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ABSTRACT

A three-year Individually Prescribed Instruction (IPI) project in mathematics was initiated at Hall Elementary School in Minneapolis, September 1969, under ESEA Title I funding. Hall School is in a low income area of the city and nearly all children in the project were considered educationally disadvantaged. First year evaluation results show that students in the program made gains in mathematics equal to gains made by average students throughout the nation. When compared with students who were also below average in mathematics achievement, the Hall School students made better than expected gains. IPI students also made greater gains in mathematics than did students in three comparable Title I schools which were not on the IPI program. It was estimated that from 15 to 30 percent of the standardized test items were not related to the IPI curriculum and that as much as 75 percent of the IPI curriculum was not measured by these standardized tests. Reactions of teachers and teacher aides to the IPI project were generally favorable. Student preferences for mathematics rose. In grades two and three, mathematics was preferred over all other subjects including gymnasium and art, two subjects which initially had higher preferences. (Author/JM)

Minneapolis Public Schools

An Evaluation Report

First Year Evaluation
IPI Mathematics Project
Hall School
1969-1970

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Research, Development
and Federal Programs
807 N. E. Broadway
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November 1970

Minneapolis Public Schools

IPI Mathematics Project Evaluation
Hall School
1969-1970

Summary

An Individually Prescribed Instruction (IPI) project in mathematics was initiated at Hall Elementary School in Minneapolis, September 1969. The project is to run for a three year trial period under Title I, ESEA funding. Hall School is in a low income area of the city and nearly all children in the project were considered educationally disadvantaged. See p. 7

First year evaluation results show that students in the IPI program made gains in mathematics equal to gains made by average students throughout the U.S. When compared with students who were also below average in mathematics achievement, the Hall School students made better than expected gains. IPI students also made greater gains in mathematics than did students in three comparable Title I schools which were not on the IPI program. See pp. 43-46

It was estimated that from 15 to 30% of the standardized test items were not related to the IPI curriculum and that as much as 75% of the IPI curriculum was not measured by these standardized tests. See pp. 38-43

Reactions of teachers and teacher aides to the IPI project were generally favorable. Student preferences for mathematics rose. In grades 2 and 3, math was preferred over all other subjects including gym and art, two subjects which initially had higher preferences. See pp. 47-54

A number of recommendations for improving the project are offered. See pp. 55-56

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This evaluation was conducted by the Research Division of the Minneapolis Public Schools with the cooperation of the Hall School Staff. The report follows the procedures and format described in Preparing Evaluation Reports, A Guide for Authors, U. S. Department of Health, Education and Welfare, OE-10065. Readers who are familiar with the Research Division Evaluation Reports may wish to skip the first section describing the City of Minneapolis and the Minneapolis Public Schools since this description is standard for all Evaluation Reports.

Mrs. Diana Hestwood conducted the evaluation under the general supervision of Dr. R. W. Faunce, Assistant Director for Research. Mr. William Scott, Hall School IPI Coordinator, was responsible for field testing and made valuable suggestions for improving the evaluation. Mr. John D. Manville, Principal of Hall School, and other staff members from the school were most cooperative.

Mr. Lary Johnson and Mrs. Rebecca Howard, from the Minneapolis Public School's Office of Research, Development and Federal Programs, assisted in the statistical analysis and writing of the report.

Chapter 1. Background

The City of Minneapolis

The program described in this report was conducted in the Minneapolis Public Schools. Minneapolis is a city of 432,000 people[1] located on the Mississippi River in the southeastern part of Minnesota. With its somewhat smaller twin city, St. Paul, it is the center of a seven county metropolitan area of over 1,865,000, the largest population center between Chicago and the Pacific Coast. As such it serves as the funneling point for the entire Upper Midwest region of the country.

The city, and its surrounding area, has long been noted for the high quality of its labor force. Typically, the unemployment rate in Minneapolis is lower than in other major cities, possibly due to the variety and density of industry in the city as well as to the high level capability of its work force The unemployment rate in May of 1970 was 3.2%, compared with a 5.5% national rate for the same month. As the economic center of a prosperous region, rich in such natural resources as forests, minerals, water power and productive agricultural land, Minneapolis attracts commerce and workers from throughout the Upper Midwest Region. Many residents are drawn from the neighboring states of Iowa, Wisconsin, Nebraska and the Dakotas as well as from the farming areas and the Iron Range region of outstate Minnesota.

More Minneapolitans work in clerical and sales jobs than in any other occupation. Reflecting its position as a major wholesale-retail center and a center for banking, finance and insurance, three out of ten residents work in clerical and sales occupations. Almost as many (27%) are employed as craftsmen, foremen and operatives, and one out of five members of the work force are professionals, technicians, managers, and

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[1] 1970 Census estimate

officials. Fewer than one out of five (17%) workers are employed in laboring and service occupations.

Minneapolis city government is the council-dominated type. Its mayor, elected for a 2 year term, has limited powers. Its elected city council operates by committee, and engages in administrative as well as legislative action.

Minneapolis is not a crowded city. While increasing industrial development has occupied more and more land, population has declined steadily from a peak of 522,000 in 1950. The city limits have not been changed since 1927. Most homes are sturdy, single family dwellings built to withstand severe winters. Row homes are practically non-existant, even in low income areas. In 1960, 53% of the housing in Minneapolis was owner-occupied.

Most Minneapolitans are native born Americans, but about 35,000 (7%) are foreign born. Swedes, Norwegians, Germans, and Canadians comprise most of the foreign born population.

Few non-white citizens live in Minneapolis, although their numbers appear to be increasing. In 1960, only 3 percent of the population was non-white, but it is expected that the 1970 census will reveal that this figure has doubled. About 80% of the non-whites are Black Americans, with most of the remaining non-white population being Indian American, typically Chippewa or Sioux. Only a small number of residents from Spanish-speaking or Oriental origins live in the city. In general, the non-white families are larger than white families. In 1960, non-white residents made up 3.2% of the city's population, but accounted for 7 8% of the children in the city's elementary schools.

Minneapolis has not yet reached the stage of many other large cities in terms of the level of social problems. It has been relatively untouched by racial disorders or by student unrest. Crime rates are below national averages. Mounting concern over law and order, however, is evidenced by the recent election of Mayor Charles Stenvig, a former police detective.

One's first impression is that Minneapolis doesn't really have serious problems of blight and decay. But the signs of trouble are evident to one who looks beyond the parks and lakes and tree-lined streets. As with many other large cities, the problems are focused in the core city and are related to increasing concentrations there of the poor, many of them non-whites, and the elderly. For example, 9 out of 10 Black Americans in Minneapolis live in just one-tenth of the city's area. While Minneapolis contains 13% of the state's population, it supports 28% of the state's AFDC families.

There has been a steady migration to the city by Indian Americans from the reservations and poor whites from the small towns and rural areas of Minnesota. They come to the "promised land" of Minneapolis looking for a job and a better way of life. Some make it, many do not. In 1957, the city supported 1 out of 10 of the state's Indian Americans who were on relief; in 1969 the city supported 3 out of 10. The Indian American population is generally confined to the same small geographic areas as the Black Americans. Estimates of their unemployment rate vary, but range as high as 60%. These same areas of the city have the lowest median incomes in the city, and the highest concentrations of dilapidated housing, welfare cases, and juvenile delinquency.

The elderly are also concentrated in the central city. In 1960, Minneapolis had the greatest percentage (13%) of persons over age 65 among the 30 largest cities in the country. The elderly, like the 18-24 year old young adults, live near the central city because of the availability of less expensive housing in multiple-unit dwellings. Younger families have continued to migrate toward the outer edges of the city and surrounding suburban areas.

These few facts about Minneapolis have been presented to help give you some feeling for the locality in which this program took place. Possibly these names can add additional life to the description: Honeywell, Billy Graham, Minnesota Vikings, Guthrie Theatre, Betty Crocker (General Mills), Minnesota Twins, Pillsbury, University of Minnesota, Minnehaha Falls, Minnesota Symphony, and Hubert Humphrey. These are representative of Minneapolis, the City of Lakes.

The Minneapolis Schools

About 77,000 children go to school in Minneapolis. Most of them, about 68,000, attend one of the city's 97 public schools; 9,000 attend parochial or private schools.

The Minneapolis Public Schools, headed by Dr. John B. Davis, Jr., who became Superintendent in 1967, consist of 68 elementary schools (kindergarten-6th grade), 14 junior high schools (grades 7-9), 9 high schools (grades 10-12), 2 junior-senior high schools, and 4 special schools. Over 3,600 certificated personnel are employed. Control of the public school system ultimately rests with the seven member School Board. These non-salaried officials are elected by popular vote for staggered six year terms. The Superintendent serves as the Board's executive officer and professional adviser, and is selected by the Board.

The system's current operating budget for 1970 is approximately $62,500,000, up from $54,100,000 in 1969 and $48,800,000 in 1968. Per pupil costs were $587.00 in 1969, up from $481.00 in 1968. The range of per pupil costs in the state for 1969 was from $321.00 - $942.00.

The median expenditure for school districts in the seven-county metropolitan area was $564.00.[2] Close to 40¢ of each local property tax dollar goes for school district levies. The School Board is a separate governmental agency which levies its own taxes and sells its own bonds. Minneapolis also receives federal funds through the Elementary and Secondary Education Act. For the 1968-1969 school year, these funds amounted to approximately $4.3 million dollars.

One of the Superintendent's goals has been to achieve greater communication among the system's schools through decentralization. Consequently, two "pyramids" or groups of geographically related schools have been formed. First to be formed, in 1967, was the North Pyramid, consisting of North High School and the elementary and junior highs which feed into it. In a similar manner, the South-Central Pyramid was formed, in 1969, around South and Central High Schools. There is a director for each pyramid, as well as advisory groups of principals, teachers, and parents. The goals of the pyramid structure are to effect greater communication among schools and between schools and the community, to develop collaborative and cooperative programs, and to share particular facilities and competencies of teachers.

In 1969 there were 20 elementary schools, 5 junior highs, 3 senior highs, and 12 parochial schools serving children in areas eligible for programs funded under Title I of the Elementary and Secondary Education Act (ESEA). The federal criteria for selecting these schools are based on economic factors, in particular the number of families receiving AFDC

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[2] Per pupil cost is the adjusted maintenance cost from state and local funds and old federal programs, exclusive of transportation, per pupil unit in average daily attendance for the 1968-69 school year. Source of these figures is Minnesota Education Association Circular 6970-C2, Basic Financial Data of Minnesota Public School Districts, February, 1970.

and/or having incomes under $2,000. Approximately 22,000 children attend these schools. Of that number, one-third are defined by the State Department of Education as educationally disadvantaged, i.e. one or more grade levels behind in basic skills such as reading and arithmetic. Federal programs are concentrated on the educationally disadvantaged group.

Based on sight counts, the propor on of Black American pupils for 1969-70 was 8.1%. Five years ago the proportion was 5.4%. Indian American children currently comprise 2.7% of the school population, approximately double the pr : rtion of 5 years ago. The proportion of minority children in the various elementary schools generally reflects the prevailing housing pattern found in each school area. Although some non-white pupils are enrolled in every elementary school, non-white pupils are concentrated in two relatively small areas of the city. Of the 68 elementary schools, 10 have more than 30% non-white enrollment and 4 of these have over 50%. There are no all-black schools nor all-white schools. Thirty-nine elementary schools have non-white enrollments of less than 5%.

The proportion of school age children in AFDC homes has increased from approximately 12% in 1962 to 17% in 1969. In 10 elementary schools, 30% or more of the pupils are from homes participating in AFDC programs.

Turnover rate is the percent of students that come in new to the school or leave the school at some time during the school year (using the September enrollment as a base figure). While the average turnover rate for the city in 1968-1969 was about 60%, this figure varied widely according to location. Target area schools generally experienced a much higher turnover rate; five of these schools had rates of 100% or greater. Eleven Minneapolis schools had turnover rates of 45% or less.

The Project School and Its Neighborhood

The project described in this report was initiated in September, 1969, in Elizabeth Hall School, one of the eight elementary schools in the North Pyramid. Hall is also located in one of the two "target" areas in the city. This target area has a substantial number of economic problems--far more than the city as a whole.

Data from the 1960 census, the Crime Prevention Bureau, and the Welfare Board, show that unemployment, divorce, delinquency, and neglect cases in this district are well above the city average; median school years completed is well below the city average. Some 70% of the housing is renter occupied. Nearly 40% of the housing was unsound in 1960, and a visual inspection of the area shows that the housing has continued to deteriorate over the past 10 years.

Hall School, built in 1960 at 1601 Aldrich Avenue North, includes kindergarten and grades 1-6; there are two classes at each grade level, with the exception of first grade, which has three classes. Total en-enrollment for 1969-70 was 402 children. The principal is John D. Manville.

Figures for 1969-70 indicate a high proportion of Black and Indian children (30%), a high turnover rate (111%), and a high proportion of children in AFDC families (50%). Many of the children suffer from medical and dental problems. High teacher turnover has also been of concern. Of the 15 regular teachers employed at Hall this year, 7 had taught two years or less. The community is not a cohesive one, and there is little parent participation in school programs. Presently there is no organized PTA group.

