DOCUMENT RESUME

ED 280 701 SE 047 863

AUTHOR Moilanen, Carolyn
TITLE Project SEED in the Portland Public Schools. Evaluation Report 1985-86.
INSTITUTION Portland Public Schools, OR. Research and Evaluation Dept.
PUB DATE Feb 87
NOTE 38p.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Discovery Learning; Educational Research; Elementary Education; *Elementary School Mathematics; Intermediate Grades; *Mathematics Achievement; *Mathematics Instruction; Motivation; Program Evaluation; *Student Attitudes; Teaching Methods
IDENTIFIERS Mathematics Education Research; Oregon (Portland); *Project SEED

ABSTRACT

Project SEED (Special Elementary Education for the Disadvantaged) is a supplementary mathematics program which applies Socratic discovery methods to mathematics instruction. It was implemented in 10 fourth- and fifth-grade classrooms in Portland to improve mathematics achievement and increase students' esteem for mathematics learning. Student achievement growth for the SEED groups was mixed. Four classes made gains greater than the district average, four classes neither gained nor lost, and one class gained less (data from the 10th class are not included). No significant correlations were found between achievement and length of time in the project. Student attitudes did not change significantly; nearly 70% were positive both before and after SEED. The implementation plan was difficult to accomplish, and the SEED curriculum was not integrated with the district's mathematics program. Observations indicated that students were introduced to some elements of exponentiation and were involved in enjoyable classroom activities. It was recommended that SEED be considered as an extracurricular enrichment program. (MNS)

1985-86 Evaluation Report

PROJECT SEED

IN THE PORTLAND PUBLIC SCHOOLS

by Carolyn Moilanen

Research and Evaluation Dept.
Portland Public Schools
Portland, Oregon
Walter E. Hathaway, Director

February 1987

ADMINISTRATIVE SUMMARY

Project SEED is a supplementary math program which applies Socratic discovery methods to math instruction. During 1985-86, SEED was implemented in the Portland Public Schools in ten fourth and fifth grade classrooms to improve math achievement and to increase students' esteem for math learning. An evaluation was conducted to report student outcomes for achievement and affect.

Student achievement growth for the SEED groups was mixed. Four classes made gains greater than the District average, four other classes neither gained nor lost, and one class gained less than the District average. There were no significant correlations between achievement outcomes and length of time in the project. Student attitudes toward math learning, surveyed both before and after participation in SEED, did not change significantly. Nearly 70% of student responses were positive regarding confidence and esteem for math learning both before and after SEED.

The phased-in implementation favored by SEED was difficult to accomplish and resulted in variations in the number of weeks the Project classes were involved in the program; participation ranged from seven to 24 weeks. The SEED-preferred 45-minute instructional period required classroom teachers to give up a third of their whole-group instructional time four days a week; time was taken from social studies and science/health. Though participation in SEED doubled instructional time for math, the SEED curriculum was not integrated with the District's mathematics program.

Based on observations conducted during the first half of the school year, SEED introduced the fourth and fifth graders to some elements of exponentiation, and the specialist's repetitive and rapid whole-class drill plus the use of hand signals involved many of the children in an enjoyable classroom activity. While student outcome data do not warrant an expansion of the Project at this time, we recommend that consideration be given to offering SEED as an extra-curricular mathematics enrichment program.

EVALUATION OF

P R O J E C T S E E D

By
Carolyn Moilanen

Department of Research and Evaluation
Portland Public Schools
Portland, Oregon

February, 1987

TABLE OF CONTENTS

INTRODUCTION

Project SEED (Special Elementary Education for the Disadvantaged) is a supplementary math program which applies Socratic discovery methods to math instruction. During 1985-86, SEED was implemented in the Portland Public Schools in ten fourth and fifth grade classrooms to improve mathematics achievement and to increase students' esteem for math learning. Designed for use with educationally disadvantaged children, K through 12, with an emphasis on grades 3-6, SEED purports to improve math achievement scores and at the same time to develop students' positive self-concepts about learning, especially math learning.

This report documents the implementation, describes the relationship of SEED to the District's mathematics curriculum, and reports student outcomes (both achievement and affect), as well as teacher and principal perceptions of the Project and its interface with the regular instructional program.

