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ABSTRACT

The Individually Prescribed Instruction (IPI) mathematics project at Hall Elementary School in Minneapolis completed its fourth year of operation in June 1973. The program is organized on a continuum of 415 math skills grouped into eight levels according to increased difficulty. Students progress through the continuum at their own rate as they master math skills. Children in grades 2-6 participated in the 1972-1973 project. Achievement scores on the Modern Math Supplement to the Iowa Tests of Basic Skills have improved each year of the IPI project. Contrary to children in many disadvantaged areas, Hall students do not compare less favorably with publisher norms as they become older; the IPI students hold near the percentile rank they had as third graders as they progress through school. Hall students have expressed more positive attitudes toward math than those in comparison schools. Hall teachers have supported the IPI project, emphasizing the individualized approach and the students' positive attitudes. IPI was not to be continued in the 1973-74 school year. (Author/BJG)

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Minneapolis Public Schools

The Fourth Year of IPI Mathematics at Minneapolis Hall School: 1972-73

A Title I, ESEA Project

Lary Johnson

Ideas expressed in this report do not necessarily reflect the official position of the Minneapolis Public School Administration nor the Minneapolis School Board.

Research and Evaluation Department
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July 1973
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Minneapolis Public Schools

The Fourth Year of IPI Mathematics at Minneapolis Hall School: 1972-73

Summary

The ESEA Title I Individually Prescribed Instruction (IPI) mathematics project at Hall Elementary School in Minneapolis completed its fourth year of operation in June 1973. The IPI math program is organized on a continuum of 415 math skills grouped into eight levels according to increased difficulty. Students progress through the continuum at their own rate as they master the skills (85% correct on each skill posttest). About 250 children in grades 2-6 participated in the project in 1972-73.

Achievement scores on the Modern Math Supplement to the Iowa Tests of Basic Skills have improved during each year of the IPI project. The mean fall-to-spring raw score gains at grades 4-6 have been equivalent to at least one grade equivalent month for each month of the project. Within each grade, the publisher's percentile for the end-of-the-year mean raw score has increased with each year of the project. For example, the fifth grade percentile has increased from 22 in May 1970 to 46 in May 1973.

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Contrary to children in many educationally disadvantaged areas, Hall students do not compare less favorably with publisher norms as they become older. The IPI students hold near their third grade percentile rank as they progress through school. If the trend continues, the mean raw score for the 1972-73 third and fourth graders will fall near the 60th percentile at the end of sixth grade.

See pp. 14-15

At the end of each of the first three years of the project, the grade 2-6 teachers enthusiastically supported the project. They emphasized the individualized approach and the students' positive attitudes. During the first two years of the project, students ranked mathematics as either their first, second, or third favorite subject. Near the end of the third year, Hall students expressed more positive attitudes toward math than did students at two comparison schools.

* * *

July 1973 Research and Evaluation Department

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Minneapolis Public Schools

The Fourth Year of IPI Mathematics at Minneapolis Hall School: 1972-73

The ESEA Title I Individually Prescribed Instruction (IPI) mathematics project at Hall Elementary School in Minneapolis completed its fourth year of operation in June 1973. This report covers the 1972-73 project year and briefly summarizes results from the previous three years. Since the school system administration decided at the end of the 1971-72 project year to completely phase out the IPI project, for economic reasons, by the beginning of the 1973-74 school year, the evaluation activities in 1972-73 were not nearly as extensive as in the previous years.

Readers who are familiar with reports published by the Research and Evaluation Department of the Minneapolis Public Schools may wish to skip the first three sections describing the City of Minneapolis, the Minneapolis Public Schools and the Target Area, since these descriptions are standard for all reports.

The City of Minneapolis

The program described in this report was conducted in the Minneapolis Public Schools. Minneapolis is a city of 434,400 people 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 1,874,000, the largest population center between Chicago and the Pacific Coast. As such it serves as the hub for the entire Upper Midwest region of the country.