Many individual and group efforts are being made to try to improve the home and school situation of the Hall School children. These efforts include school sponsored programs such as a hot lunch program (which most Minneapolis schools do not have), teacher aides, a youth tutoring youth program, reserve teacher training, and a special reading program. Private groups operating in the school include Project Motivation (individual tutoring by university students through the sponsorship of the YMCA), the Big Brother and Sister programs, and WISE- Women in Service to Education (individual tutoring by women volunteers).

The Project and Its History

The IPI math project was introduced at Hall School in the fall of 1969. IPI stand for Individually Prescribed Instruction. It is an instructional system based on the premise that each child progresses at his own rate. Development of the IPI system was begun by the Learning Research and Development Center at the University of Pittsburgh in 1963. The Center's activities were funded by the U.S. Office of Education. Oakleaf Elementary School, located in a suburban district of Pittsburgh, was selected as the first experimental school and in 1965 the IPI mathematics and reading materials were introduced there in grades 1-6. In 1968, spelling, handwriting, and science materials were ready for use at Oakleaf. Presently, social studies materials are being developed, and there are plans to extend the curriculum into grades 7-12. Since 1966, Research for Better Schools, Inc. (RBS), a Regional Educational Laboratory supported by federal funds and located in Philadelphia, has been responsible for the dissemination of the IPI program to interested schools throughout the country. Presently over 175 schools are using various IPI materials.

The majority of research concerning the effectiveness of the IPI system has dealt with mathematics. In the area of pupil achievement it has been found that: IPI pupils do as well as non-IPI pupils on standard achievement tests; standard achievement tests do not adequately measure the IPI program since many of the IPI skills are not tested (it is claimed that less than 30% of the skills are tested); on IPI placement tests the IPI students score significantly higher statistically than non-IPI students; girls achieve at a higher rate than boys in IPI schools.

Needs Assessment

Staff members of the Research, Development, and Federal Programs Office of the Minneapolis Public Schools became acquainted with the IPI system, and heard encouraging reports of its accomplishments. Visits to one of the experimental schools, Downey School, in Harrisburg, Pa., in 1968 provoked further interest. Of particular interest were the changes in children's behavior and the positive learning climate of the classrooms which seemed to result from the IPI system. It was felt that even if research failed to show greater gains on standardized test scores, these other changes would be highly desirable, particularly in target area schools. Contact was made with Research for Better Schools, Inc., the IPI disseminating agency.

It was found that Title I federal funds (under ESEA) could be made available for a trial of IPI materials in a Minneapolis school. The first criterion, therefore, in selecting a trial school was that it be in a target area. Hall School met this requirement; in addition it contained many children achieving well below expected levels in math, as indicated by scores on standardized tests. (RBS requires that math be the first subject in which a school uses IPI materials). Because Hall School had a relatively small enrollment, the cost of a trial of IPI math materials would not be prohibitive. Also, an extra room was available in the building to serve as a center for materials storage, teacher planning, etc. The principal of Hall visited Downey School, and he and his staff agreed to take the training necessary to implement the program.

Chapter 2, The Project

Project Objectives

The purpose of the Individually Prescribed Instruction (IPI) math project at Hall School was to increase the basic mathematics skills of educationally disadvantaged children by providing a highly structured and carefully sequenced system of individualized instruction.[3] The system is based on the premise that each child learns best by working at his own pace. Carefully specified objectives are correlated with diagnostic tools, teaching methods and materials. The overall goals of the IPI program, as stated by RBS, are:

1. To enable each pupil to work at his own rate through the units of study which constitute the learning sequence.
2. To develop in each pupil a demonstrable degree of mastery of the specified math skills.
3. To develop self-initiation and self-direction of learning.
4. To foster the development of problem-solving thought processes.
5. To encourage self-evaluation and foster self-motivation in the learning process.

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3 In the application for Title I funds for the 1969-70 school year, it was stated that the goals of the IPI math program were to raise the median scores for Hall School as follows: (1) In Mathematical Concepts, from the 29th percentile to the 39th percentile on Minneapolis city-wide norms. (2) In Problem Solving, from the 31st percentile to the 41st. Percentiles were to be based on scores from the Iowa Test of Basic Skills, Test A-1 (Mathematical Concepts), and Test A-2 (Problem Solving). Unfortunately, the ITBS Modern Mathematics Supplement replaced Tests A-1 and A-2 for use in city-wide testing starting with the 1969-70 school year. Therefore, no comparisons of gains in percentile rank can be made. City-wide norms will subsequently be compiled for the Modern Math Supplement, and from this information it will be possible to assess gains in percentile rank from the 1969-70 school year to the 1970-71 school year. This comparison will be made in the second-year evaluation of IPI. Comparisons with publisher's norms are made, however.

Project Description

Participants

Children enrolled in grades 2-6 at Elizabeth Hall Elementary School in Minneapolis during the 1969-70 school year were the participants in the IPI math project. Enrollment in these grades was about 250 children. Approximately 20 first graders were also involved in the program but only from January until the end of the school year. Participants ranged in age from 5 to 13 years, and there were approximately equal numbers of boys and girls. About two-thirds of the children in grades 4-6 scored in the bottom quartile on standardized mathematics tests given in the fall of 1969.[4]

A three year trial of the IPI math materials at Hall School was planned. This report is an evaluation of the first year of the program.

Personnel

The IPI project added one project coordinator, two "floating teachers," and six teacher aides to the existing Hall School staff. All were full-time employees. The project coordinator had been an intermediate grade teacher for 20 years and had an M.A. degree plus additional course work. The two floating teachers had 18 years and 20 years of teaching experience respectively; one had a B.A. degree plus additional course work, the other an M.A. Both floating teachers had been teaching in target area schools. The coordinator had not taught in target area schools. Of the six teacher aides, five had had previous experience as aides. One aide had a college degree, three were high school graduates, and the other two had completed high school equivalency exams. Twelve regular classroom teachers, two at each grade level, completed the staff

[4]The Stanford Diagnostic Arithemtic Test was given to grade 4 and the ITBS Modern Mathematics Supplement to grades 5 and 6. The publisher's national norms were used in evaluating the tests.

for the program. All these people participated in special training before using IPI materials.

The role of the classroom teacher was a key aspect of Individually Prescribed Instruction. Each classroom teacher was responsible for evaluating the record for each pupil, diagnosing his needs, and preparing an individual learning prescription. These activities occurred daily. Teachers also tutored individuals or small groups of children. The most significant change in the teacher's role from that in a regular classroom was that little time was spent in lecturing to the entire class, while the majority of time was spent helping individual students, evaluating their progress, and diagnosing learning needs. Class size for each teacher ranged from 21 to 30 children, with an average of 26.

Two "floating teachers", one assigned to the primary grades and the other to the intermediate grades, assisted the teachers in reviewing records and writing individual prescriptions. They also devised and supplied supplementary worksheets and materials and directed the use of manipulative devices. Floating teachers also presented seminar sessions on various topics to groups of children in the class and acted as tutors for individual students.

One teacher aide was assigned to each grade level. For the two classes at that level, she corrected all pupil work booklets, skill sheets, and tests, maintained student folders, and assisted in duplicating supplementary instructional materials and keeping manipulative devices in good repair. The project coordinator assumed responsibility for coordinating all phases of the program, as well as making public presentations on the program, planning tours for visitors, and assisting in the evaluation efforts.

Inservice Training

The entire Hall School staff, including the six IPI teacher aides, met two weeks before the beginning of the 1969-70 school year for an eight day training session. Each teacher received a set of six manuals entitled "Teaching in IPI Mathematics" explaining the IPI system in great detail. Aides received a manual entitled "Teacher Aide in IPI Mathematics" which describes their role in the IPI system. A film of the IPI program, as used in the Oakleaf School, also was presented.[5]

The first week of training was spent reading and discussing the contents of the manuals. During the last three days the staff actually tested students and filled out student placement profile sheets. Everyone was involved in both theory and practice.

Physical Arrangements

An unused classroom at Hall School was designated as a materials center and office for the IPI program. Special shelving was purchased to accomodate the printed instructional materials (workbooks), tests, and supplementary worksheets. Cabinets, counter tops and tables in the room were used to store supplementary textbooks and manipulative devices. The math program was set up on a self-contained classroom basis, that is, the children remained in their same rooms throughout the day. Two math classes were in progress each hour of the school day. The two floating teachers and the teacher aides moved from room to room, taking all math materials and equipment with them on rolling carts.

Planning and Training

Approximately six inservice meetings were held during the school year to answer questions and discuss problems that had arisen. These meetings were scheduled when the project coordinator felt there was a need for a meeting and were held on Tuesday afternoons starting at 2:15 p.m. (This time was

5 These materials were provided by Research for Better Schools, Inc., the IPI disseminating agency. Its address is 1700 Market Street, Philadelphia, Pa., 19103.

designated as release time for teacher meetings and preparation throughout the city). Aides were included in the first two meetings only.

Research for Better Schools, Inc. also monitored the Hall School project. RBS obtained information on the materials, the pupils, the teaching staff, and the community setting at Hall. Twice during the year, the prescription sheets of ten children from each class were collected and sent to RBS. The ten children were selected by taking the first and last five children on an alphabetical list for each class. On the basis of this data, RBS assessed the degree of implementation of the IPI program in the school. In particular, RBS evaluated how children's prescriptions were being written. RBS also tabulated a minimal amount of information on student progress, such as average number of skills mastered. The RBS area consultant assisted in the training sessions held just prior to the opening of school. He also visited Hall several times during the year to observe.

Activities and Materials

The overall goals of the IPI math program were given earlier in this report (see page 10). Samples of the 390 specific math skills which form the IPI continuum are listed, in abbreviated form, in Appendix A. These skills are grouped into eight levels, from A-H, according to increasing difficulty (A=easiest, H=hardest). There are thirteen topic areas, which cut across all levels: Numeration, Place Value, Addition, Subtraction, Multiplication, Division, Combination of Processes, Fractions, Money, Time, Systems of Measurement, Geometry, and Special Topics. Each topic area consists of groups of skills in each of the eight levels. The skills in one topic area at one difficulty level comprise a unit. Thus the precise point at which a child is working in the continuum can be identified by naming the level, the topic area, and the specific skill number within that topic area. For example, D-Addition-3 identifies the 3rd skill in the Addition unit at the D level.

The next few paragraphs describe the IPI system in detail. A sample is given of how one child progressed through the diagnostic system and through one of the units of study. Persons who are already familiar with IPI may wish to turn directly to the next section, <u>Parent Involvement</u>, on page 24.

The first step in administering the program is to assess the child's level of skill acquisition so that he can be placed at the proper point in the continuum. The placement instrument measures mastery for each unit of work (for example, the skills in D-Addition constitute one unit), and provides a gross profile of the students' strengths and weaknesses. Such a profile is shown on page 16. The criterion level for mastery of each unit on the placement test is 80%. Shaded areas on the placement profile indicate areas in which no objectives are specified in the IPI continuum.

In the example shown, Peggy was first given the placement test covering all units in Level B. Because she was in fourth grade she would normally be expected to place in level D. Because of the generally lower achievement levels of children at Hall School, her first placement test was given two levels below that. The profile shows that Peggy scored 80% or better on all 8 units in Level B. So she was given the entire Level C placement test. She scored 80% or better on all but three units: Combination of Processes, Fractions, and Systems of Measurement. This indicated that Peggy should begin her instruction in these three topics in Level C. Next, Peggy took the Level D placement test, but was only required to complete the sections on those topics which she had passed in Level C. This time she failed to pass Numeration, Subtraction, Multiplication, Division, Money, Time and Geometry. Her instruction in these topics therefore began in Level D. Finally, she took the Level E placement test, completing only the sections on Place Value and Addition, the two topics

ipi MATHEMATICS PLACEMENT PROFILE

STUDENT NAME Peggy STUDENT NUMBER

SCHOOL NAME E. Hall GRADE 4 ROOM 308

MATHEMATICS AREA	DATE OF TEST	PLACEMENT LEVELS B–H	B	C	D	E	F	G	H	PLACED AT LEVEL
NUMERATION (01)	9/15	MAX. PTS.	10	5	5					D
		SCORE	10	5	0					
		%	100	100	0					
PLACE VALUE (02)		MAX. PTS.	5	5	5	7				E
		SCORE	5	5	5	4				
		%	100	100	100	57				
ADDITION (03)		MAX. PTS.		10	5	5				E
		SCORE		9	5	3				
		%		90	100	60				
SUBTRACTION (04)		MAX. PTS.		10	5					D
		SCORE		8	0					
		%		80	0					
ADDITION/ SUBTRACTION (34)		MAX. PTS.	13							H
		SCORE	11							
		%	85							
MULTIPLICATION (05)		MAX. PTS.			10					D
		SCORE			4					
		%			40					
DIVISION (06)		MAX. PTS.			10					D
		SCORE			4					
		%			40					
COMBINATION OF PROCESSES (07)		MAX. PTS.		5						C
		SCORE		3						
		%		60						
FRACTIONS (08)		MAX. PTS.	5	4						C
		SCORE	5	2						
		%	100	50						
MONEY (09)		MAX. PTS.	5	5	5					D
		SCORE	5	5	0					
		%	100	100	0					
TIME (10)		MAX. PTS.	9	3	4					D
		SCORE	9	3	0					
		%	100	100	0					
SYSTEMS OF MEASUREMENT (11)		MAX. PTS.	4	5						C
		SCORE	4	2						
		%	100	40						
GEOMETRY (12)		MAX. PTS.	5	3	4					D
		SCORE	5	3	3					
		%	100	100	75					

Based upon prototype originated by the Learning Research and Development Center. As Field tested by Research for Better Schools, Inc.

