed the objectives along with the materials that the pupil was to start studying. This might include materials for a day or several days, depending upon the ability of the student and the difficulty of the task assigned.

A student then started working on his prescribed materials, typically by studying by himself. This type of individual study is done at a desk in a study area seating 60 to 75 pupils. Supervising study activities in this room are two or three teachers who provide instructional assistance and two to four clerks who distribute materials and grade papers. For the most part pupils are able to work through their lesson materials with only occasional help from these teachers. The pupil who needs more help than can be given in this large group situation is directed to a small side room where a teacher will give him more extensive individual assistance either through tutoring or small group instruction.

The final exercise included in each prescription will typically be a "curriculum embedded" test. This test, which the student will view as only another worksheet, will play a large part in determining what the pupil does next. When a pupil completes his prescribed unit of work, including the check test, he knows that he is to take this to a clerk for correction. Having done this, he then takes his materials to the teacher for another prescription. After examining the work that the pupil has just completed and having a brief conference with him, the teacher then uses all of this information to develop the next prescription.

Also included in the sequence through which a pupil works in any given subject are periodic "unit tests." These tests, which do not occur as frequently as the check tests, are formally identified as tests covering a rather sizeable unit of work and are given prior to working in a unit and after the child has completed the unit. The unit "pre" and "post" tests are used for making decisions concerning pupil progress.

Purposes to be Served by the IPI Project

The purposes that are to be served by the project for Individually Prescribed Instruction can be grouped in three major categories.

1. Providing an occasion and a focus for creative efforts in the development of a workable program for individualized instruction.

2. Providing for the testing of certain hypotheses concerning the results of such a program.

3. Providing a unique laboratory for the study of a number of basic problems in learning and instruction.

The work to be done in evaluating the success of the project in serving each of these purposes is described in the following section.

The Development of the Program

As has been mentioned previously, the IPI program is an instructional program that is being developed and modified as the project progresses. This makes a definition of the program somewhat difficult. However, at any stage where a formal evaluation of the project is undertaken a major aspect of that assessment will be a careful description of the program as it has been operating during the period under consideration.

One purpose of this description will be to provide information on steps and procedures that prove useful in individualizing instruction. As the project progresses a variety of materials, of procedures, and of organizational plans will be given a trial.[1] Those that prove useful will be retained. Those that are of no use will be abandoned. In some cases decisions of this type will be based on the results of planned research studies. In other cases they will be made rather informally and on the basis of the obvious requirements of the program. In any case, the result will be that those practices that are retained will be those that have survived some degree of assessment concerning their effectiveness.

To guide this phase of evaluation and provide information on steps that prove to be of some worth, certain general questions have been formulated. These include the following:

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[1] While the IPI project is using the Oakleaf School as a field laboratory for developing a variety of procedures for individualizing instruction, the Center's computer based instructional laboratory is involved with more basic research on individualization. It is felt that the interaction between these two efforts should lead to some exciting new approaches to a basic educational problem.

Questions concerning study materials, evaluation devices, and instructional procedures:

1. To what extent can self-study materials enable the student to master instructional objectives?

2. What types of self-study materials are most effective for specific types of learning?

3. What types of materials are most useful for peer-tutor instruction?

4. How can materials be organized and handled so as to make individualization feasible and efficient?

5. What types of tests and other evaluation techniques are needed for obtaining the information about pupil progress and ability that is necessary for effective instructional guidance of individuals?

6. Can certain types of objectives only be achieved through direct teacher instruction?

7. Is this type of program at all feasible for the typical school in terms of the costs involved?

8. What teaching and classroom management techniques are most effective for different aspects of the IPI program?

Questions concerning organizational procedures:

1. What is a workable ratio of staff to pupils for this type of program?

2. What are the most effective way of using teachers in individualizing instruction?

3. What particular skills should a teacher possess or develop?

4. In what ways can non-professional clerical employees and/or computerized procedures be used effectively to supplement the efforts of teachers?