The city, and its surrounding area, long has been noted for the high quality of its labor force. 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 1972 was 4.1%, compared with a 5.9% 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 (32%) work in clerical and sales jobs than in any other occupation, reflecting the city's position as a major wholesale-retail center and a center for banking, finance and insurance. Almost as many (26%) are employed as craftsmen, foremen and operatives, and 23% of the work force are professionals, technicians, managers, and officials. One out of five workers is employed in laboring and service occupations.

Minneapolis city government is the council-dominated type. Its mayor, elected for a two 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, the city's 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 1970, 48% of the housing units in Minneapolis were 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.

Relatively few non-white citizens live in Minneapolis although their numbers are increasing. In 1960 only three percent of the population was non-white. The 1970 census figures indicate that the non-white population has more than doubled (6.4%) in the intervening 10 years. About 70% of the non-whites are black. Most of the remaining non-white population is Indian-American, mainly Chippewa and Sioux. Only a small number of residents from Spanish-speaking or Oriental origins live in the city. In 1970 non-white residents made up 6.4% of the city's

population but accounted for 15% of the children in the city's elementary schools.

Minneapolis has not 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. Continuing concern over law and order, however, is still evidenced by the recent re-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 larger 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 of the elderly. For example, nine out of 10 black Americans in Minneapolis live in just one-tenth of the city's area. While Minneapolis contains 11% 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 by 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. The Indian American population is generally confined to the same small geographic areas in which black Americans live. 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 also are concentrated in the central city. In 1970, 15% of the city's population was over age 65. The elderly, like the 18 to 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 to the surrounding suburban areas.

The Minneapolis Schools

About 69,477 children go to school in Minneapolis. Most of them, about 61,052 attend one of the city's 98 public schools; 8,425 attend parochial or private schools.

The Minneapolis Public Schools, headed by Dr. John B. Davis, Jr., who became superintendent in 1967, consists of 67 elementary schools (kindergarten-6th grade), 15 junior high schools (grades 7-9), nine high schools (grades 10-12), two junior-senior high schools, and five special schools. Nearly 3,500 certificated personnel are employed.

Control of the public school system ultimately rests with a seven member board which levies its own taxes and sells its own bonds. These non-salaried officials are elected by popular votes for staggered six year terms. The superintendent is selected by the board and serves as its executive officer and professional adviser.

Almost 40 cents of each local property tax dollar goes to support a school system whose annual operating general fund budget in 1972-73 is $78,992,236 up from $74,340,271 in 1971-72. Minneapolis received federal funds totaling 8 million dollars in 1971-72 from many different federal aid programs. The Elementary and Secondary Education Act provided about 6.8 million dollars, of which 3.4 million dollars were from Title I funds. Per pupil costs in the system were $920 in 1970-71 while the range of per pupil costs in the state was from $254 to $1,041.

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 high schools which feed into it. In 1969 the South-Central Pyramid was formed around South and Central High Schools. Each pyramid has an area assistant superintendent 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.

Based on sight counts on October 17, 1972 the percentage of black American pupils for the school district was 10.6%. Eight years before, the proportion was 5.4%. Indian American children currently comprise 3.8% of the school population, more than double the proportion of eight 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 67 elementary schools, 11 have more than 30% non-white enrollment and four of these have over 50%. There are no all-black nor all-white schools. Twenty-three elementary schools have non-white enrollments of less than 5%.

The Minneapolis School Board has approved a plan which would desegregate the city's schools in September 1973.

The proportion of school age children in AFDC homes has more than doubled from approximately 12% in 1962 to 28% in 1972.

While the median pupil turnover rate for all the city schools in 1970-71 was about 23%, this figure varied widely according to location (turnover rate is the percentage of students that comes new to the school or leaves the school at some time during the school year, using the September enrollment as a base figure). Target area schools generally experience a much higher turnover rate; in fact only two of the target area schools had turnover rates less than the city median. Compared with the city, the median for the target area schools was almost twice as large (39%).