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440 Park Avenue South, New York, N. Y. 10016

she passed in Level D. Both scores were below the 80% criterion level, so she did not take any more placement tests.

A plan for Peggy's course of study resulted. She would first remove the deficiencies in Level C, starting with the skills in Combination of Processes, followed by Fractions. Then she would move to Systems of Measurement in Level C. Next, she would move into Level D and cover, in order, the skills in Numeration, Subtraction, Multiplication, Division, Combination of Processes, Fractions, Money, Time, Systems of Measurement, and Geometry. Then she would move on to Level E, covering all 12 units in that Level in order.

The Student Profile, shown on page 18, indicates Peggy's progress through the units. An X indicates that she passed that unit on the placement test. A single diagonal line indicates she went through the instructional materials and passed the posttest on the date shown.

While the placement test indicated areas of weaknesses, it did not identify specific skills which Peggy lacked. To do this on the initial placement test would make it much too long and cumbersome. Therefore, a pretest for each unit at each level was given to measure acquisition of the specific skills within that unit, and was assigned prior to any teaching within the unit. For example, before Peggy started in Combination of Processes, Level C, she took a pretest covering only the six skills in that unit. The criterion level for mastery of a skill on the pretest is 85%. Peggy received a score on each of the six skills; where she fell below 85% indicated the need for instruction.

An individual prescription or plan of study was written for Peggy by her teacher, assigning her to the Standard Teaching Sequence (STS) booklets covering the skills she had not mastered. Each STS booklet covers one skill and contains a number of pages which the chil' works himself. Each prescription

Exhibit 2

ipi STUDENT PROFILE

MATHEMATICS

Name Peggy ______ Grade 4 Room 308

Level	NUMERATION (01)	PLACE VALUE (02)	ADDITION (03)	SUBTRACTION (04)	ADDITION/ SUBTRACTION (34)	MULTIPLICATION (05)	DIVISION (06)	MULTIPLICATION/ DIVISION (56)	COMBINATION OF PROCESSES (07)	FRACTIONS (08)	MONEY (09)	TIME (10)	SYSTEMS OF MEASUREMENT (11)	GEOMETRY (12)	SPECIAL TOPICS (13)
H											shaded		shaded		
G					shaded			shaded			shaded				
F					shaded			shaded							
E					shaded			shaded							
D	1-8	X	X	2-11	shaded	2-11	3-2	shaded	3-4						
C	X	X	X	X	shaded	shaded	shaded	shaded	10/10	10-29	X	X	11-13	X	
B	X	X	shaded	shaded	X	shaded	shaded	shaded	shaded	X	X	X	X	X	shaded
A	X	shaded	shaded	shaded	X	shaded	shaded	shaded	shaded	X	shaded	shaded	shaded	shaded	shaded

MATHEMATICS AREA

Check (X) the box to indicate mastery of unit.

Based on the prototype originated by the Learning Research and Development Center. As Field tested by Research for Better Schools, Inc.

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is corrected by an aide as the child completes it, and a record of the number of correct problems is made. Sample pages from an STS booklet for Fractions, Level C, Skill 1 are shown in Appendix B.

Within each booklet there are two curriculum embedded tests (CET). A sample is shown in Appendix B. The CET serves as a short test of a child's progress toward acquisition of the skill. If the child fails a CET (less than 85% correct) he is assigned to supplementary materials, which are described in further detail below.

When the child has completed the instructional materials on all the skills in a particular unit, he takes a posttest to measure his level of mastery of the entire unit. The posttest is an alternate form of the pretest for that unit and the criterion level is 85% correct. He does not move on to a new unit until this level of mastery is achieved.

The child's progress through a unit is recorded on a Mathematics prescription sheet, like the one shown on page 20. This sample shows Peggy's route through the Division unit in Level D. In the lower right corner is a record of her scores on each of the seven skills in this unit on the pretest and posttest. On the pretest, Peggy scored 85% or more on all but skills 3 and 5. From this information, her teacher wrote a prescription which indicated that Peggy should work on the STS booklet for skill 3 in D-Division. The prescription sheet is kept in a folder with the child's name on it, and is reviewed daily by the classroom teacher. The sheet records Peggy's score on each page of the booklet, and her scores on the two curriculum embedded tests.

The prepared STS booklets are not sufficient, in themselves, for individualizing instruction. A variety of settings and materials are utilized. These are entered on the prescription sheet according to the code designations

Exhibit 3

ipi MATHEMATICS PRESCRIPTION SHEET

Peggy — STUDENT NAME | STUDENT NUMBER | SCHOOL NUMBER | Mastery 4 — GRADE | 208 — ROOM

D-Division (06) — UNIT

UNIT DATES	
UNIT BEGAN	2-12-70
UNIT ENDED	3-2-70
DAYS WORKED	10

DATE PRES.	PRES. INIT.	SKILL NO.	PAGE NO.	TOTAL POINTS	NUMBER CORRECT	INST. TECH CODES	INSTRUCTIONAL NOTES	CURRICULUM TEST PART 1 NO. OF POINTS	PART 1 %	PART 2 NO. OF POINTS	PART 2 %	DAYS WORKED
2-12		Pretest				12	Mult - Num					
2-16		Pre test				05,07	Mult					
2-17	P.T.	Pre test				06,12	Mult.					
2-18	P.T	Read Student Page										
		3	1	12	12	06-12	Mult					
			2									
			3									
			4									
			5									
			6									
			7									
			8									
		CT. I						13	100	5	100	
2-25	P.T.		10	10	10	05	Numeration					
			11	12	12	12						
			12	12	12							
		CT II	13					13	100	5	100	
2-26	P.T.	5	1	4	4							
			2	4	4							
			3	11	11							

INSTRUCTIONAL TECHNIQUES	
CODE	SETTING
01	Teacher Tutor
02	Peer Tutor
03	Small Group
04	Large Group
05	Seminar
	MATERIALS
06	Curr. Texts
07	Teacher Made Skillsheets
08	Film Strips
09	Records/Tapes
10	Research
12	Manipulative Devices

PRE AND POST TEST SCORES

SKILL NUMBER	MAX POINTS PER SKILL	PRE SCORE	%	POST SCORE	%	POST SCORE	%	POST SCORE	%
1	5	5	100	5	100				
2	10	10	100	10	100				
(3)	5	3	60	5	100				
4	20	20	100	19	95				
(5)	6	4	67	6	100				
6	6	6	100	6	100				
7	4	4	100	4	100				
DATES									

B... Prototype originated by the Learning R... Development Center. As Field tested by Research for Better Schools, Inc.

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ipi MATHEMATICS PRESCRIPTION SHEET

STUDENT NAME ______________________ UNIT ______________________ PAGE ______ OF ______

TASKS								CURRICULUM TEST				DAYS WORKED
								PART 1		PART 2		
DATE PRES.	PRES. INIT.	SKILL NO.	PAGE NO.	TOTAL POINTS	NO. CORRECT	INST. TECH. CODES	INSTRUCTIONAL NOTES	NO. OF POINTS	%	NO. OF POINTS	%	
2-26	P.T.	5	4	10	10							
			5	2	2							
			6	8	8							
			7	34	34							
			8	16	16							
		Cit	9					11	100	7	100	
2-27	P.T.					12	Mult.					
3-2			10	10	10	05	Place Value					
			11	8	8							
			12	16	16							
		Cit	13					11	100	7	100	
		Post test										

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listed in the lower left corner. A description of the various settings follows:

Alone:	If a pupil works in materials but does not have any of the following settings, he is said to work by himself.
Teacher Tutor:	The teacher aids the child by explaining, questioning, etc. This does not include reading of directions.
Peer Tutor:	Two students work together, or one pupil helps another with a specific skill.
Small Group Instruction:	A group of two to ten students is brought together for instruction on a particular skill.
Large Group Instruction:	Eleven or more students are brought together for group instruction on a particular skill.
Seminar:	A large group receives instruction on a group of related skills from the floating teacher. An example might be a discussion of the use of Time, applying all the skills from a particular level in this area.

The various types of materials which may be included in a prescription are:

Curriculum Tests:	Material from various textbooks and workbooks is correlated with the various topics and levels. This material is reproduced and distributed to children for work.
Teacher Made Skillsheets:	The child completes a skillsheet prepared by the teacher or a staff member. This usually provides drill exercises in a particular skill.
Film Strips:	This includes the use of any film or filmstrip.
Record/Tapes:	This includes the use of any records, tapes or other audio devices that provide instruction in a particular skill.
Research:	The pupil uses books and/or other materials to learn a skill or group of skills. This work may go beyond simple mastery to include the use of the skill in problem solving.
Manipulative Devices:	A child works with a manipulative device that aids the teaching of a particular skill. Some of the devices used were flash cards, clocks, play money, place value charts, fraction boards, dominoes, geo-boards, abacus, number lines, rulers, protractors, peg boards, and liquid measure containers.

Pupils receive immediate feedback on their daily work. Their work is corrected immediately and either help is given or a new prescription is written. For Peggy's prescriptions for skill 3 in D-Division, one sees that in addition to working the STS booklet, she also used manipulative devices, participated in a seminar, and used material from a curriculum text. A level of 100% mastery on the two CET's in the booklet indicated that she was successfully progressing through the material.

After completing the work on skill 3, Peggy started on skill 5, the only other skill she had not acquired in this division unit. Her prescriptions, which continue on page 21, included the STS booklet on this skill, use of a manipulative device, and a seminar on place value. Again, success on the two CET's indicated adequate progress. A poor showing on one of the CET's would have called for a change in her prescription; perhaps a skillsheet with drill exercises or teacher or peer tutoring. The floating teacher assists in reviewing records and writing prescriptions and is available for special help in cases where children are experiencing difficulty.

At the completion of the material on skill 5, Peggy was ready to take the posttest covering all skills in D-Division. Her scores, shown in the lower right hand corner, indicate that she now had reached criterion level (85%) on all the skills in this unit. She had mastered the unit and was ready to move on to the next unit, D-Combination of Processes.

Supplementary materials, particularly the manipulative devices, are a vital addition to the STS booklets. Concrete representations of concepts are very important, especially for primary children. The project coordinator estimates that the children at Hall spent 30-40% of class time on materials and equipment other than the prepared STS booklets. The IPI system encourages the use of such materials to provide relief from paper and pencil work. However, the selection and implementation of supplementary materials is left almost entirely to the individual school. At the beginning of the program, Hall had a very limited number of manipulative devices available. The inventory for the second year will be much greater. The staff plans to make math kits to correlate with the various areas. These will be used both for building background and improving skills.

Parent Involvement

The IPI system was explained to the parents of Hall School children during an open house in the fall, and again at each parent-teacher conference. Parents also received information on their child's progress in IPI from completed work taken home by the child, and from report cards. The report card indicated progress by an S-N letter designation: S for "satisfactory progress" and N for "needs improvement." A list of IPI skills which the child had mastered during the marking period was used to supplement the report card.

Budget

The total cost of the IPI program at Hall School for the 1969-70 school year was $71,000. This amount was made available from the U.S. Office of Education under Title I of ESEA. Of the total expenditures, $64,000 (90%) was for salaries and training: $38,000 for the salaries of the coordinator and two floating teachers; $20,000 for the salaries of six teacher aides; and $6,000 for inservice training. The remaining $7,000 was used for equipment and supplies: $4,000 for IPI printed materials; $2,000 for room equipment (in particular, the special shelving to hold the printed materials); and $1,000 for manipulative devices and office supplies. The per pupil cost for the IPI program in 1969-70 was thus approximately $265. It is expected that per pupil cost at Hall for the 1970-71 school year will be approximately $195, or $70 less per pupil than in 1969-70.

Costs of the 1969-70 program exceed the costs for continuing the same program at Hall. For example, durable room equipment will not have to be replaced, and extensive inservice training will be required only for new personnel. The cost of the IPI printed materials is also decreasing. For 1969-70, the per pupil cost for printed materials was $12.00; for 1970-71 it will be reduced to $9.50. The eventual per pupil cost for printed materials is hard to predict, but efforts are being made to bring it down to $4.00 or less per year.

Costs for introducing the IPI program at other schools will vary considerably. The number of children involved will influence the number of teachers and aides employed, and the salaries for these individuals vary. The amount of available equipment and supplies would also be a factor.

Chapter 3. Results-Achievement Tests

Preview

Students in the Hall School IPI project made gains in mathematics equal to gains made by average students throughout the United States. When compared with students who also were below average in mathematics achievement, the Hall school students made better than expected gains.

Hall students also made greater gains in mathematics than did students in three comparable Minneapolis Title I schools which were not on the IPI program.

Improvement may have been even better than standardized tests suggest. Students were tested in the spring following a three week absence caused by a teacher strike. Also, it is estimated that from 15% to 30% of the test items were not related to the IPI curriculum and that as much as 75% of the IPI curriculum was not measured by the standardized tests.