PROJECT SEED IN THE PORTLAND PUBLIC SCHOOLS

Program Description

Project SEED is a mathematics program whose curriculum focuses on exponentiation, and the scope and sequence is a skeletal conceptual outline which is developed and expanded as the discovery methods of instruction and learning unfold. SEED instruction is supplementary to regular classroom math instruction. Instruction is provided by the SEED specialist, not the classroom teacher. It is not a pull-out program for educationally disadvantaged, but is conducted instead with whole class groups four days a week in 40-45 minute periods.

The regular classroom teacher, who has usually volunteered his or her class for the SEED project, is present for all sessions. SEED specialists may be available for conference with the classroom teachers on the fifth day of the week. While this setting--daily observations and weekly conferencing--may suggest opportunities for regular teacher inservice in the SEED methodology, there is no systematic training aimed at this effect.

Project SEED selects, trains, and provides continuous in-service for its instructor-specialists. In addition, Project SEED works to recruit community business personnel to train as SEED specialists for the purpose of providing short-term classroom instruction.

District Orientation to Project SEED

In 1984, the Portland Public Schools contracted with Project SEED for the purpose of introducing fourth and fifth grade teachers in Jefferson and Grant clusters to SEED's techniques for increasing positive participation and involvement in math learning. The 1984-85 adapted SEED implementation was intended to orient teachers to the SEED techniques and methods and interest them in volunteering their classes for regular Project SEED instruction. Forty-nine teachers participated in the orientation/demonstration and ten agreed to have their classes participate in regular SEED instruction in 1985-86.

The 1985-86 Implementation

During 1985-86, the Portland Public Schools contracted with Project SEED to provide 1) long-term instruction in 9 classes, 2) orientation for 11 new teachers.

Long-Term Classes. SEED prefers a "phased in" implementation, to begin in one class at a time and to monitor and maintain a quality program beginning before starting to work in a second class. Because of the phased-in implementation, the participating classes received SEED instruction for varying amounts of time, and at different times during the school year.

The Project also phased in its specialist staff. Three specialists worked in the Portland Public Schools during the 1985-86 implementation. One specialist remained with the Project all year; one worked the first semester of the school year, and a third came to Portland in November and remained until June. Because of the changes, one of the long-term SEED classes had two different instructor specialists during the year.

Table 1 presents the classes and the duration of their SEED instruction during 1985-86. Start dates reflect the Project's "phasing-in" approach to implementation.

Table 1

SEED Classes, 1985-86

Project SEED Classes	Grade Level classes	Number Who Received SEED Instruction	Duration of SEED Instructional Program in Weeks	Start Date	SEED Specialist
A	4	21	7	10-21-85	A
B	5	20	10	09-27-85	A
C	4	27	14	01-27-86	C
D	5	23	23	10-14-85	A,C
E	5	30	10	10-02-85	C
F	5	25	14	01-27-86	B
G	4	30	13	12-05-85	B
H	4	22	21	10-03-85	C
I	4/5	22	8	11-12-85	B
J	4	20	19	11-13-85	B
Total N:		240 students			

SEED implementation ranged from seven to twenty-four weeks; for each five days of SEED, students spent an average of 225 minutes in the program in addition to 250 minutes in their regular math program. For the duration of the program, students' instructional time for math was nearly doubled.

Teacher Orientation to Project SEED. SEED also contracted to provide orientation/demonstration sessions for a minimum of 11 fourth and fifth grade teachers new to the eight project schools. SEED specialists conducted two-week orientations for thirteen new teachers. The orientation acquainted teachers with Project SEED in action in their own classrooms. The goal of the orientation was to inform teachers' decisions about volunteering their class for later participation in the Project. One orientation session actually extended into a "long-term" class.[1]

Other Services. In addition to conducting regular SEED classes and orienting new teachers, specialists engaged in informal conferences with participating classroom teachers and worked with small groups of their students for extra instruction and encouragement. In four classes, specialists conducted 30 to 45 minute instructional sessions with 5-8 students an average of four times.