The Target Area

The Target Area is a portion of the core city of Minneapolis where the schools are eligible to receive benefits from programs funded under Title I of the Elementary and Secondary Education Act (ESEA). A school is eligible to receive Title I aid if the percentage of families residing in that school's district which receives AFDC payments (in excess of $2,000 a year)--or has an annual income under $2,000--exceeds the citywide percentage for families in those categories.

In 1972-73, nearly 26,871 children attended the 24 elementary schools, five junior highs, three senior highs and seven parochial schools that were eligible to receive this aid. One-third of these students were from minority groups and one-third were 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.

According to 1970 census data, over 170,000 persons resided in the Target Area. Of that group, 11 percent were black and 3½ percent were Indian, more than double the citywide percentage of minority group members. Over half of the Target Area residents over 25 years old had not completed high school, compared to the 35 percent of the non-Target Area residents who did not have high school diplomas. One out of five Target Area residents over the age of 25 had gone to college, and nine percent had completed four or more years. One out of four of the non-Target Area residents had gone to college, and 15 percent had completed four or more years.

The income for an average Target Area family was $9,113 in 1970, over $2,000 less than the citywide average. The homes they lived in had an average value of $10,385, over 40 percent less than the average value of a single family residence in Minneapolis. One out of five Target Area children between the ages of 6 and 17 was a member of a family that is below the poverty level, while only 6 percent of the non-Target Area children had such a family status.

The Project School and Its Neighborhood

The Individually Prescribed Instruction project described in this report took place at Hall School, one of eight elementary schools in the North Pyramid of the Minneapolis Public School System. Hall was designated as a Title I school because its attendance district falls below the city median on a combination of economic criteria.

Based on 1970 U. S. Census data, the median family income of residents in the Hall School area was in the $6,000 - $6,999 range. Thirty-six percent of the families in the neighborhood earned less than $5,000 per year and 30% earned $10,000 or more annually. More than one-third of the families and unrelated individuals received social security,

railroad retirement, or public assistance payments. About three-fourths of the employed males worked in blue collar occupations, about 20% of the families owned their homes, and slightly less than two-thirds of the individuals 25 years or older had not completed high school.

Hall School, built in 1960, includes kindergarten and grades 1-6. It is a relatively small school with a student population of about 350 children. For the past few years, the annual student turnover, the total number of entries and withdrawals during the year, has been about one-third of the student population. Forty-two percent of the students have minority background; 16% Indian American, 25% Black American, and 1% Spanish-surnamed.

The principal of Hall School was John D. Manville, and the IPI project coordinator was Donald R. Ostrum.

Historical Background

After Minneapolis Public School staff members visited an experimental school that was using IPI materials, Title I funds were made available for a three-year trial at Hall Elementary School, a school whose mathematics achievement scores on standardized tests were well below the city average.

First year (1969-70) evaluation results indicated that Hall students made gains in mathematics equal to gains made by average students on standardized test publisher norms.[1] Hall students also made somewhat greater gains in mathematics than did students in three comparable Title I schools which did not use IPI materials. Staff reactions were positive and students gave high rankings to mathematics compared with other subjects.

Hall students continued to make progress during the second year (1970-71). On a standardized achievement test, students in grades 4, 5, and 6 gained nine, ten, and seven grade equivalent months, respectively,

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[1] Hestwood, Diana. "First Year Evaluation IPI Mathematics Project 1969-70." Minneapolis Public Schools, November 1970.

during an eight-month period from early October to late May.[2] Reactions to the IPI project by both staff and students continued to be favorable. Teachers preferred IPI over more traditional math programs, while students rated mathematics as one of their favorite subjects.

In May 1972, at the end of the third year of the project, percentile ranks on the ITBS Modern Math Supplement were 5 to 10 percentile points higher at each of grades 3-6 than at the end of the previous year.[3] All teachers wanted to have IPI continued. They stressed the value of an individualized approach for students' achievement and attitude. Fourth and fifth grade students at Hall tended to have more positive attitudes toward math than did students at two comparison schools.