Selecting Participants

The IPI math materials were used with all children in grades 2-6 throughout the 1969-70 school year at Hall School. An attempt was made in January to include first grade children, but it was found that many of them were not yet capable of operating within the IPI system. Twenty first graders were included in the program from January through the end of the school year. None of the children on IPI received other formal instruction or assistance in mathematics during the school year.

Pretest and posttest data were collected on children in grades 4, 5, and 6. These grades included 163 children, or 58% of the total 275 participants. The main evaluation tools were standardized tests of mathematics skills. Because of the lack of suitable tests of this type for primary grades 1, 2, and 3, children in those grades were not included in the evaluation group, except for completing a ranking of their favorite school subjects.

Children in grade 4 were tested on subtests 1 and 2 of the Stanford Diagnostic Arithmetic Test, form W. Children in grades 5 and 6 were tested on the Iowa Tests of Basic Skills, Modern Math Supplement, form X. A teachers' strike interrupted school sessions for three weeks just prior to the spring testing. The impact of this absence on the posttest scores was indeterminate.

Turnover at Hall School had been quite high in previous years, so it was expected that there would be considerable turnover in the children involved in the program. Of the 163 children enrolled in grades 4-6 in September, 24 (15%) left the school during the year. Nine were from grade 4, seven from grade 5, and eight from grade 6. There was no evidence that the children who moved were significantly different from those who stayed. During the school year, seventeen new children entered grades 4-6 and were placed in the IPI math program. These new children were not included in the evaluation group. In addition, varying numbers of children were absent during the fall or spring testing sessions for the various grades. These omissions left a total of 120 children, or 74% of the original sample, who completed both the pretesting and posttesting. Participation in the program was compulsory since it replaced the regular math program and occurred during regular school hours.

Achievement in the IPI Program

Samples of the 390 specific objectives or skills of the IPI math program appear in Appendix A. These objectives are carefully sequenced according to difficulty into eight levels, labeled A through H. Individualized instruction precludes the use of grade level distinctions but to provide a frame of reference, Level A may be thought of as corresponding roughly with first grade level material, Level B with second grade, etc.

One measure of progress was the number of children working at each level of the program at different points in time. Table 1 shows the percentage of children in grades 2-6 who were working at the various levels in the IPI program as the school year progressed. The level placement represented the lowest level at which each student was working. None of the children worked in Levels F-H, the most difficult levels, at any time during the year. Since the last day of school was June 11, the information in Table 1, which goes to May 15, does not cover the last month of school.

At the beginning of the year, almost 7 out of 10 children were working in Levels A or B (approximately first grade level); in May, only 14% were in Level B, and no one was working in Level A. By May, nearly 6 out of 10 were working in Levels D or E (approximately fifth grade level). A child had to reach the criterion level of 85% correct on a test of the skills in a particular unit before progressing to the next unit. He did not progress through the material simply at the discretion of his teacher.

Another indicator of progress within the IPI math continuum was the average number of skills mastered by the children and the average number of units completed during the school year. This information, covering the period from September 1 through mid-May, is presented for grades 4, 5, and 6 in Table 2.

Because a child studied only those particular skills within a unit on which he was deficient, he may have had to acquire only one or two skills in order to complete a unit. The "average number of units completed" figures in Table 2 suggest that most children covered at least one grade level of materials during the school year. This estimate was based on the fact that there are 84 units in the entire IPI math curriculum, with 10-12 units at each level. The data does not cover progress made during the last month of school.

Table 1
Levels of Achievement in IPI Program for Grade 2-6
(Percentage of Students)

Date	N	Level A	Level B	Level C	Level D	Level E
Sept. 1, 1969	256	13%	55%	25%	7%	0%
Nov. 26, 1969	258	1	27	35	35	3
Jan. 15, 1970	240	0	23	35	37	6
Mar. 20, 1970	247	0	17	30	33	21
May 15, 1970	260	0	14	28	35	23

Table 2
Average Number of Skills Acquired and Units Completed

Grade	N	Average Number of Skills Acquired	Average Number of Units Completed
4	51	16	10
5	38	28	15
6	47	27	15

Standardized Test Results for Grade 4

Children in Grade 4 were given subtests 1 and 2 of the Stanford Diagnostic Arithmetic Test, Level 1, form W, in early September and again during the first week in May. Test 1 was titled Concepts of Numbers and consisted of three parts: (1) Number System, Counting; (2) Operations; and (3) Decimal Place Value. All statements in the test were read to the children by the teacher. Consequently, all students moved through the test at the same rate. A total score for Test 1 was obtained for each child by adding the raw scores on each part. Test 2 of the Stanford was Computation. It consisted of 18 problems in each of the whole number operations. The 18 problems in each part were done independently by the children. A time limit of 15 minutes on the addition problems and on the subtraction problems and a limit of 20 minutes on the multiplication problems and on the division problems was required. A total score for each child was obtained by adding the raw scores or each part of the test. Test 2 was given on a different day from Test 1.

Of the 60 children enrolled in Grade 4 in September, nine left the school during the year. In addition, eight children were absent for either the fall or spring administration of Test 1. Eight children were also absent for either the fall or spring administration of test 2. These were not necessarily the same children, since the two tests were given on different days. Thus, for both Test 1 and Test 2 of the Stanford, there were 43 children on whom complete data was available. It does not appear that the children who were absent were significantly different from those who took the tests.

Mean raw scores, grade equivalents, and statistical test data for the fall and spring administration of Test 1, Concepts of Numbers, is given in Table 3. Similar data for Test 2, Computation, is given in Table 4. Grade equivalents and percentile ranks are based on publisher norms.[6] To check the statistical significance of the gain in mean raw scores, a two-tailed t-test for dependent measures was used to compare pretest and posttest means. The t-statistic for both Test 1 and 2 was significant at the .001 level. That is, it is unlikely that the gains made by these students could have been due to chance fluctuations. Again, it is important to note that posttesting took place five days after students returned from a three-week absence due to a teachers' strike. This break may well have had an adverse effect on the posttest scores.

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6 Manual for Administering and Interpreting Stanford Diagnostic Test, Level I, New York: Harcourt, Brace & World, Inc., 1966

Table 3

Raw Scores, Grade Equivalents, and Percentile Ranks on Stanford Diagnostic Arithmetic Test 1, form W Concepts of Numbers, for Grade 4
N=43

	Pretest Sept. 1969		Posttest May 1970				
	Mean	S.D.	Mean	S.D.	Mean Gain	t	p
Raw Score	36.6	12.6	53.3	13.1	16.7	14.91	.001
Grade Equivalent[a]	2.4		3.3		.9		

[a] Publisher Norm

Table 4
Raw Scores, Grade Equivalents, and Percentile Ranks on Stanford Diagnostic Arithmetic Test 2, form W, Computation, for Grade 4
N=43

	Pretest Sept. 1969		Posttest May 1970				
	Mean	S.D.	Mean	S.D.	Mean Gain	t	p
Raw Score	25.0	8.9	34.4	12.4	9.4	5.50	.001
Grade Equivalent[a]	3.0		3.4		.4		

[a] Publisher Norm

A comparison of grade equivalents shows that these fourth grade students gained .9 grade in Concepts of Numbers and .4 grade in Computation. Since the testing period covered .9 grade, the students were making "normal" progress in Concepts of Numbers, when compared with the normative group used by the test publisher, but they were not doing well in Computation.

Additional comparisons of pretest and posttest mean scores were made by dividing the total fourth grade group into smaller groups according to teacher, sex of student, and attendance. Poor attendance was identified as missing 15 or more school days between pretesting and posttesting. The results of these comparisons for Tests 1 and 2 are shown in Tables 5 and 6.

The data on Test 1, Concept of Numbers, (Table 5), indicate that there were no significant differences in mean gains according to classroom teacher or sex of student. Students in Teacher A's class gained just as well as students in Teacher B's class; gains by boys and girls were equal. Children with good attendance records made somewhat greater gains than those with poor attendance records, although a two-tailed independent-sample t-test comparing gain scores was not statistically significant.

The data from Test 2, Computation, (Table 6), showed some differences in mean gain scores. A teacher-by-sex of student analysis of variance on the gain scores indicated that the greater mean gain by boys was not significant, but that the greater mean gain by students of Teacher A was significant (.01 level). Students in Teacher A's class averaged .8 grade equivalent's gain while students in Teacher B's class averaged .3 grade equivalent's gain.

The difference in mean gain scores between teachers may have been due to basic differences in the student composition of the two classes. However, no statistically significant differences were found between the two classes' distributions of student sex and student attendance. Possibly Teacher A was placing greater emphasis on using supplementary materials in computation than Teacher B. An analysis of Lorge-Thorndike Intelligence Test scores using an independent-sample t-test revealed no differences between the two classes on the verbal scores, but a significant (.05 level) difference in favor of Teacher B on the non-verbal scores. Since the students in Teacher B's room made smaller gains on Test 2 (Computation), the difference in arithmetic computation gain scores between the two classes cannot be

Table 5
Means and Standard Deviations on Raw Scores on Stanford Diagnostic Arithmetic Test 1, Concepts of Numbers, form W, for Grade 4 by Teacher, Sex of Student and Attendance

		Pretest[a]		Posttest[b]		Mean		
	N	Mean	S.D.	Mean	S.D.	Gain	F	p
Teacher A	17	38.2	13.6	54.8	13.1	16.6	not tested	
Teacher B	26	35.5	12.0	52.2	13.3	16.7		
Male Students	20	38.3	12.2	55.1	11.5	16.8	not tested	
Female Students	23	35.0	12.9	51.7	14.4	16.7		
Good attenders	32	36.7	11.7	54.1	11.1	17.4		
Poor attenders	11	36.1	15.3	50.9	18.3	14.8	not tested	

Table 6
Means and Standard Deviations on Raw Scores on Stanford Diagnostic Arithmetic Test 2, form W, Computation, for Grade 4 by Teacher, Sex of Student and Attendance

		Pretest[a]		Posttest[b]		Mean		
	N	Mean	S.D.	Mean	S.D.	Gain	F	p
Teacher A	18	23.6	8.1	38.8	12.8	15.2	8.19	.01
Teacher B	25	26.1	9.4	31.3	11.2	5.2		
Male Students	20	24.8	6.3	37.5	11.9	12.7	1.01	n.s.
Female Students	23	25.3	10.7	31.8	12.4	6.5		
Good attenders	31	24.9	6.7	36.3	11.2	11.4	Not in ANOVA	
Poor attenders	12	25.5	13.4	29.6	14.3	4.1	$t > .05$	

a Pretest=Sept. 1969
b Posttest=May 1970

explained by whatever the Lorge-Thorndike measures. The students in Teacher B's class were as good as, and probably better than, the students in Teacher A's class on the Lorge-Thorndike ability measures.

The sample size was too small to include attendance as a third factor in the analysis of variance of gain scores. Although a t-test on attendance necessitated the use of redundant information from the data, the greater mean gain by the good attenders was not quite significant at the .05 level using a two-tailed independent-sample t-test.

Standardized Test Results, Grade 5

Forty-five children were enrolled in the two fifth grade classes in September. During the school year, seven of these children moved out of the school district. One other child was not included in the evaluation group because he was a homebound student. This left 37 fifth graders who took the Iowa Tests of Basic Skills, Modern Mathematics Supplement in mid-September and again in early May.

The Modern Mathematics Supplement contains items for grades 3 through 9. Fifth grade students completed only items numbered 31 through 72, for a total of 42 problems. Statistics for the fall and spring administration of the test, based on publisher norms, are given in Table 7.[7]

A two-tailed t-test for dependent measures indicated that the mean raw score gain of 3.6 between the pretest and posttest was statistically significant at the .001 level.

A gain of .7 grades suggests that the Hall students were falling further behind their peers. However, Hall students actually improved their relative standing slightly as indicated by a rise in their percentile rank

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7 Norms were taken from Manual for Administration and Interpretation, Modern Mathematics Supplement to the Iowa Tests of Basic Skills, Boston: Houghton Mifflin Company, 1968.

Table 7
Raw Scores, Grade Equivalents, and Percentile Ranks on the ITBS Modern Math Supplement, form X, for Grade 5
N=37

	Pretest Sept. 1969		Posttest May 1970		Mean		
	Mean	S.D.	Mean	S.D.	Gain	t	p
Raw score	10.9	3.1	14.6	5.6	3.7	4.04	.001
Grade equivalent[a]	3.9		4.6		.7		
Percentile rank[a]	17		22		5		

a Publisher norm

from 17 to 22. Apparently, Hall students scored better on the test than did the normative children who were at similar low levels on the pretest. The posttest was given two days after the end of a three-week school closing. It is not known what affect this time lapse had on the posttest scores.

A teacher-by-sex of student analysis of variance showed that the difference in gains between males and females and the difference in gains between classrooms were not statistically significant. Also, greater gains by the good attenders compared with the poor attenders were not statistically significant.

Effect of Reading on Standardized Test Scores

Because each item on the Modern Math Supplement required some reading, it was felt that reading ability might affect total scores. In particular, because so many of the Hall School children were reading below grade level, it was hypothesized that this would cause them to score lower on the Supplement. To test this hypothesis, the fifth graders were randomly assigned to two groups in the fall. In one group the children read the test themselves. In the second group, each test item was read aloud to the children by the teacher. Each group received the same treatment in the spring administration of the test, that is they either read the test themselves, or had the test items read aloud to them. Table 8 presents the means and standard deviations for the two groups. One girl who was in the second group in the fall was accidently placed in the first group in the spring. Her test scores were removed from this analysis.