SEED specialists maintained on-going communication with District administrators, Directors of Instruction and their staffs, project school principals and support staff throughout the second year. At the request of the principal at Irvington School, SEED conducted an evening Parent Demonstration which was attended by about twenty persons. In response to a SEED survey, twelve parents wrote comments about the demonstration. They remarked that SEED was "impressive" and "exciting", noted "whole class participation," and said that their children "enjoyed" and were "enthusiastic" about the SEED experience. A summary of the group's responses is in the Appendix A.

In February, 1986, Project SEED negotiated with Pacific Power and Light for a release of two professional personnel to be trained as part-time volunteer specialists. The time for training varied according to both

[1]In the fall of 1986, four of the teachers oriented the previous year volunteered to participate in SEED. Since the first year of SEED, only two teachers have volunteered to participate more than once.

volunteers' work schedules. Volunteers were trained through observation of SEED classes, four hours of small-group consultation meetings with specialists to review philosophy, methods, class management, curriculum and instructional strategies. The goal was to prepare each volunteer to teach SEED forty-five minutes a day for two-weeks during the spring of the 1985-86 school year. One specialist did conduct a SEED class for three weeks in the late spring; plans were made for the second volunteer-specialist to conduct or team-teach a class during the fall of 1986.[2]

EVALUATION OF 1985-86 PROJECT SEED

The Directors of Instruction in the Jefferson and Grant clusters requested the services of the Department of Research and Evaluation to conduct an evaluation for the purposes of:

- o Documenting the implementation,
- o Describing the fit between SEED and the District's elementary mathematics program,
- o Reporting student achievement gains in mathematics, and
- o Reporting students' affective gains regarding their confidence/interest in mathematics learning.

In order to document the SEED implementation, data were collected from principals and teachers who participated in the project during 1985-86. To describe the fit between SEED and the regular mathematics curriculum, data were collected from principals and teachers and by on-site observations of both SEED and companion regular class instruction. Copies of the "Principal Interview Questionnaire" and "Interview Questionnaire for Teachers" are in Appendix B.

To assess achievement, fall to spring achievement growth on the Portland Achievement Levels Tests in mathematics was analysed for the classes which participated in SEED. To assess increased confidence/interest in math, the 45-item "Portland Public Schools Math Questionnaire" was administered to

[2]During the fall of 1986, the first volunteer specialist taught SEED for five weeks in a fifth grade class. The second volunteer was unable to participate during the fall due to an injury.

participating students by an evaluation specialist during the fall and again (in either winter or spring) upon completion of their participation in Project SEED. A copy of the questionnaire items is in Appendix B.

The Implementation of Project SEED

Information about the implementation was collected from both Project SEED principals and teachers. During the fall, an evaluation specialist from the Department of Research and Evaluation conducted principal interviews and in the spring, typed transcripts of the interviews were sent to principals for verification and editing as they saw fit. Eight of the ten teachers with long-term classes were interviewed at the conclusion of their participation in the Project; two of the teachers were on leave at the time of interview.

Project SEED prefers to work for 45 minutes a day, four days a week in classrooms where students are heterogenously grouped for math instruction, where classroom teachers have volunteered their participation, and where discipline problems are at a minimum. While SEED purports to improve basic skills achievement, SEED staff more often point out that their curriculum is like algebra and not intended to replace regular math instruction. Therefore, participants have a regular 50 minute math period and SEED math for an additional 45 minutes a day, four days a week.

These implementation conditions require that principals and teachers decide what part of the curriculum will be given up to SEED during 45 minutes per day four days a week. In buildings with supplementary programs and/or cross-graded grouping for basic skills, classroom teachers already have a limited amount of whole-group instruction time. Implementing SEED according to Project requirements (for time and grouping) affects regular school schedules and in some cases precludes participation by teachers who are willing to volunteer for SEED with shorter (e.g. 30 minutes per day, four days a week) instructional periods. Without adequate advance planning, these implementation problems are exacerbated by the "phased-in" implementation; when SEED is ready to begin a new class, schedules are fixed and finding a 45 minute time period while protecting the regular teacher's whole-group instructional block is difficult.