Project Objectives

No product, process, or management objectives were specifically stated for the IPI project in the 1972-73 Title I application. The overall mathematics objectives for all Title I elementary schools was stated as follows:

Primary:	Pupils enrolled in the Title I math program will show gains in the computational and conceptual skills being taught.
Intermediate:	Pupils enrolled in the Title I math program will show a 10% gain in computational and conceptual skills over their previous year's score.

Project Context

Participants

All children at Hall School in grades 2-6 participated in the fourth year of the IPI mathematics project. About 250 children were enrolled in these grades. As part of the phasing out of IPI, which was to be completed by the beginning of the 1973-74 school year, first graders did not participate.

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[2] Johnson, Lary and Ostrum, Donald R. "Second Year Evaluation IPI Mathematics Project 1970-71." Minneapolis Public Schools, October 1971.

[3] Johnson, Lary. "Minneapolis IPI Mathematics Project 1971-72: Third Year Evaluation." Minneapolis Public Schools, November 1972.

Personnel

The number of personnel was cut for the 1972-73 project year. In addition to the regular staff of ten teachers at grades 2-6, Title I funds provided for one certificated teacher-coordinator and five teacher aides. This was one less certificated teacher and one less teacher aide than in the previous year. Near the middle of the year one teacher aide left the project. The IPI project finished the year with the four remaining aides.

The regular classroom teacher was responsible for the daily evaluation of each pupil's progress, diagnosis of his needs, and preparation of individual learning prescriptions. The teacher-coordinator worked within the classrooms, assisting the teacher with individual evaluations and helping individuals and small groups of children, as well as coordinating all phases of the project.

The teacher aides were responsible for correcting all pupil work booklets, skill sheets, and tests. They also helped individuals and small groups of children.

Due to personnel cutbacks, it was not possible to have an extra teacher and two aides in each IPI class every day as occurred in 1971-72. The coordinator indicated that the teachers felt some strains in this area.

Budget

All funds for the 1972-73 IPI project came from Title I of the Elementary and Secondary Education Act. The total budget of $39,900 was allocated as follows:

Salaries and fringe	$39,483
Instructional materials	517

Project Activities

More complete descriptions of the IPI project activities can be found in the reports for the first three years of the project. The IPI coordinator indicated that the project activities in the fourth year (1972-73) were similar to the previous three years.

Briefly, the IPI math program is organized on a continuum of 415 math skills grouped into eight levels according to increasing difficulty. There are thirteen topic areas which cut across all difficulty levels: Numeration, Place Value, Addition, Subtraction, Multiplication, Division, Combination of Processes, Fractions, Money, Time, Systems of Measurement, Geometry, and Special Topics.

The first step in using the IPI program is to assess the child's level of skill acquisition by giving him a placement test. The teacher then writes an individual prescription that assigns the child to the Standard Teaching Sequence (STS) booklet that covers the skill on the continuum that he should master next. When the child has completed the instructional materials on all needed skills in a particular unit, he takes a posttest to measure his level of mastery (criterion level of 85% correct). He does not move on to a new unit until this level of mastery is achieved.

In 1971-72 differences existed between classrooms in the use of group instructional methods, instructional materials, and prescription practices. No study of these practices was carried out in 1972-73. However, each classroom in grades 2-6 used the IPI program as its instructional method in mathematics.

Evaluation

An administrative decision was made at the end of the third year (1971-72) of the IPI program at Hall School to phase out IPI completely by the beginning of the 1973-74 school year. However, since there were enough IPI materials remaining to continue with grades 2-6 in 1972-73, it seemed reasonable to at least look at standardized mathematics achievement test scores after the fourth, and final, year. It also was a simple matter to look at the children's progress through the IPI continuum of mathematics skills.

Student Progress in the IPI Continuum

Table 1 on page 12 indicates the percentage of students at each grade level who were working at each level in the IPI continuum at the beginning of the 1972-73 school year and on May 17, 1973, near the end of the school year. As in previous years, students made progress through the IPI continuum, considering that a mastery level of 85% correct was necessary before a student could move on to another unit within a level. For example, in September 88% of the fourth graders were working in level C. By the following May, 68% of the fourth graders were working in level D and 32% in level E; all fourth graders had progressed beyond level C.