Table 8
Means and Standard Deviations on Raw Scores for Children Who Read Their Own Test and Children Who Had the Test Read to Them, ITBS Modern Mathematics Supplement form X, for Grade 5

		Pretest		Posttest		Mean
	N	Mean	S.D.	Mean	S.D.	Gain
Children who read their own test	19	10.9	2.9	13.9	6.2	3.0
Children who had the test read to them	17	11.1	3.4	15.2	5.1	4.1

While the mean gain on raw scores was greater for children who had the test read to them, a two-tailed independent sample t-test indicated that the difference was not statistically significant at the .05 level. The children who had the test read to them scored slightly higher on the pretest and the posttest.

Standardized Test Results, Grade 6

Of the fifty-eight children enrolled in grade 6 in September, seven left the school during the year. An additional seven children were absent for either the fall or spring administration of the ITBS Modern Mathematics Supplement. This left 44 children or 76%, on whom complete data were available.

Children in sixth grade were tested on items 52 through 96 of the Supplement, for a total of 45 items. The first 21 of these items were also taken by the fifth graders, due to the overlapping nature of the test sections. Statistics on the pre- and posttesting, based on the publisher's norms, are shown in Table 9.

Table 9
Raw Scores, Grade Equivalents, and Percentile Ranks
on the ITBS Modern Mathematics Supplement, form X
for Grade 6
N=44

	Pretest Sept. 1969		Posttest May 1970		Mean		
	Mean	S.D.	Mean	S.D.	Gain	t	p
Raw score	11.5	4.4	16.4	7.0	4.9	3.90	.001
Grade equivalent[a]	4.7		5.6		.9		
Percentile rank[a]	16		24		8		

[a] Publisher Norm

A two-tailed t-test for dependent samples showed the increase in mean raw score to be significant at the .001 level. Sixth grade students improved in mathematics at the "normal" rate of .9 grade when compared with the publisher's sample of students. Hall students made relatively greater gains, however, since students with their initially low scores were not expected to achieve as well as the average student. This relative gain is shown by a rise in percentile rank from 16 to 24.

The sixth graders were also randomly assigned to two groups, one which read their own test, and one to which the test was read aloud by the teacher. As with the fifth grade students, there was no statistically significant difference between these two groups. Apparently, for these groups of children, the reading difficulty level of the test was not a major factor.

Comparisons of mean raw score gains were made between the two classes, between male and female students, and between children with good attendance records and those with poor attendance records. Although the good attenders made slightly greater gains than poor attenders and girls made slightly greater gains than the boys, these differences were not statistically significant. Gains made by students in different classes also were similar.

Data on the Modern Math Supplement also were obtained from three other target area elementary schools. The sixth grade students in these schools completed a pretesting session in early September and a posttesting session in mid-May. All three schools had special, federally financed programs. None of the programs were in math, however.

Pretest and posttest mean raw scores and grade equivalents based on publisher's norms are given in Table 10 for Hall and the other three schools. Pretest information from schools A, B, and C was obtained through the city-wide testing program.

Table 10
Mean Raw Scores and Grade Equivalents on the ITBS Modern Mathematics Supplement, form X, for Grade 6 for Hall School and Three Comparative Title I Schools

		Pretest		Posttest		Grade
School	N	Mean R.S.	Grade Equiv.	Mean R.S.	Grade Equiv.	Equiv. Gain
Hall	44	11.5	4.7	16.4	5.6	0.9
School A	32	15.2	5.4	20.5	6.2	0.8
School B	63	12.6	4.9	15.3	5.5	0.6
School C	85	13.8	5.2	17.4	5.7	0.5

In terms of grade equivalents, Hall School's gain of .9 was better than the other three comparable schools.

Comparison Between the Iowa Modern Mathematics Supplement Test Items and the IPI Continuum

Proponents of the IPI system have contended that standardized tests, such as the Stanford and ITBS, do not adequately measure the particular skills taught in the IPI math program.[8] The chief criticism of a norm-referenced test is that while there is a wide variety of such tests which cover broad areas of content, none are appropriate to any one specific

8 "The Application of a Model for Deriving More Meaning from Standardized Test Results," a working paper from the Learning Research and Development Center, University of Pittsburgh, February, 1968.

curriculum. The score a student receives on these normative tests may have little or no relation to his actual performance in his own curricula. What is needed is a criterion-referenced test which reflects the degree to which an individual's achievement corresponds to some desired criteria. It was decided to attempt a procedure for providing criterion-referenced scores from the norm-referenced Modern Mathematics Supplement. The procedure, similar to that suggested by staff members of the Learning Research and Development Center at the University of Pittsburgh, involved three basic steps.[9]

1. Precise specification of the curriculum objectives and a determination of each child's level of acquisition of these objectives.

2. A comparison of each item on the ITBS Modern Mathematics Supplement with the IPI math objectives.

3. Rescoring each child's Modern Mathematics Supplement test in accordance with his level of achievement in the IPI curriculum.

Step 1 presented no problem, because the objectives in the IPI math program are carefully specified and sequenced into a continuum. At any point in time it is easy to identify the child's exact position in the continuum. This information was obtained on each fifth and sixth grade child at the time he took the posttest of the Modern Math Supplement.

Step 2 required that each Supplement test item be examined for content and difficulty in order to compare them with the IPI objectives. A rather extensive procedure involving five independent raters was used to make this comparison. Because the Supplement was given only to children in grades 5 and 6, only items 31-96 were rated. Children in grade 5 worked items 31-72; children in grade 6 worked items 52-96.

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9 <u>Ibid</u>.

The first phase of the comparison involved independent ratings by a member of the Research Division staff of the Minneapolis Public Schools and a floating teacher in the IPI program at Hall Elementary. Where these two persons agreed, the item comparison was accepted. There were a number of items, however, which one rater felt was covered by the IPI continuum while the other rater did not. These items, plus others, where the first two raters agreed on level and topic but not skill number, were submitted to the IPI Project Director at Hall School. He rated these items, and if his comparison agreed with one of the first two raters, the comparison was accepted.

Sixteen items on which the first two raters had disagreed, on which the Project Director did not agree with either of the first two ratings remained. These items were sent to RBS where two staff members independently rated the items. This procedure resulted in a total of four or five ratings on each of the 16 items. Where there were four ratings, three had to match for the comparison to be accepted; where there were five ratings, four had to match.

Nine items remained on which consensus could not be reached. These items were not used in the analysis of test data. A summary of the comparison appears in Table 11.

Table 11
Summary of Comparison Between Items on the ITBS Modern Mathematics Supplement and the IPI Math Skills Continuum

	No.	% of Total
Total number of Modern Math Supplement items rated.	66	100%
Number of Supplement items included in the IPI continuum.	46	69.7
Number of Supplement items not included in the IPI continuum.	11	16.6
Number of Supplement items on which agreement was not reached.	9	13.6

A detailed listing of the ratings on individual items from the Modern Math Supplement appears in Appendix C. The majority of the items (65%)

tested objectives found in Levels D, E, and F of the IPI continuum.

Step 3 involved rescoring the Supplement posttest for each child, taking into account where the child was working in the continuum at the time he took the test. This resulted in two scores for each child. The first score was based on those items which tested objectives the child had studied during the school year, that is, a score on the items he was expected to know. The second score was based on the remainder of the test, which included items testing objectives beyond the child's present level of achievement or which tested objectives not included in the IPI continuum.

For example, one boy in the 5th grade was working on the fifth skill in Level E-Systems of Measurement at the time he took the Modern Math Supplement in early May. Since the child was at that point in the continuum, the assumption was made that he would correctly answer those items on the Modern Math Supplement which tested objectives included in the IPI continuum up to that point. An examination of the item comparisons revealed that there were 18 Supplement items which tested skills the boy had either studied during the school year or which he had passed on an IPI diagnostic test. Those 18 "expected" items were scored separately. A score was also obtained on the other 21 "not expected" test items. (The nine Supplement items on which no agreement was reached by raters were not scored.) The boy correctly answered 11 of the 18 expected items, or 61%. On the remaining 21 "not expected" items, he answered 6 correctly, or 29%.

A similar procedure was followed for all fifth and sixth grade students. Some children started at a very low point in the continuum, at Level B or C. Even though they may have made substantial progress during the year in terms of number of skills mastered, they still were not expected to know many items on the Supplement, because most of the items tested skills in Levels D, E, or F. In grade 5 there were three children, and in grade 6 there was one child who, according to their position in the IPI continuum, were not expected to know any of the Supplement items. These children were not included in this particular analysis. In addition, there were four fifth graders and six sixth graders who were expected to know only one Supplement item. These children also were eliminated from the analysis because their percent correct on expected items would be either 0% or 100%. Sixty-nine children in grades 5 and 6 were included in the analysis.

The percent correct on the "expected" and "not expected" items was computed for each of these 69 children. The Kolmogorov-Smirnov Two-Sample Test (Siegel, 1956)[10] was applied to the cumulative frequency distributions of the "expected" and "not expected" items. This test is concerned with the degree of agreement between the two distributions. The distributions were shown to be significantly different at the .025 level. On the average, the children correctly answered half of the "expected" items and only a third of the "not expected" items.

The Kolmogorov-Smirnov Test also was applied to two distributions based on the Supplement test items themselves. For each test item, a tabulation was made of the number of children who were expected to answer the item correctly, i.e. the number of children who had studied the IPI skill which the item tested. Then the number of these children who got the item correct on the posttest was noted, and a "percentage correct" computed. The same procedure was repeated on each test item for those children who were not expected to get the item correct.

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10 Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences, New York: McGraw-Hill, 1956, pp. 127-136.

(It has been noted that the fifth graders took items 31-72 on the Supplement, while the sixth graders took items 52-96. Thus, items 52-72 were completed by both grades. The percentages for items 31-51 were computed on the basis of fifth grade children only, for items 52-72 on the basis of fifth and sixth grade children combined, and for items 73-96 on the basis of sixth grade children only. There were 38 items out of the total 66 items which no children were expected to answer correctly and there were two items which every child was expected to know.)

When applied to the two cumulative frequencies (the percentages of children expected to know each item who got it correct, and the percentages of children not expected to know each item who got it correct), the Kolmogorov-Smirnov test showed a difference significant at the .001 level. This difference was in favor of the percentages of children expected to know each item who did get it correct. On the average, about half the children expected to know an item got it correct. Slightly less than a third of the children who were not expected to know an item got it correct.

The import of this analysis is that greater credence can be given to IPI claims. Test items which actually measure what IPI claims to have in its program show that children are learning these things in better fashion than they are learning things which IPI does not claim to teach, or which it does not claim to teach at this level.

Summary

Standardized mathematics achievement tests were used at grades 4, 5 and 6 to evaluate student progress with the IPI materials. Table 12 summarizes results.

The grade equivalents and percentiles, based on a national sample used by the test publisher as a norm group, indicate students at Hall School were below grade level on the pretest and the posttest. For example,

Table 12
Grade Equivalents and Percentiles on Standardized Achievement Tests for Grades 4, 5 and 6

Grade and Test	Pretest Sept. 1969 Grade Equiv.	Pretest Sept. 1969 %ile Rank	Posttest May 1970 Grade Equiv.	Posttest May 1970 %ile Rank	Equiv. Gain
Grade 4					
Stanford Diagnostic Arithmetic, Concepts of Numbers	2.4	8	3.3	NA	.9
Stanford Diagnostic Arithmetic, Computation	3.0	4	3.4	NA	.4
Grade 5					
Iowa Tests of Basic Skills, Modern Mathematics Supplement	3.9	17	4.6	22	.7
Grade 6					
Iowa Tests of Basic Skills, Modern Mathematics Supplement	4.7	16	5.6	24	.9

NA=Not available

on the Stanford Concepts of Numbers test, fourth graders were at grade 2.4 on the pretest and at grade 3.3 on the posttest. The difference between 2.4 and 3.3 represents a gain of nine months (.9) between pretest and posttest. The gain is equal to the gain expected by the average student in the publisher's sample. At grades 4 and 6, Hall students gained close to a year in terms of grade equivalents on at least one measure of mathematics achievement. At grade 4, however, computation skills appeared to be lagging.

Although the Hall students need an average gain of more than one year during each school year to catch up with the average student throughout the country, the students at Hall did gain more than was expected for students who started at their achievement level. Students who are behind grade level are not expected to make the grade equivalent gains shown by the Hall students. These larger-than-expected gains are indicated by the higher posttest percentile ranks than pretest percentiles on the ITBS Modern Mathematics Supplement at grades 5 and 6.

Statistical analyses revealed no consistent differences in gains made by boys and girls. Students with good attendance made slightly higher, but not significant gains at each grade level than did poor students with poor attendance. No differences in gains for different classrooms were found in grades 5 and 6, but in grade 4, teacher A students had significantly higher gains than teacher B students in Computation scores, but not in Concepts scores. This difference could not be attributed to basic differences in students since the differences which did exist appeared to favor teacher B students.