In five of the eight SEED schools, teachers volunteered to participate in the project and in three schools, principals requested teacher participation. In some instances, additional teachers volunteered to participate in SEED but

their classes could only participate for 30 minutes four days a week, and Project specialists considered the shorter class periods inadequate. Half of the participating classes were heterogeneously grouped for both SEED and their regular math instruction; the other classes were appropriately grouped for SEED, but ability-grouped for their regular math instruction.

Both principals and teachers reported three student objectives for participation in Project SEED: 1) Improved self-esteem and positive attitudes for math learning, 2) Development of higher-level thinking skills, and 3) Improved mathematics achievement.

While staff expected improved student achievement, they had questions about the interface between the SEED and regular math curriculum. Five teachers reported that SEED reinforced basic skills, and two reported that SEED reinforced problem solving in mathematics. Five teachers reported that they liked the SEED signals (though three remarked that they had learned them the previous year during the orientation). On average, each specialist conferred five times with the regular classroom teacher in whose room he taught SEED. Conferences were face-to-face or telephone conversations held before or after school or during teacher preparation periods. They ranged from five minutes to over an hour in length, averaging about 30 minutes.

The participating teachers had their whole class group together for instruction an average of three hours per day; that meant that on the four days SEED was implemented, whole-group instruction was cut by a third. Teachers and principals reported that the time for SEED was taken from instructional time in social studies, science/health, and sometimes language arts.

Staff in three of the eight SEED schools (two teachers and one principal) reported that the SEED specialists had poor discipline/management skills which had a negative affect on students.

Description of the Fit Between SEED and PPS Elementary Math Program

To gather information on the fit of SEED with the regular PPS math program, classroom observations of SEED and regular math were conducted. Observations were scheduled so that SEED could be observed during each of thirteen weeks of its implementation during the first semester of the school year. The regular class was visited within seven instructional days of each

SEED observation. Observation time ranged from 25 to 40 minutes. Eight participating classes were visited four times -- twice during SEED instruction and twice during regular instruction.

The purpose of the observations was to collect information on the relationships between the curriculum and instruction of both programs in order to describe how SEED supplements the elementary math program. During both visitations (to SEED and to regular math) the observer made written notes describing the following:

- o General curriculum content/emphasis of the day's lesson;
- o Instructional delivery;
- o Student/teacher interaction; and
- o Student participation.

Curriculum Content. In fourteen of sixteen regular math classes observed, the curricular emphasis was on basic operations (in order of greatest frequency: addition, multiplication, division, subtraction). Eleven of the fourteen classes had a co-focus on related problem-solving activities. In two regular classes, the curriculum was fractions.

In SEED, basic operations were not emphasized. Exponentiation was the main curriculum for thirteen of sixteen observed SEED lessons. During three lessons observed in separate classes during the 11th, 12th, and 14th week of the implementation, the curricular emphasis was negative numbers and additive inverses. It is important to note that during every observed SEED class, the specialist involved the whole group in basic skills drills, e.g., times tables, addition facts. These drills provided skills reinforcement, but during observed classes they were used primarily as management tools to re-focus the class when attention or participation lagged.

On one occasion, the curricular emphasis in SEED paralleled that of the regular program: during the 4th week of SEED, one specialist was observed devoting part of his instructional time to a lesson on carrying and place value, and during the same week, regular class instruction focused on place value in addition.

In an informational letter to parents, SEED staff stated that "the responses of the students guide the mathematics specialist to other pertinent questions which allow the students to discover mathematical ideas for themselves." Classroom observations suggest otherwise. The SEED curriculum delivery was repetitive and remarkably homogeneous across classes and over time (See Table A in Appendix A). Two possible explanations for the

consistency are that specialists expected the Project to end early or that specialist assignments would change in certain classrooms. Given these expectations, specialists may have chosen to concentrate on repeated instruction in order to leave the whole class with a common understanding of one unit of SEED curriculum content.

Instructional Delivery. Instructional practices in the observed regular classes were varied. Teachers used whole-group direct instruction for part of the observed time, and organized partnering and small-group problem-solving activities and games, individualized written (or calculator) drill and practice, coaching, and follow-up monitoring the rest of the time. Verbal participation was more often an individual response to the teacher or to peer group members and less often a chorused response. In most regular classes, students spent some time on written math assignments.