If the IPI program has been successful during its four years of operation, one would expect fewer students working in the lower levels and more students working in the upper levels by the fourth year than at the first year. Table 2 on page 12 indicates such a trend. In May of 1970, 1971, 1972, and 1973, respectively, 23%, 31%, 36% and 39% of the IPI students were working at or above level E. These figures do not necessarily indicate that each year's students had better math skills than the previous year's students, but it does indicate that the students in each successive year had progressed further along the IPI continuum of mathematics skills.

Achievement Test Data

The Modern Math Supplement to the Iowa Tests of Basic Skills was given in early October to students in grades 4-6 and in mid-May to students in grades 3-6. The fall administration to fourth and sixth graders was part of the citywide testing schedule. Fall pretest and spring posttest scores were obtained for 33 of the 36 sixth graders who were at Hall during the entire 1972-73 school year, for 37 of the 40 fifth graders, and for all of the 28 fourth graders. May 1973 ITBS Modern Math Supplement scores were obtained for all of the 43 third graders who were on roll at the time. The second graders were not given a standardized achievement test.

Table 3 gives the pretest and posttest mean raw scores, the grade equivalent scores corresponding to the mean raw scores, the publisher's percentiles for the mean raw scores, and the gains between pretest and posttest at grades 4, 5, and 6. The mean raw score gains over the seventh-month period from October 1972 to May 1973 were one-year-two-months

Table 1

Percentage of Students in Each Grade Working at Various IPI Levels in September 1972 and May 1973

Grade	Date	Level A	Level B	Level C	Level D	Level E	Level F	Level G
Grade 2	Sept 1972	77%	21%	2%				
N=52	May 1973	6%	52%	35%	8%			
Grade 3	Sept 1972	14%	37%	44%	5%			
N=43	May 1973		5%	30%	60%	5%		
Grade 4	Sept 1972			88%	13%			
N=32	May 1973				63%	38%		
Grade 5	Sept 1972			28%	63%	10%		
N=40	May 1973				25%	65%	10%	
Grade 6	Sept 1972				51%	41%	8%	
N=39	May 1973				5%	53%	33%	8%

Table 2

Percentage of Students in Combined Grades 2-6 Working at Various IPI Levels in May 1970, 1971, 1972 and 1973

Date	N	Level A	Level B	Level C	Level D	Level E	Level F	Level G
May 1970	260	0%	14%	28%	35%	23%	0%	
May 1971	202	1%	12%	26%	31%	30%	1%	
May 1972	203	1%	8%	19%	36%	27%	9%	
May 1973	206	1%	14%	15%	30%	30%	8%	1%

Table 3

Mean Raw Scores, Grade Equivalents, Publisher Percentiles, and Gains for Hall Students in Grades 3-6 on the Modern Mathematics Supplement to the Iowa Tests of Basic Skills in October 1972 and May 1973

	Pretest	Posttest	Gain
Grade 6 (N=33)			
Mean Raw Score	14.5	20.1	5.6
Grade Equivalent	5.3	6.1	.8
Publisher Percentile	29	36	+7
Grade 5 (N=37)			
Mean Raw Score	14.5	19.8	5.3
Grade Equivalent	4.6	5.6	1.0
Publisher Percentile	35	46	+11
Grade 4 (N=28)			
Mean Raw Score	15.2	22.5	6.7
Grade Equivalent	4.0	5.2	1.2
Publisher Percentile	47	62	+15
Grade 3 (N=43)			
Mean Raw Score	-	19.2	-
Grade Equivalent	-	4.0	-
Publisher Percentile	-	60	-

at grade 4, one year at grade 5, and eight months at grade 6. The percentile ranks corresponding to the mean raw scores were higher in May than October by 15 points at grade 4, 11 points at grade 5, and 7 points at grade 6 on the publisher's norms.