Reading difficulty level of the ITBS, Modern Math Supplement was tested and did not appear to be a major factor for fifth and sixth graders. Students who had the test read to them scored slightly, but not significantly, higher than students who did their own reading.

Compared with three Minneapolis target schools with similar student populations, the sixth graders at Hall School made greater gains on the ITBS Modern Mathematics Supplement from September to May.

	Pretest Grade Equivalent	Posttest Grade Equivalent	Grade Equivalent Gain
Hall	4.7	5.6	0.9
School A	5.4	6.2	0.8
School B	4.9	5.5	0.6
School C	5.2	5.7	0.5

An analysis of instructional material covered showed that the average number of units of IPI material completed by the students (10-15 units) was equivalent to one grade level of work. The average completion of one grade level's work is significant in that the student must reach a criterion level of 85% correct to advance to the next unit of instruction.

A comparison was made between the items on the Modern Mathematics Supplement and the skills covered in the IPI materials. For each fifth and sixth grader, a comparison was made between the test items the child was expected to know (he had studied the related IPI skills), and items he was not expected to know (he had not studied the related IPI skills). The children knew significantly more of the expected items than the not-expected items.

The next chapter describes reactions of students, teachers, and teacher aides to the program.

Chapter 4. Results-Reactions

Preview

Chapter 4 describes the reactions of students, teachers, and teacher aides to the IPI project. Mathematics appeared to increase in popularity for the children. Nine of ten teachers and five of six aides had generally favorable reactions to the project. Aides reported a need for improved communications with their supervisors.

Subject Preferences of Students

Children in grades 2-6 were asked to identify their three favorite school subjects in early October and again in mid May. Each child received a list of subjects which included social studies, spelling, math, music, gym, reading language, science, and art. He was instructed to place the numeral 1 by his first choice, 2 by his second choice, and 3 by his third choice. Responses were anonymous. Results were tabulated for each grade, and appear in Table 13. A single rating for each subject area was obtained by assigning a value of 3 points each time the subject was selected as a first choice, 2 points each time it was selected as a second choice, and 1 point each time it was selected as a third choice.

The results show considerable gains in the popularity of math in the lower grades, particularly in grades 2 and 4 where it moved up three positions in the ranking of favorite subjects. In both grades 2 and 3, math was preferred over gym and art in the spring of the year, an admirable achievement for any academic subject.

In grade 5 and 6, math did not change its position, ranking third after gym and art in both the fall and the spring. This suggests

Table 13
Ranking of Subject Preferences
by IPI Students in Grades 2-6
in October 1969 and May 1970

	Ranking by Grade									
	2		3		4		5		6	
Subject	Oct.	May	Oct.	May	Oct.	May	Oct.	May	Oct.	May
Math	3	1	3	1	4	2	3	3	3	3
Art	2	3	2	3	1	1	1	2	2	2
Gym	1	2	1	2	2	3	2	1	1	1
Language	4	7	6.5	8	8	8	6	7	8	8
Reading	5	4.5	4	5	5	5	5	6	5.5	7
Science	8	6	6.5	7	3	7	7	4	5.5	4
Social Studies	6	8	8	6	7	6	8	8	7	6
Spelling	7	4.5	5	4	6	4	4	5	4	5

[a] Music was included in the list of subjects given to the children in October, but inadvertantly left off the list given to the children in May. Therefore, music was also excluded from the fall ranking.

several possibilities. Math may already have been a popular subject with the children. Or perhaps the younger children, having been exposed for fewer years to the more traditional approach, adapted more easily to the new system. Another factor to consider is that the fall ranking was made in early October, after the children had already been using IPI for a full month. The older children may have, in fact, reacted more quickly to the new system and may have already changed their views toward math by October.

The popularity of IPI math was also demonstrated when a six-week summer class was offered to the Hall School children. Within a week of the announcement of the class, over 50 children had voluntarily signed up, with the consent of their parents. The summer class limit was 60. Several non-IPI classes were hard pressed to meet a minimum quota of 15 children.

Teachers' Reactions

The 10 regular classroom teachers in grades 2-6 completed an evaluation questionnaire in May 1970. A copy of the questionnaire appears in Appendix D . Generally, the teachers were enthusiastic about the math program. Nine teachers felt that, all in all, the program was "very worthwhile." Eight teachers indicated that they thought most children learn more under IPI than in other math programs, and nine teachers said they would prefer to continue using IPI math materials. When asked to rate IPI compared to other math programs, four called it "much better than any other program," three rated it as "better than some," and one person felt it was "no better or worse than any other." Three teachers had not used other math programs. All but one expressed interest in trying IPI materials in other subject areas. Spelling was the most common request, followed by social studies and handwriting.

Teachers were asked to comment on changes which they had observed in the childrens' general behavior. Among the comments, two teachers mentioned increased enthusiasm for math and four teachers mentioned positive changes in social behavior, such as moving about the room in a more orderly fashion, taking better care of games and materials, and generally acting "more adult." One teacher felt that because of success in IPI, several children improved in all other academic areas but, two teachers were more cautious in their remarks. One stated that the childrens' attitudes had fluctuated up and down, but they generally liked the program quite well. Another teacher remarked that some children liked it very well and really became absorbed in the work.

Six teachers were aware of some positive parental reaction to the program. The most commonly heard remark from parents concerned their childrens' increased enthusiasm for math.

Several problems were brought out. Two teachers noted that some children did not function well in the individualized setting and either became behavior problems or required constant help and direction.

Teachers were asked to specify children whom they thought "would have benefited more from a traditional approach than IPI." Three teachers checked "children with emotional problems." One each listed fast learners, boys, very slow learners, children with discipline problems and non-readers.

One upper grade teacher, who had taught more than four years, felt that there had been "a breakdown in the general behavior," because "this particular group cannot work in such a free choice atmosphere." This teacher felt that many children chose to do as little as possible, and reported that it was a problem getting the children to "settle down to work" after IPI. She suggested letting the upper grades choose between IPI and a conventional approach with textbooks.

Six teachers felt that there had been "some positive carryover" from IPI into other subject areas. Half of these people mentioned vocabulary words as the most important carryover. Other responses were map reading, design and shape in art, and following directions.

With respect to physical arrangements for the program, 9 teachers stated that they were adequate or good. One felt they were poor, suggesting that all the children go to a special large room for IPI instead of working in self-contained classrooms. Another teacher requested more space for small group work, while a third suggested that disruptive children should go to the IPI office to work.

Half of the teachers felt the program had been staffed appropriately in terms of the right kind and right number of people. The other half felt there was some room for improvement. The most common request was for more aides to help with group work and to assist the slow learners. In general, teachers felt that communication among staff members was adequate. The three teachers who saw a need for improved communication suggested that the roles of each staff member should be clearly defined each fall; they requested more frequent teacher meetings.

Two questions attempted to assess the teachers' view of their role in the IPI program compared with that in a conventional math program. Two teachers said that teaching under the IPI system made them "feel more like a professional teacher." Both expressed the feeling that they were more aware of each child's needs and better able to give the individual help needed. Two others said they felt "less like a professional teacher."

One of these teachers said she could plan more definitely with the youngsters under a conventional program; the other felt she was subservient to the material. The remaining teachers stated that they felt no different about their professional status than before.

A number of suggestions were offered for improving the inservice training. The most common suggestion was to do much more actual writing of prescriptions for groups of children, and to observe staff members working with children in all aspects of the program. Another frequent request was to acquaint teachers with all the manipulative aids. A strong plea also was made for greater use of a wider variety of aids in the classroom. Three people suggested bringing in teachers who had used IPI to help explain the system.

The three first grade teachers also completed the questionnaire, although only a few children from each of their classes participated, and then only from January through the end of the school year. All three expressed concern over the level of vocabulary and reading skills necessary for IPI. They felt more teacher aides would be needed in their rooms to assist non-readers if all first graders participated. They noted that children who did participate appeared enthusiastic about the program, and two of the teachers asked that all first graders participate the next year.

Generally the teachers liked the IPI math project, although they had some specific suggestions for improvement. Here are some of the teachers' comments:"

- You become more aware of the problems of the child in IPI.
- I would like to see less paper work with the teacher aides. I would like the aide to assist in the room during math most of the time.

- There are many exciting and interesting things to do in math which don't get touched in IPI. I would have liked to choose ways to present topics which I felt were poorly presented in IPI.

- Once again - smaller classes here, more help in the classroom, more time to prepare are absolute necessities to make it work well.

- I feel I am adequately helping more children more often and that the degree of failure and frustration of the children is far less.

- In IPI our role is that of meeting the individual needs of each student each day. This would be a much harder role to fill in a conventional program.

- I feel the program could best be improved by the addition of more prepared supplementary and review materials, and by a series of manipulative materials directly connected with skill levels.

- I felt I was truly teaching math for the first time. I am more than pleased with the program--and excited about the results. My children as a whole express the same enthusiasm.

- I really feel a sense of achievement in math and I think the children feel the same. It took but a small effort and a little interest to make it work.

Teacher Aide Reactions

The six IPI aides at Hall School completed a short questionnaire toward the end of the program. A copy of the questionnaire appears in Appendix E . In general the aides were quite positive in their attitude toward both the IPI math program and their jobs.

Five of the six aides felt that "most children learned more under IPI than in other math programs," and four of them felt that, all in all, the program had been "very worthwhile." When asked to comment on changes in the children's behavior, four aides indicated positive changes. (Two of them said that the children seemed to have a more positive attitude toward math, while another mentioned that students seemed to take pride in mastering the units. One aide mentioned increased enthusiasm, which she felt was due to the fact that "nothing was too hard.") The fifth aide felt that no changes had occurred, and the sixth aide did not respond to the question.

Several questions dealt with the role of the aide in the IPI program compared with the job of a regular classroom aide. Five aides felt that their jobs resulted in more contact with the children, and that they were assuming more responsibility than regular classroom aides. The IPI aide felt her job was more satisfying and more rewarding because of seeing the children do things they were capable of doing. It made her feel "a little more important." Five aides said they would recommend to a friend that she work with IPI instead of in a regular classroom.

All the aides felt that the IPI program required closer working relationships between themselves and their supervisors than in a regular classroom situation. While there also was unanimous agreement that the program was "staffed appropriately" in terms of the right kind and the right number of people, four aides mentioned some concern about the quantity or quality of the communication between staff members. A recurring comment was the need for more meetings to "get things out in the air."

Five aides rated their inservice training as "fairly adequate, while the sixth thought it was "very adequate." Reaction to the aides' training manual was mixed. Several aides requested more involvement of children in the training program, observing other staff members working with children, and actually working with a "sample student" themselves.

The teacher aides apparently had less contact with parents than did the teachers during the school year. Five aides were not aware of any parental reaction to the IPI program, while the sixth said that several parents mentioned that their children seemed more interested in math.

Chapter 5 presents recommendations based on the evaluation results.

Chapter 5. Recommendations

1. Continue the project! Changes in achievement and attitudes warrant further exploration.

2. Continue to increase the diversity of supplementary materials, particularly manipulative devices, available for use. Key the supplementary materials to the appropriate skills. Introduce the classroom teachers to all the supplementary materials at an early inservice meeting. Periodically bring the teachers up to date on new supplementary materials as they are introduced into the program.

3. Use actual groups of children as much as possible during the inservice training for new teachers and aides. Provide teachers with more practice in writing actual prescriptions for individual children. Reduce the training session from eight to five days.

4. Schedule at least one staff meeting per month, including all teachers and teacher aides at each meeting. During the first month of school, weekly meetings may be desirable, especially for new teachers. Encourage staff members to communicate with the coordinator on problems or questions, so that these may be discussed at the staff meetings. When requested, schedule meetings for subgroups of the total staff, such as aides, intermediate grade teachers, primary grade teachers, new teachers, etc.

5. Include as many first grade children in the program as possible. "Transfer" individual children into the IPI program as soon as they are ready. Investigate the possibility of developing a vocabulary

unit on the most common words and phrases used in the beginning levels of IPI. This unit might help to increase the number of first graders who could operate successfully within the system.

6. Continue the practice of specifying one day per week as Visitor's Day. Limiting visits, for example, to Wednesday, will minimize disruptions of the program.

Recommendations for the Second and Third Year Evaluations of IPI at Hall

1. Do not use the Stanford Diagnostic Arithmetic Test. It is very long, and a number of children simply refused to complete it.

2. If standardized test results are desired, use the ITBS Modern Mathematics Supplement in grades 4, 5, and 6. It was found that many children in grades 5 and 6 who took the test during 1969-70 were not expected to know more than one or two items, according to their position in the IPI continuum. The test really did not measure the achievement of these children. Including the test items designated for the next lower grade level would be helpful. For example, children in grade 4 would start with the test items designated for grade 3; children in grade 5 would start with the test items for grade 4; etc.

3. Include the Minneapolis Arithmetic Test for grades 4 and 6. This test provides basic computation items, which are not present on the Modern Mathematics Supplement. It does not require reading.