All of the observed SEED classes were teacher- directed whole-group instruction in a question/answer mode. The SEED specialist asked questions and students provided original or repeated verbal answers (individually, or in unison) or signalled their responses. Students often referred to written "exponentation charts"; occasionally they worked out an addition or multiplication problem on paper.

Student Participation/Interaction. During observed SEED classes, specialists regularly used a variety of SEED techniques as displayed in Table 2. During regular math class instruction regular classroom teachers were observed using the starred techniques.

Table 2

SEED Interaction Techniques

FEEDBACK/INVOLVEMENT	BUILD CONFIDENCE/ SUCCESS REINFORCEMENT	FOCUS FOR FEEDBACK INVOLVEMENT/ CONTENT REINFORCEMENT
*Hand signals: agreement/dis-agreement/support	*Students call on other students	Involve teacher
*Finger signals	Student to the board	*Stop eraser/chalk
*Hand count	Star problems	Rapid questions/drill
Number of hands		
*Chorus (unison) responses, reading		
Repeated responses		
*Deliberate errors		

*Techniques used by regular classroom teachers.

During observed SEED classes, frequencies of individual student answers (including original, paraphrased and repeated responses) were tallied. A total of 336 students were observed during the two visits to participating SEED classes. During those observations, 19% of the students (N = 64) did not provide any individual responses to specialist questions; 59% (198 students) responded one, two or three times; 16% (53 students) responded between four and six times; 4% (13 students) responded seven to ten times. During each SEED class, there were many opportunities for group responses, both verbal and by signal.

Because of the multiple activities and groups observed in the regular classroom setting, it was difficult for a single observer to tally comparative response frequencies. In the regular math class, there were fewer occasions which required group responses.

Student Achievement

Achievement growth was measured by the Portland Achievement Levels Test in mathematics, administered both fall and spring to all District fourth and fifth grade students, including those participating in Project SEED. Only clear and intact group scores were used; that is, only if a fourth or fifth grade SEED student had both a fall and spring mathematics score in the same school would the score be included for comparative data analysis.

The results are reported in tables using Deviation scores and GROW indices for clear and intact groups. These are defined as follows:

1. Clear and intact groups include students who had fall and spring test scores for a given year (clear) and were enrolled at the same school in the fall and spring (intact). The Deviation and GROW scores are based on one-year clear and intact groups.
2. Deviations are group statistics showing the deviation of a group mean from a mean of all group RIT means in the District. RIT scores are equal-interval curriculum-based scores that are obtained from Portland Achievement Levels Tests.
3. GROW is an index that represents the amount of achievement growth in clear and intact groups in a given year. It shows the deviation of groups' fall to spring gain from the mean gains of all grade level groups in the District.

The criteria for interpreting GROW are presented in Table 3.

Table 3

Criteria for Interpretation of GROW Values

GROW Value	Interpretation
-2.0 and below	Negative significant gain
-2.0 to -1.7	Negative gain approaching significance
-1.6 to -.7	Non-significant negative gain
- .7 to .7	No gain or loss
.7 to 1.6	Non-significant positive gain
1.7 to 2.0	Positive gain approaching significance
2.0 and above	Positive significant gain

With other supplementary programs aimed at achievement growth (e.g., HOSTS, Prescription Learning), student outcomes are analysed when the program treatment has been in place for a minimum of sixteen weeks (or half a year). Then a responsible comparison of achievement results across programs can be made. Only three of the Project SEED classes met this criterion; the growth in two was the same as the District average, and the third class had a loss. To determine whether these results were similar for classes which had SEED for shorter periods of time, the deviations and GROW scores for each of the nine classes were examined and are displayed in Table 4 in descending order from the class with the greatest gain to the class with the least gain[3]. The final column of Table 4 includes an interpretation of the statistical significance of class gains at the .05 level according to the guidelines presented in Table 3.

[3]Data for one class were not included in the interpretation because the class operates a year-round program and the fall to spring growth is not directly comparable.