Tables 4a, 4b, and 4c on page 15 give three ways of looking at the publisher's percentiles for the mean raw scores for grades 3-6 at the end of each of the four years of the IPI project. Also see Figure 1 on page 16. Looking horizontally in Table 4a from May 1970 to May 1973, the percentiles within each grade have increased each year, with one exception at grade six in May 1971. For example, at grade five the mean score percentile increased from 22 in May 1970, to 28 in May 1971, to 34 in May 1972, and to 46 in May 1973.

Looking vertically in Table 4b across grade levels within a given year, the publisher percentiles become progressively higher from grade 6 down to grade 3. The higher percentiles at grade 3 and 4 than grades 5 and 6, suggest that the IPI project has had a positive effect on mathematics achievement. The current third and fourth graders have received most of their formal mathematics instruction in the IPI project, while the fifth and sixth graders had experience with other math programs before IPI.

On the other hand, perhaps--as with many groups of children from educationally disadvantaged environments--the younger children (grades 3 and 4) will compare less favorably with the normative group as they become older. This does not appear to be the case with the IPI students at Hall. In Table 4c the same students can be followed diagonally as they proceed through the grades. For example, the 46th percentile for the third graders in May 1971 held up very well over the next two years in school....still the 46th percentile as fifth graders in May 1973. As with the other three grades, most of the fifth graders (30 of 37) in the May 1973 results have spent at least two years in the IPI project..

Table 4

Four Years of ITBS Modern Math Supplement Publisher Percentiles Based on Mean Raw Scores for Hall Students in Grades 3-6

Table 4a

	May 1970	May 1971	May 1972	May 1973
Grade 6	24	21	28	36
Grade 5	22	28	34	46
Grade 4	a	36	41	62
Grade 3	a	46	56	60

Table 4b

	May 1970	May 1971	May 1972	May 1973
Grade 6	24	21	28	36
Grade 5	22	28	34	46
Grade 4	a	36	41	62
Grade 3	a	46	56	60