4. Investigate reasons for differences in achievement in computation between students in different classes.

5. Omit separate reading-non reading instructions for test administration.

Appendix A

Sample Pages from IPI Mathematics Continuum

	level A	level B	level C	level D
NU[illegible]N	1. Counts orally from 1 to 10. 2. Reads numerals 1-10. Left to right. 3. Number sequence 1-10, number relations. 4. Identifies, orally-written, cardinal numbers, concept of set. 5. Counts orally a set 1-10 objects. 6 Writes numerals from 1-10. 7. Written numbers 10 objects—ordered. 8. Understands concept of (0) zero. 9. Vocabulary skills — before, after, smaller, larger, etc.	1. Reads number words orally, matches them with numerals, 0-10. 2. Reads numerals 0-100, counts orally 1-100. 3. Connects dots by 1's to 100, plays number trail game. 4. Counts orally by 10's to 100. 5. Writes numerals 1-100 sequentially. Writes numerals sequentially backward or forward for small blocks of numbers. 6. Identifies cardinal number of a structured group to 100. 7. Identifies number before or after a given number or between 2 numbers to 100. 8. Identifies relative magnitude of numbers in a group of 2 or 3, to 100. Uses > or < between 2 numbers to indicate greater or lesser. 9. Identifies ordinals through tenth.	1. Reads and writes numerals to 200 in positive or reverse sequential order. 2. Reads or writes short sequences backward or forward from any point to 200. 3. Identifies number before or after a given number, or between 2 numbers to 200. 4. Skip counts backward/forward by 10's. Limit 200. 5. Skip counts backward/forward by 5's. Limit 200. 6. Skip counts backward/forward by 2's. Limit 200. 7. Mixed skip count exercises, backward/forward by 2's, 5's, 10's. Limit 200.	1. Reads & writes numbers to 1000. Reads & writes short sequences backward or forward. 2. Skip counts by 3's to 1000 backward or forward. 3. Skip counts by 4's to 1000 backward or forward. 4. Converts decimals to fractions & words. Vice versa. Fills in number line. Tenths. 5. Converts decimals to fractions & words. Vice versa. Hundreths.
PLACE VALUE			1. Identifies place value of the units, 10's, 100's to 200. 2. Writes cardinal number for structured decimal groups to 200. 3. Writes number as — hundreds, — tens, — units and in expanded notation using +. Limit 200. 4. Uses > <. Limit 200. 5. Writes numbers to 200 in columns for units, tens and hundreds. Limit 200.	1. Identifies place value of 1's, 10's, 100's, 1000's in words or numbers. 2. Uses >, < to 1000. 3. Writes number before or after a given number or between 2 numbers to 1000. 4. Writes numbers in expanded notation. To 1000. 5. Regroups, renames numbers for borrowing/carrying. 6. Add & subt. problems related by multiples of 10. 7. Writes decimals in expanded notation. Words, fractions, decimals. 8. Identifies place value of decimals, words, fractions, decimals. To hundredths. 9. Place value chart. Decimals. To hundredths.
ADDITION	1. Associates objects in a 1 to 1 relationship. Equivalent-non equivalent groups. 2. Manipulates objects to illustrate a[illegible]d. subt. facts through 6.	1. Writes number of objects in 2 sets separately & combined. Sums to 12. 2. Circles numeral-pictured addition. 3. Identifies +, −, =. 4. Makes true number sentences using "+", "−", "=". Fills in missing sums and addends. 5. Mastery +, −, from 0 to 10. 6. Selects other names for numbers. 7. Places "=" or "≠" in true or not true statements. 8. Use of commutative principle (+). 9. Completes addition and subtraction sentences within number families. 10. Solves 1-step word problems. 11. Vocabulary skills.	1. Use of associative principle, sums to 12. 2. Using expanded notation adds 2 numbers. Sums to 20. 3. Sums 2 or 3 numbers, no carrying. 4. Uses >, <, or = between addition expressions. Sums to 18. 5. Work[illegible] column addition — 3 or more addends, sums to 20.	1. Mastery sums thru 20. Timed test 2. Column addition 2 addends, 3 + digits. No carrying. 3. Finds missing addends. 3 single digits. Sums thru 20. 4. Uses words sum, addend — labels part. 5. Adds carrying to 10's using 2 digit numerals, 2 or more addends. To 200. 6. Adds, carrying to 10's/100's, using 3 digit numerals, 2 or more addends. To 2000. 7. Adds, carry 10's, 100's using 3 digit numerals, 2 or more addends. To 2000. 8. Finds sums, column addition. Using 3 or more addends of 1 digit. To 50.

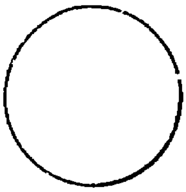
level E	level F	level G	level H	level I
1. C[illegible]s, writes to 1,000,000, any [illegible]nt. 2. Identifies odd-even numbers. States, uses *rules for addition, subtraction,* multiplication 2 numbers. 3. Rounds numbers to 10's, 100's, for comparison and estimating answers in sample word problems. 4. Gives numeral for 2, 3, 4 place number written in words, writes 2, 3, 4 place number in words. 5. Writes decimal fractions for common or mixed fractions of 10 or 100 denominator — vice versa. 6. Number words for mixed decimals to 1000ths. Vice versa. 7. Converts decimal fractions (to thousandths to other forms). 8. Orders mixed & pure decimals. To 100.-001.	1. Rounds numbers to nearest thousands, ten thousands, millions, for estimating answers. 2. Writes numerals for a 5, 6, or more place number, writes words. 3. Locates prime numbers to 100 on a chart.	1. Tests any number to determine if it is prime or composite. 2. Finds prime factors of given #. 3. Identifies numbers possible in base 5. Multiple choice questions about characteristics. 4. Writes base 5 numbers in expanded base 5 and 10. 5. Converts base 10 number to base 5. Vice versa. 6. Locates, writes negative numbers on number line, thermometer. 7. Illustrates use of negative numbers. 8. Writes numbers in scientific or other exponential notation. Positive powers.	1. Identifies numbers in base, 3, & 8. Changes numbers to base 10 and vice versa. 2. Adds and subtracts 1 & 2 digit numbers in base 2, 3 & 8 using expanded notation. 3. Adds and subtracts 1 & 2 digit numbers in base 2, 3, & 8 without expanded notation. 4. Identifies and uses the commutative principle for adding one and two digit numbers in base 5. 5. Identifies and uses the associative principle for adding more than 2 numbers (1 and 2 digits) in base 5. 6. Solves 1-step word problems which require adding and subtracting 1 and 2 digit base 5 numbers.	1. Identifies which numbers can appear in a base three, six, or seven system; writes numbers in the base in expanded notation; changes numbers written in base ten notation to numbers in this system and vice versa. 2. Adds and subtracts with one and two digit numbers using expanded notation in base three, six, or seven. 3. Adds and subtracts one and two digit numbers without using expanded notation in bases three, six, or seven. 4. Identifies and uses the commutative principle for adding one and two digit numbers in base three, six, or seven. 5. Identifies and uses the associative principle for adding one and two numbers of one or two digits in base three, six, or seven. 6. Solves one-step word problems which require adding and subtracting one and two digits in base three, six, or seven. 7. Uses repeated addition to solve multiplication problems in base three, five, six, or seven. 8. Solves multiplication problems with a number line for numbers in base three, five, six, or seven. 9. Completes a multiplication matrix for basic facts in base three, five, six, or seven. 10. Does multiplication of a one digit factor times a one or two digit factor for base three, five, six, or seven (may refer to above multiplication matrix).
1. Identifies place value digits to 1,000,-000. 2. Writes numbers to 1,000,000 in expanded notation, words/numbers "+" signs. Place value chart. 3. Uses > or < to 1,000,000. 4. Uses multiples of 10 to generalize multiplication and division facts. Uses factors to 5x10. 5. Identifies place value of mixed decimals to 1000ths. 6. Writes decimal as whole number plus sum of decimal part to thousandths place. 7. Place value chart for mixed decimals to 1000.001.	1. Place value chart for 4 + digit #'s. 2. Writes 10 as a power. Identifies the base and exponent or power *of a term.* 3. Writes number with 1 non-zero digit as a whole number < 10 times a power of 10, i.e., 7×10^3. 4. Writes a number, 1 thru 9 multiplied by itself a number times in exponential form. 5. Reads and charts decimal numbers to millionths.	1. Makes place value charts in base 5 and 10 to compare systems. 2. Makes decimal place value chart with positive exponents. Fractions instead of negative exponents. Limit 10^9.	1. Makes place value chart in base 2, 3 & 8 for comparison with base 10.	
1. Column addition, no carrying, 3 or more digit numbers, more than 2 addends. 2. *Uses commutative principle of addition.* 3. Uses associative principle for addition to add 2 or more place numerals. 4. Adds with carrying for 4 or more place numerals with 2 addends. 5. Adds 2 mixed numbers to thousands *(whole no.'s) and hundredths (decimals).* 6. Solves multiple-step word problems.	1. Adds — carrying 4 or more place numbers, more than 2 addends. 2. Adds, 2 or *more numbers with* whole number parts and decimals to the millionths.	1. Adds 2 negative numbers, uses number line or thermometer. 2. *Adds negative and positive numbers.* Uses number line or thermometer. 3. Adds any 2 numbers which are multiplied by the same base to the same positive power.	1. Adds all combinations of negative and positive numbers (more than 1 digit) *without using a number line.* 2. Writes small whole numbers or decimal numbers in scientific notation using negative powers of bases 2 thru 10. Adds 2 numbers which are multiplied by the same base to the same negative power. 3. Adds numbers with decimal parts to the thousandths place or more.	

level 1 continued on page 5

Appendix B

Sample Pages from Standard Teaching
Sequence (STS) Booklet for
Fractions, Level C, Skill 1

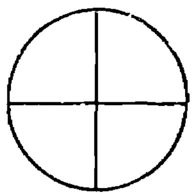
Fill in the blanks.

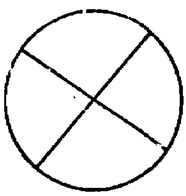


This is a circle.

This circle is divided into

__4__ equal parts.





This circle is divided into how many

equal parts? ______

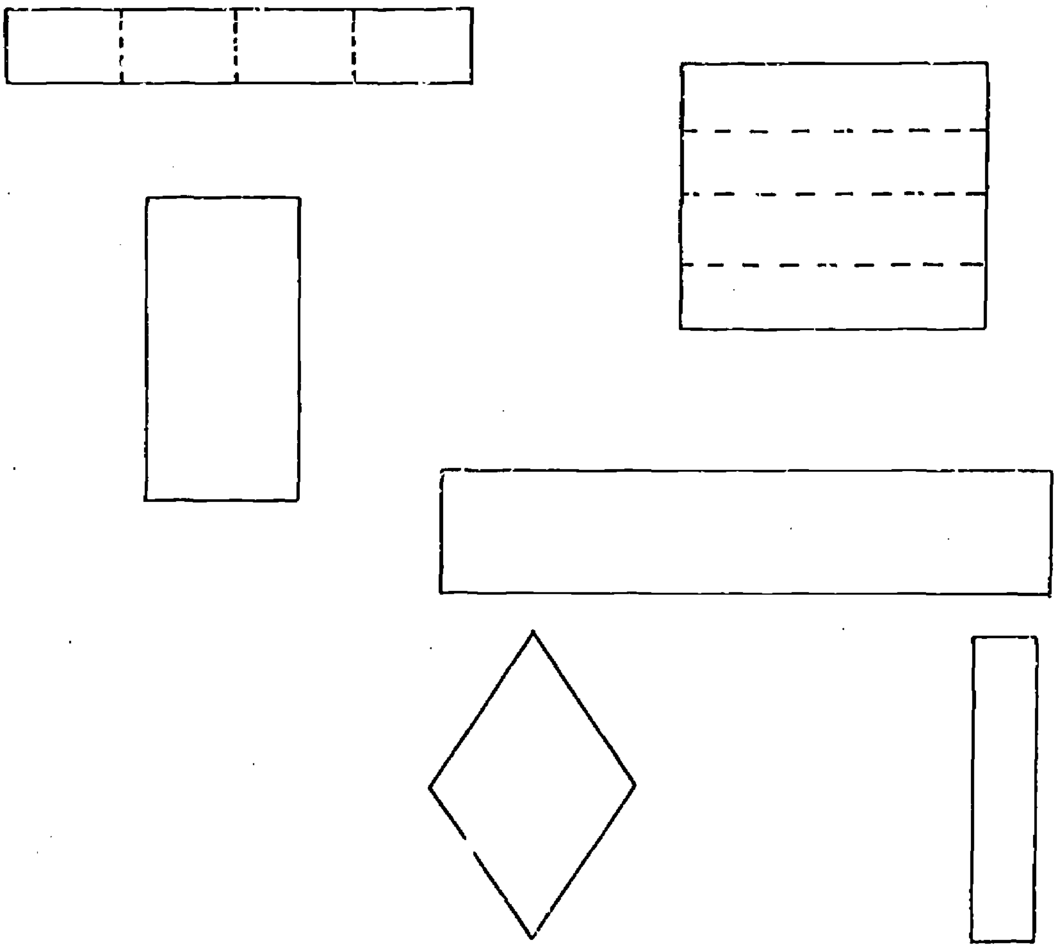
When an object is divided into 4 equal parts, we say the object is divided into fourths.

This box is divided into how many

equal parts? ______

When an object is divided into 4 equal parts, it is divided into fourths.

Divide the objects below into fourths.