Table 4

Mathematics Standard Deviation Means Showing Growth
for 1985-86 SEED Classes

Class	Weeks in SEED	Deviation of Group Means Fall, 1985	Spring, 1986	Growth Fall to Spring GROW	Interpretation of GROW Value
1	14	-2.91	-1.35	4.25	Positive Significant
2	10	-1.88	-.96	2.50	Gain (2.0 and above)
3	14	-1.96	-1.35	1.35	Non-Significant Positive
4	10	-1.19	-.77	1.17	Gain (.7 to 1.6)
5	24	.43	.62	.38	
6	7	-1.43	-1.27	.31	No Gain/No Loss
7	23	.71	.65	-.12	(-.7 to .7)
8	8	.93	.78	-.34	
9	19	-.80	-1.18	-.93	Non-Significant Negative Gain (-1.6 to -.7)

Table 4 displays a wide range of GROW values. Four classes had significant gains when compared with the growth of the District as a whole; four classes neither gained nor lost; one class had a negative gain. It is important to recognize that some error is associated with these interpretations due to the small numbers of students who were clear and intact; each class has scores for fewer than 25 students. There was no significant correlation between the number of weeks in the program and achievement growth (rank difference correlation = .05). Nor was there any direct correlation between achievement growth and SEED specialist.

Student Attitude Survey

An evaluation specialist administered "The Portland Public Schools Math Questionnaire" to SEED classes before and after Project participation. The instrument used was a 45-item questionnaire designed by a task force of principals, teachers and Evaluation Department personnel to attempt to extend Item Response Theory-based measurement into noncognitive areas in grades three to five. The instrument's face validity and reliability are very high, however neither its scalar properties nor its construct validity is well understood at this time. Thus, responses are provided only on a "percent

positive" basis. Scores were included for clear and intact SEED student groups who completed at least 20 of the 45 questionnaire items. Table 5 presents the percentage of students' positive responses before and after participation in Project SEED. There were no measurable differences.

Table 5

Student Responses to the PPS Math Questionnaire

	Percentage of Positive Responses		
	Before SEED	After SEED	Gain
N (150)	69.13%	69.59%	.46%

FINDINGS

Documentation of Contracted Services

- According to contract, SEED was to provide regular long term instruction for nine classes. Because "long term" can be defined in terms of teacher and class participation in the Project, or, in terms of SEED's continuing presence in a school, the extent of "long term" participation varied during the 1985-86 school year. Six of the eight participating schools maintained a SEED implementation for over half of the school year. By the end of the 1985-86 school year, eleven classes had participated for a duration ranging from 7 to 24 weeks.
- Contracted services were for orientations for a minimum of 11 fourth and fifth grade teachers. SEED provided orientation for 13 teachers.

SEED and the Regular Elementary Math Program

- SEED does not supplement the regular math program in a traditional manner by providing additional and alternate instruction to reinforce identifiable mathematics curriculum goals. The SEED curriculum and instruction is a complement to the regular elementary math program in much the same way that enrichment programs are.

- o SEED introduces young children to some elements of higher mathematics with an algebra-like curriculum emphasizing exponentiation, and the repetitive and rapid whole-class drill, plus the use of hand signals involves many children in an enjoyable classroom activity.

Student Achievement

The achievement growth for the SEED groups was diverse and gains ranged from significant positive to non-significant negative. There were no significant correlations between achievement outcomes and length of time in the Project, nor between achievement outcomes and SEED specialist.

These mixed results are unexpected given the fact that these students had doubled instructional time for mathematics. One possible explanation for the mixed results is that the SEED curriculum neither reflects nor directly supplements the regular mathematics program, and as an enrichment activity might not be expected to improve mathematics achievement as measured by the District's curriculum-aligned achievement tests.

Student Esteem for Math

Results of the esteem for math assessment were also unexpected, as SEED often describes program outcomes primarily in terms of improved confidence for math learning. Student attitudes toward math learning, surveyed both before and after participation in SEED, did not change significantly. Nearly 70% of student responses were positive regarding confidence and esteem for math learning both before and after SEED. The fact that there are no changes in the esteem scores may be because the scores were already quite high before SEED.

CONCLUSIONS

It appears that this implementation of Project SEED had little or no short-term effect on either student math achievement or self-esteem for math learning.