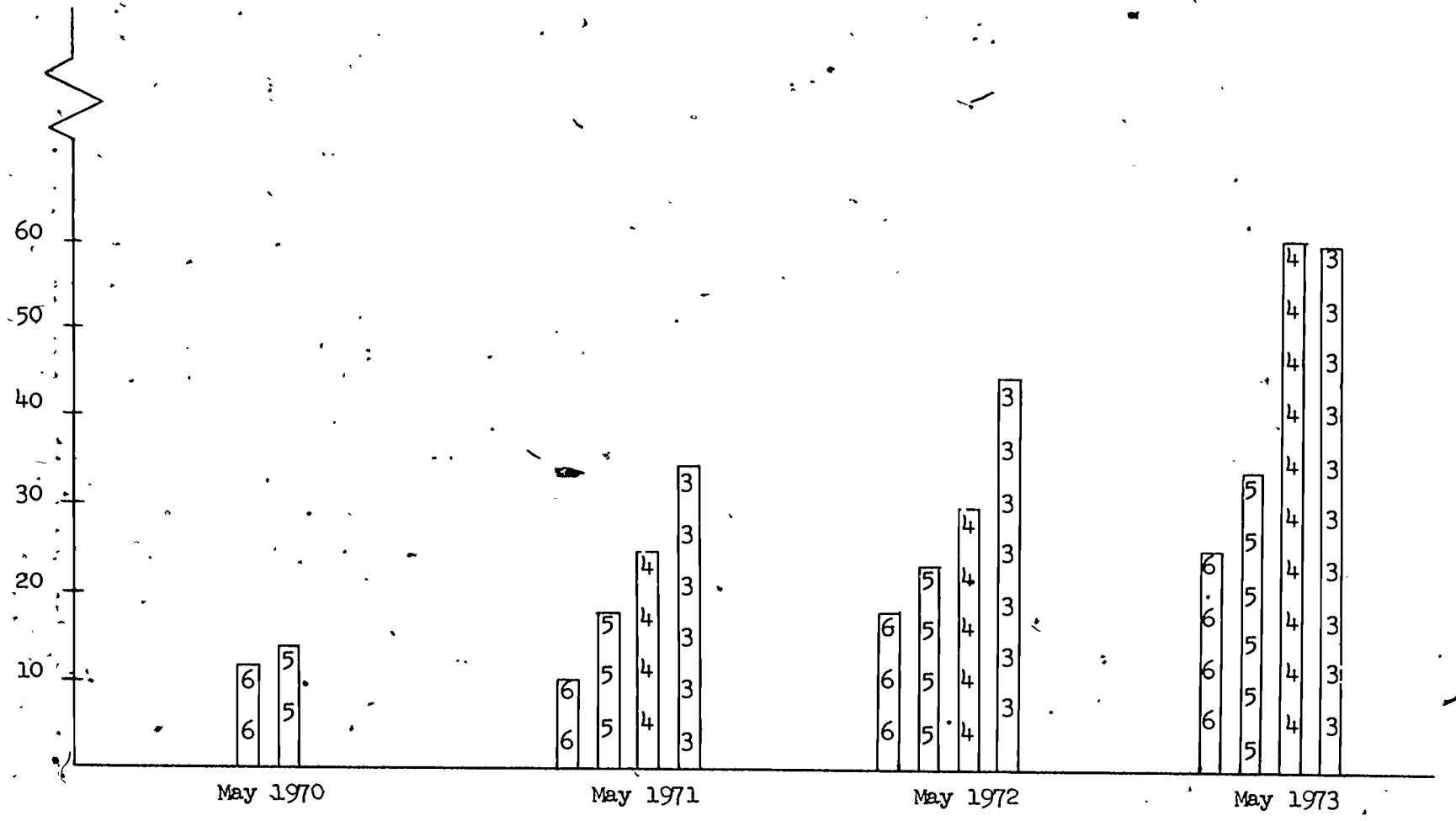
Table 4c

	May 1970	May 1971	May 1972	May 1973
Grade 6	24	21	28	36
Grade 5	22	28	34	46
Grade 4	a	36	41	62
Grade 3	a	46	56	60

[a]ITBS Modern Math Supplement was not given in grades 3 and 4 in May 1970

Figure 1

Four Years of Publisher Percentiles Based on Mean Raw Scores for IPI Students in Grades 3-6 on the ITBS Modern Math Supplement



Four Year Summary and Discussion

Has the Title I IPI project at Hall School been successful during its four years of operation? The evidence is positive, although the evaluation designs have not permitted unequivocal statements of results.

Achievement

For each of the four years of the project, the mean fall-to-spring raw score gains on standardized achievement tests at grades 4-6 have been equivalent to at least one grade equivalent month for each month between tests. The gains are better than gains expected for students who start below grade level on the publisher's norms, such as many of the students at Hall. The spring percentile rank at each grade level has ranged from 2 to 15 points higher than the fall percentile for each of the four years of the project. For example, the percentile rank corresponding to the mean raw score was 11 points higher in May than in October for the 1972-73 fifth graders.

The percentile corresponding to the mean raw score has risen at the end of each of the four years of the IPI project for each of grades 3-6, with only one reversal in the trend at grade 6 in 1971. For example, the fifth grade percentile has increased from 22 in May 1970 to 46 in May 1973.

For each of the last three years, the percentile ranks have shown an inverse relationship to grade (with one minor reversal). That is, within a given year, third graders have higher percentiles than fourth graders, fourth graders higher than fifth graders, and fifth graders higher than sixth graders. Since the students in third and fourth grade have received more of their formal mathematics instruction with IPI materials than have fifth and sixth graders, the better results at the lower grades suggest that IPI has had a positive effect on achievement. For example, most of the May 1971 third graders had IPI as second and third graders, while the May 1971 sixth graders had some other math program in grades 2-4. Why do the 1972 third graders score higher than the 1971 third graders? Again, it may be attributed to their greater experience with IPI (one more year as first graders). Also, the IPI instruction may be improving as the teachers become more experienced with the IPI system.