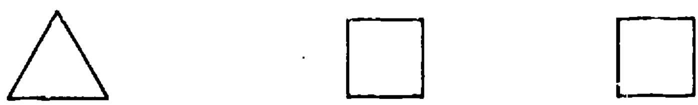
All these objects are now divided into equal parts.

They are divided into ________.

CET I

TL. PTS.	
8	100%
NO. OF PTS.	%
7	88
6	75
5	63
4	50
3	38
2	25
1	13

Divide the figures into the parts named.



halves　　thirds　　fourths

fourths　　halves

Mark each figure in the row that matches the word.

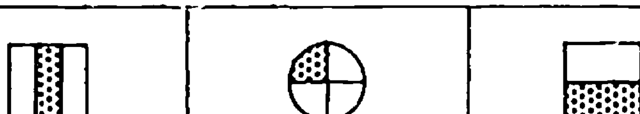
thirds

halves

fourths

Ring the fraction.

TL. PTS.	
3	100%
NO. OF PTS.	%
2	67
1	33



$\frac{1}{3}$ $\frac{1}{2}$ $\frac{1}{4}$	$\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$	$\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$

LEVEL	UNIT	SKILL	PAGE
C	08	1	10

Appendix C

Comparison of Items on the ITBS Modern Mathematics Supplement, Form X with Skills in the IPI Mathematics Continuum

Supplement Item Number	CORRESPONDING IPI SKILL: Research Staff Member	IPI Floating Teacher	IPI Project Director	RBS Staff Members		Decision
31	- - -	D-Frac-4	D-Frac-4			D-Frac-4
32	D-PV-1	D-PV-1				D-PV-1
33	D-Mult-4	D-Mult-4				D-Mult-4
34	F-Frac-8 D-SOM-5	D-SOM-5	D-SOM-5			D-SOM-5
35	D-COP-4	D-COP-4				D-COP-4
36	E-SOM-1	E-SOM-1				E-SOM-1
37	E-Div-4	E-Div-1	E-Div-4			E-Div-4
38	E-Frac-1	D-Frac-1	E-Frac-1			E-Frac-1
39	F-Div-8	F-Div-8 F-COP-4	F-Div-8			F-Div-8
40	E-Add-4	E-Pv-3	E-Add-4	D-Sub-2	E-Num-1	DISAGREE
41	D-Div-3	E-Div-1 D-Div-2,3	D-Div-3			D-Div-3
42	- - -	E-Mult-5	- - -			- - -
43	- - -	D-Money-4	- - -			- - -
44	- - -	F-COP-3	F-COP-3			F-COP-3
45	E-Mult-3	E-Mult-3				E-Mult-3
46	F-Frac-1	D-Frac-4	D-Frac-4			D-Frac-4
47	G-Geom-1	E-Geom-4	G-Geom-1			G-Geom-1
48	F-Geom-2	D-ST-3		F-Geom-2	F-Geom-2	F-Geom-2
49	D-PV-5	E-Add-3		D-PV-5	D-PV-2	DISAGREE
50	E-Mult-6	E-COP-4		E-Mult-6	E-COP-4	DISAGREE
51	- - -	- - -				- - -
52	E-PV-2	E-PV-2				E-PV-2
53	D-Frac-5	D-Frac-5				D-Frac-5

Supplement Item Number	CORRESPONDING IPI SKILL: Research Staff Member	IPI Floating Teacher	IPI Project Director	RBS Staff Members		Decision
54	C-Add-4	E-Add-3	C-Add-4	D-COP-5	E-COP-4	DISAGREE
55	- - -	E-COP-2,4,6,7	E-COP-2,4,6,7			E-COP-2,4,6,7
56	D-Mult-7	D-Mult-7				D-Mult-7
57	C-ST-3	D-Add-3		E-COP-2	D-Sub-4	DISAGREE
58	E-ST-2	D-SOM-1		E-ST-2	E-ST-2	E-ST-2
59	E-Mult-4	E-Mult-3	E-Mult-4			E-Mult-4
60	C-Add-5	E-Add-3	E-Add-3	C-Add-5	D-Add-3	DISAGREE
61	- - -	E-COP-6	E-COP-6			E-COP-6
62	- - -	F-Geom-6	F-Geom-6			F-Geom-6
63	F-Frac-1	F-Frac-1				F-Frac-1
64	E-Geom-6	E-Geom-6,7	E-Geom-7			E-Geom-7
65	E-Frac-4	E-Frac-4				E-Frac-4
66	E-Frac-4	E-Frac-4				E-Frac-4
67	G-ST-2	G-ST-2				G-ST-2
68	- - -	D-Geom-2	- - -			- - -
69	- - -	D-SOM-5	D-SOM-5			D-SOM-5
70	- - -	D-Frac-4	- - -			- - -
71	F-Geom-2	F-Geom-2				F-Geom-2
72	F-Mult-3	F-Mult-3				F-Mult-3
73	F-Frac-1	E-Frac-8	F-Frac-1			F-Frac-1
74	E-Num-3	E-Num-3				E-Num-3
75	F-Frac-4	E-Frac-4,5	F-Frac-4			F-Frac-4
76	E-Num-5	E-Num-6	E-Num-5			E-Num-5

Supplement Item Number	CORRESPONDING IPI SKILL Research Staff Member	IPI Floating Teacher	IPI Project Director	RBS Staff Members		Decision
77	- - -	E-Mult-5 F-Mult-3	- - -			- - -
78	E-Frac-4	E-Frac-4 F-Frac-4,5		E-Frac-5	E-Frac-4	DISAGREE
79	F-ST-1 D-SOM-1	D-Frac-2 D-SOM-1		F-ST-1	F-ST-1	F-ST-1
80	E-Frac-4	E-Frac-4				E-Frac-4
81	- - -	F-Geom-5	- - -			- - -
82	E-COP-2	D-COP-5		E-COP-2	E-COP-2	E-COP-2
83	F-Frac-10	E-Frac-4	F-Frac-10			F-Frac-10
84	C-Geom-1	D-Geom-3	D-Geom-3	D-Geom-3	D-Geom-3	D-Geom-3
85	- - -	E-Num-2	- - -			- - -
86	F-Frac-2	E-Frac-4	F-Frac-2	F-Frac-2	F-Frac-2	F-Frac-2
87	- - -	E-COP-6	- - -			- - -
83	E-COP-2	E-Mult-9		E-COP-2	E-COP-2	E-COP-2
89	E-Num-8	E-Num-8				E-Num-8
90	E-COP-2	E-Frac-2		G-ST-3	G-ST-3	DISAGREE
91	- - -	E-COP-5	E-COP-5			E-COP-5
92	G-COP-4	E-SOM-4		E-SOM-4	G-Add-2	DISAGREE
93	- - -	G-Frac-2	G-Frac-2			G-Frac-2
94	- - -	F-Num-1	- - -			- - -
95	- - -	E-COP-6	E-COP-6			E-COP-6
96	- - -	F-COP-4	- - -			- - -

Appendix D

Teacher Questionnaire

Minneapolis Public Schools

Individually Prescribed Instruction (IPI)
Teacher Questionnaire

Because IPI is new in the Minneapolis Schools and because Hall School is the only school where it is being tried, your opinion of this program is very important. Your reactions will help determine the future role of IPI in Minneapolis. Therefore, we hope you will give us your honest answers to a few questions about the program. These questionnaires are anonymous; please do not sign your name. Feel free to make comments on any of the questions or on important topics not covered. Use the backs of the pages for additional writing space if you need to.

1. The physical arrangements for the program were:

______good

______adequate

______poor

What changes would you make?________________________________

2. What changes have occurred, if any, in the children's general behavior as a result of the program?________________________________

3. In your opinion, do most children:

______learn more under IPI than in other math programs.

______learn about the same under IPI as in other math programs.

______learn less under IPI than in other math programs.

4. Was there any particular group of children that you feel would have benefited more from a traditional approach than from IPI? (Check as many as apply).

______slow learners ______boys

______average students ______girls

______fast learners ______other (specify)____________

______children with emotional problems

5. Was there any positive or negative carryover into other subject areas?

______strong positive carryover ______some negative carryover

______some positive carryover ______strong negative carryover

______no effect on other subjects

If there was positive or negative carryover, how was this exhibited, and in what subject areas did it occur?

____

____

____

____

6. Were you aware of any parental reaction to the program?

______no, not aware of any

______strong positive reaction

______some positive reaction

______some negative reaction

______strong negative reaction

Comment:________________________________

____

____

7. My inservice training for the IPI program was:

______very adequate; covered all important aspects of the program.

______fairly adequate; covered most of the important aspects of the program.

______not very adequate; covered only a few of the important aspects of the program.

______useless.

What changes would you make in the inservice training?

____

____

____

____

8. Do you feel the program was staffed appropriately; that is, were the right kind and the right number of people available to run the program efficiently (teachers, aides, etc.)?

______staffed appropriately

______staffed appropriately, but could be improved

______inappropriate staffing

What changes would you make in staffing?____________________________

____

____

____

9. Was there adequate communication between aides, teachers, floating teachers, and the coordinator so that problems could be resolved?

______adequate communication

______adequate, but could be improved

______inadequate communication

What suggestions would you make for improving communication?________

____

____

____

10. How would you rate the IPI math program compared to others you have used?

_______have not used other math programs

_______much better than any other program

_______better than some

_______no better or worse than any other

_______not as good as others

_______any approach would be better than IPI

11. Would you like to continue using IPI math materials?

_______would prefer to use IPI

_______would prefer some other math program

_______no preference, either is O.K.

_______don't know

12. In what other subject areas would you be interested in trying IPI materials? (check as many as apply)

_______none   _______science

_______reading   _______social studies

_______spelling   _______handwriting

13. Does teaching under the IPI system make you

_______feel more like a professional teacher

_______feel less like a professional teacher

_______feel no different than before

14. How would you compare your role as a teacher in the IPI program with that of a teacher in a conventional math program?

____

____

____

15. If this program were going to be started in another school, what recommendations would you make about how it should be introduced to the staff?

____

____

____

____

To the children?

____

____

____

16. All in all, how worthwhile do you feel the IPI math program was this year?

______very worthwhile

______fairly worthwhile

______not very worthwhile

______a waste of time

17. I have taught for:

______one year or less ______three years

______two years ______four years

______more than 4 years

18. We would appreciate any additional comments you have on the IPI math program. We are especially interested in how the program can be improved. (use the back side for additional space if needed)

____

____

____

____

____

____

Appendix E

Teacher Aide Questionnaire

Minneapolis Public Schools

Individually Prescribed Instruction (IPI)
Teacher Aide Questionnaire

Because IPI is new in the Minneapolis Schools and because Hall School is the only school where it is being tried, your opinion of this program is very important. Your reactions will help determine the future role of IPI in Minneapolis. Therefore, we hope you will give us your honest answers to a few questions about the program. These questionnaires are anonymous; please do not sign your name. Feel free to make comments on any of the questions or on important topics not covered. Use the backs of the pages for additional writing space if you need to.

1. My inservice training for the IPI program was:

 ____very adequate; covered all important aspects of my job.

 ____fairly adequate; covered most of the important aspects of my job.

 ____not very adequate; covered only a few of the important aspects of my job.

 ____useless.

 What changes would you make in the inservice training for teacher aides?

 ____

 ____

 ____

2. Do you feel the program was staffed appropriately; that is, were the right kind and the right number of people available to run the program efficiently (teachers, aides, etc.)?

 ____staffed appropriately

 ____staffed appropriately, but could be improved

 ____inappropriate staffing

 What changes would you make in staffing?

 ____

 ____

 ____

3. How would you compare your job as a teacher aide in the IPI program with that of a teacher aide in a regular classroom?

____

____

____

____

4. Do you have more contact with the children under the IPI program than you would in a regular classroom?

____more contact ____less contact ____about the same

5. Does the IPI program require closer working relationships between aides and supervisors than in a regular classroom?

____yes ____no ____about the same

6. Do you feel you are assuming more responsibility than a teacher aide in a regular classroom?

____yes ____no ____about the same

7. If a friend of yours had a chance to work as a teacher aide in an IPI program in another school, would you recommend:

_______that she work with IPI

_______that she work in a regular classroom

_______I would tell her it didn't make any difference

_______don't know what I would recommend

8. The physical arrangements for the program were:

_______good

_______adequate

_______poor

What changes would you make?______________________________

____

____

____

9. What changes have occurred, if any, in children's behavior as a result of the program?

____

____

____

____

____

10. In your opinion, do most children:

______learn more under IPI than in other math programs.

______learn about the same under IPI as in other math programs.

______learn less under IPI than in other math programs.

11. Were you aware of any reaction on the part of parents to the program?

______no, not aware of any

______strong positive reaction

______some positive reaction

______some negative reaction

______strong negative reaction

If you were aware of parents' reactions, what things did they like or dislike about the IPI program?____

____

____

12. If this program was going to be started in another school, what recommendations would you make about how it should be introduced to the aides?

____

____

____

____

____

____

13. All in all, how worthwhile do you feel the IPI math program was this year?

______very worthwhile

______fairly worthwhile

______not very worthwhile

______a waste of time

14. How long have you been a teacher aide?

______one year

______two years

______three or more years

15. We would appreciate any additional comments you have on the IPI math program. We are especially interested in how the program can be improved, and what changes you would like to see in the role of the teacher aide in the program.