The phased-in implementation favored by SEED is difficult to accomplish, and resulted in variations in the number of weeks students wre involved in the program. The SEED-preferred 45-minute instructional period required classroom teachers to give up about one third of their total whole-group instructional

time four days a week; teachers most often took time from social studies and science/health instruction. The curriculum which SEED teaches is not integrated with the District's mathematics program.

Based on observations in the SEED classes, the responsive nature of guided discovery in the 1985-86 implementation was replaced by a remarkably consistent--even a "slowed down" -- presentation of an exponentiation curriculum. (See Table A in Appendix A.)

The District supports an array of before and after-school enrichment programs; and it is possible that as an enrichment experience, Project SEED may contribute to longer-term effects for children's math learning.

Because Project SEED does not supplement the elementary mathematics curriculum, it is not reasonable to expect the program as implemented to improve achievement.

RECOMMENDATIONS

1. The data do not warrant an expansion of Project SEED at this time.
2. We recommend that consideration be given to offering Project SEED as an extra-curricular mathematics enrichment program.
3. If the District continues to expect Project SEED to produce achievement growth the following implementation conditions should apply:
   A. A commitment from SEED to apply their instructional strategies to the District's mathematics curriculum.
   B. District support for release of participating classroom teachers during the school year for regular curriculum integration and planning with the SEED specialist.
   C. A pre-planned implementation of at least sixteen weeks per classroom; implementation to begin at the beginning of either the first or second semester of the school year; with scheduling which does not adversely affect a teacher's whole-group instructional time.
4. If the District requires an evaluation of program outcomes, we recommend a comparative study with the District's Heath/Problem Solving in Math program to be delivered by a team of District math specialists for 45 minutes 4 days a week in addition to regular classroom instruction.

APPENDIX A

- Table A: SEED and Regular Mathematics Curriculum
- Summary of Parent Comments on Irvington SEED Demonstration

Table A
SEED and Regular Mathematics Curriculum:
Content/emphasis During Classroom Observations

SEED	Regular Math
1. Exponentiation; factor form, base	Basic skills worksheets
2. Exponentiation; (), base, conjecture sets	Team games at board; 2/3 place addition
3. Exponentiation; conjecture sets; equivalent forms	Fractions; patterns of primes
4. Exponentiation; sentences; Carrying and place value	2/3 place addition; multiplication timed test
5. Exponentiation; sentences	3 digit addition; place value; unifix cubes display manipulation
6. Exponentiation; factor forms; fun sheet	Digits and Places; graphs; rounding numbers; addition enrichment activity
7. Exponentiation; ALFE; true equations, equivalent forms; numerical values	Multiplication factors; activity for generalization
8. Exponentiation; ALFE; Greek letters as variables	3 digit addition; place value; guess and check for sums

9. Exponentiation; ALFE; star problems	Factors in division
10. Exponentiation; numerical values	Subtraction Patterns; multiplication exercises
11. ALFE; inverse operations	Steps in division; use of inverse operation (multiplication) to check
12. Additive inverse; negative numbers, variables	Multiplication factor trees; addition drill with calculators
13. Exponentiation; base	Magic Shapes, equivalent sums; multiplication
14. Subtract exponents; inverse operations	Digit Game--how many in quotient; steps in division
15. Exponentiation chart;/ ALFE; proof of numerical value; identity element	Division, fractions, addition make-up work

Summary of
Parent Comments on Irvington SEED Demonstration

Students	Program/Method	Other Remarks
Child enjoyed		Not sure any teacher can carry it off
Child growth in confidence in math	Exciting method	
My under-achieving child sees a purpose in learning math	Great	
Children excited, participating, enthusiastic	Interesting	The extent of their conceptual understanding is unclear
	Exciting	
Entire class participated, thinking was happening	Fun	
Children excited	Motivating	
My child loves SEED		
Whole class participated, was alert, interested and seemed to enjoy		
	Impressive	
	Impressive	

APPENDIX B

- Principal Interview Questionnaire and Summary of Principal Responses
- Interview Questionnaire for Teachers and Summary of Teacher Responses
- Items from Portland Public Schools Math Questionnaire

1985-86 Project SEED Evaluation

Principal Interview Questionnaire

1. What purpose does Project SEED fulfill in your school program goals?

2. Which class/es will participate in Project SEED? How were they chosen?

3. Are participating classes heterogeneously or homogeneously grouped for Project SEED instruction? Does the regular classroom teacher provide math instruction to the same group of students?