However, perhaps as with many children from educationally disadvantaged areas, the third and fourth graders will compare less favorably with publisher norms as they become older. This does not appear to be the case at Hall School. The IPI students hold near the percentile rank they had as third graders as they progress through the grades. For example, the May 1973 fifth graders scored at the same percentile as they did as third graders in May 1971. In fact, one would predict, on the basis of the past four years, that the mean raw score for the 1972-73 third and fourth graders will fall near the 60th percentile on publisher's norms at the end of sixth grade.

Although there have been no extensive or adequately controlled studies comparing IPI with other math programs, comparisons with other schools tended to favor the IPI program. During the first year of the program, Hall students made somewhat greater gains in mathematics than did students in three other Title I schools that did not use IPI materials. Also, between February 1971 and May 1972 Hall fifth graders made somewhat greater gains than fifth graders at two other schools. Between February 1970 and October 1971 Hall sixth graders made gains similar to sixth graders at the other schools.

Citywide test results provided by the Minneapolis Schools' Department of Assessment and Guidance Services indicate that median raw scores on mathematics tests for the city have not risen during the last few years. Math achievement in the target areas has shown some improvement recently, but not as much as at Hall School. Comparisons between IPI and citywide results should be made cautiously, since the Hall data were gathered in spring for pupils who were in the IPI program the entire year, while citywide results were collected in the fall and includes a greater percentage of pupils who have high school-to-school mobility.

Can the improved mathematics achievement at Hall School be attributed to factors other than the IPI program? Although several potentially important variables were not experimentally controlled, it appears that Hall students of 1972-73 were quite similar to students of 1969-70 on

characteristics related to mathematics achievement. The socio-economic background of the families has not improved during the last few years. In fact, on some indices, such as AFDC, the population changes have been in a direction which would--typically--result in poorer achievement.

Some improvement in reading comprehension has occurred during the last four years, particularly at the lower grades (Table 5). The reading comprehension percentiles were not based on exactly the same pupil population as the mathematics percentiles, but the overlap is about 80 percent. Since the ITBS Modern Math Supplement requires reading skill, part of the improved mathematics scores at grades 3 and 4 may be related to improved reading skills. However, the gains in math skills over the last four years have been substantially greater than the corresponding gains in reading comprehension.

Table 5

Publisher's Percentiles Based on Median Raw Scores for Hall Students in Grades 3-6 on the Gates-MacGinitie Reading Comprehension Test

	1969-70	1970-71	1971-72	1972-73
Grade 6	31	16	14	18
Grade 5	8	16	24	14
Grade 4	14	18	27	31
Grade 3	-	18	14	24

Certain organizational variables that are not unique to the IPI approach may have been partially responsible for the mathematics improvement. If another math program had the additional personnel, would they do as well as the IPI program? The rigidly scheduled math period each day also may have had a positive influence on mathematics achievement.

Student Attitudes

Teachers at Hall claimed that one of the most positive aspects of the IPI program is the favorable attitude of the students toward the math period and IPI materials. During the first two years of the project, students ranked mathematics as either their first, second, or third favorite subject in grades 2-6. When mathematics was not number one, it was outranked by art or gym. Near the end of the third year, Hall fifth graders expressed more positive attitudes toward "Math Time During the School Day" than did students at two comparison schools. Hall fourth graders had more favorable attitudes toward math than did one of the comparison schools.

Teacher Attitudes

At the end of each of the first three years of the project, the grade 2-6 teachers enthusiastically supported the IPI project. They emphasized the individualized approach and the students' positive attitude.

Recommendation

Since IPI apparently was not to be continued in the 1973-74 school year, the evaluation for 1972-73 was not designed to provide data for program recommendations. However, a recommendation made in the 1971-72 report still seems to be appropriate: the school system should investigate the possibility of using or developing individualized materials and approaches similar to IPI. The students enjoyed mathematics, the teachers believed in the IPI project, and most important, the students achieved very satisfactorily.

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