5. In what ways can the planning of study programs for individual students be made a cooperative teacher-pupil effort?

6. To what extent can pupils do such things as evaluate their own work, plan their own study program, serve as peer tutors, etc., in a program for individualized instruction?

7. What types of schedules work most effectively in an IPI program?

Questions concerning facilities:

1. What types of provisions for student study space are most effective?

2. What provisions for the storage, reproduction, and dissemination of materials prove most efficient?

Testing Hypotheses

An essential purpose in the study of any innovation is to evaluate it in such a way as to secure an answer to the question "Does this innovation do what it is intended to do?" The evaluation of an innovation can be thought of as a process of hypotheses testing where each hypotheses is of the form "If this procedure is applied then these results will occur." In such hypotheses "this procedure" will refer to the innovation as it has operated during the period in which the hypotheses are being tested. This is an additional reason for emphasizing the importance of a clearly specified operational definition of the innovation. Only if such a description is available will the reader have any exact knowledge as to what the independent variable is.

The formulation of specific hypotheses to be tested serves to center attention on the exact dependent variables that are to be of concern. The following are some illustrations of hypotheses to be tested in the formulative years of the IPI study.

1. Under Individually Prescribed Instruction there will be great differences in rate of progress among pupils of the same age.

2. Pupils studying under Individually Prescribed Instruction will show a higher level of achievement on standardized achievement tests than will comparable students studying under traditional instruction.

3. Pupils studying under Individually Prescribed Instruction will display a greater interest in their school work than will comparable pupils studying under traditional instruction.

4. Under Individually Prescribed Instruction there will be a significant positive correlation between rate of progress and IQ.

5. Under Individually Prescribed Instruction there will be a significant positive correlation between rate in one subject and rate in another subject.

Providing a Field Laboratory

While the central purpose of the project for Individually Prescribed Instruction is to investigate a particular type of provision for the individualization of instruction, the project also serves a second function. This is to provide a laboratory for the study of a variety of relatively basic research problems. Some of these problems may have rather direct implications for the IPI project itself. Others may not.

The IPI program provides conditions that are relatively unique as far as the study of learning is concerned. For example, it provides a situation where, in a school operating as an integral part of the regular program of a school system, essentially all pupils are learning at individual rates. This provides a unique opportunity for the study of variables related to rate, factors which may influence rate as well as those affected by rate. The program also provides for a special sequence of proficiency measures in each of a number of sub-areas of the subjects involved, where each such measuring instrument is related to clearly defined behavioral objectives. This provides special opportunities for the study of pupil progression as well as for the study of problems related to proficiency and diagnostic testing. Without attempting to

point out all of the relatively unusual features of the IPI program, the point can be made that its operation involves the opportunity to study many variables not usually found in a regular school operation. Not to take advantage of this opportunity to make an intensive study of these variables would represent a relative waste of the investment in the program.

Some of the types of studies that might be undertaken by using the program as a special laboratory situation are suggested by the following questions:

1. What type of feedback to the student concerning the correctness of his work makes for the most effective learning?

2. Are there differences in rate of progression and in pupil interest between a situation where a pupil is told what to study and one where he chooses what to study?

3. Is reading ability a major determiner of rate?

4. Can pupils learn effectively if they score their own workpapers and grade their own tests?

5. To what extent can units of work and/or the specific objectives within units be organized in a "scalable" sequence?

6. How can tests be developed and scored so as to yield "content referenced" scores?

7. To what extent do pupils learn new material merely from being exposed to it on a pretest?

It should be emphasized that the lists of questions and hypotheses included in this paper are intended to provide examples only and are not to be taken as all inclusive. Some of the important questions that the project should help to answer will suggest themselves as work progresses. It is also assumed that this process of continued study and planning may serve to refine some of the questions and hypotheses already formulated. However, all such efforts will be guided by the rather broad rationale presented in this paper.

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