4. What outcomes do you expect as a result of participation in Project SEED?

5. How much time will be spent in Project SEED instruction? (i.e., minutes/day; days/week; weeks/year)

6. How much time will be spent in regular math instruction? (i.e., minutes/day; days/week; weeks/year)

7. How much time will be spent in Chapter I math instruction? (i.e., minutes/day; days/week; weeks/year)

8. How does Project SEED interface with the regular and/or other supplementary math curriculum and instruction?

9. How is instruction time re-allocated to allow time for Project SEED? (i.e., What is being given up? Reading, language arts, social studies, science, other time?)

6687E

Summary of Principal Responses
1985-86 Project SEED Evaluation

Principal Interview Questionnaire

1. What purpose does Project SEED fulfill in your school program goals?

   I see it as a possible change agent helping all staff to take a look at a different way of instruction. We do have goal to try to lift certain grade levels to or above District City average in math.

   Community relations; positive student self-image; improved teaching strategies; higher-level thinking skills.

   Self-esteem; classroom management techniques very positive; all class involvement; children responding; instructional strategy - some esteem related to Algebra - instills some math values. Use of nonverbal signals by students.

   Teaches kids thinking skills, self-esteem, logic and some math skills.

   Doesn't fit into any specific goals or objectives of this school. Does offer something to make kids happy learning - look at learning with a different light.

   Trying to stimulate interest in math; critical thinking skills for low-achieving and minority students.

   I think it gives children awareness of a different method of math; it opens up a method for children to do new things.

   It does not; is not consistent with our goals. We are looking at scope and sequence in each area to teach those things that are appropriate in those grade level areas. SEED goals were not directly related.

2. Which class/es will participate in Project SEED? How were they chosen?

   Will depend on number of instructors; if I have 1 instructor the 4th grade will do it -- 4th teacher is very enthused and is using techniques (additional inservice for her) -- 5th interested in technique not so much in changing. Both were involved last year.

   One 5th now; trying for other 5th - SEED doesn't have enough staff yet. Our 2 teachers asked to participate; they were in orientation last year.

   4th - chosen by persuasion; had 2 weeks last year; SEED wanted her. Will know in January if she'll continue.

2. Which class/es will participate in Project SEED? How were they chosen? (continued)

One 4th grade class only; we were told we could have only one specialist; I chose class I thought housed best support for kids and teachers. Teacher selected did orientation last year.

4/5; she volunteered; none others volunteered. She had orientation last year.

One 4th - may end in December or go on. Teacher I asked to participate had orientation.

5th now participating; teacher was in last year and wanted to do it. 5th will stay in until Christmas; 4th will start in January. Two 5th grade teachers and one fourth grade have participated in the Project SEED Orientation Program during 1985-86 school year.

4th, chosen because she was only 4/5 teacher with orientation and she was willing. She liked program and people in it.

3. Are participating classes heterogeneously or homogeneously grouped for Project SEED instruction? Does the regular classroom teacher provide math instruction to the same group of students?

Heterogeneously grouped for SEED; homogeneously - 4th: high 5th: average.

Heterogeneously for SEED; not for regular -- students are split between 3 teachers for regular math instruction.

Yes -- Yes

They are heterogeneously grouped for both SEED and regular math instruction.

Yes -- for our school they are not severely below grade level learners, but some are students with severe behavior problems - selected because they have potential to be at grade level.

Heterogeneously - the regular classroom teacher provides math instruction until next grading period; then next 9 weeks someone else will teach that group.

All are heterogeneously grouped. Regular instruction is grouped, but only the 2 teachers (one in SEED now; the other likely to be replacement after X-mas) involved in the regular instruction. Two 5th grade orientation classes were held in Project SEED this spring.

Heterogeneously, same group for both.

4. How much time will be spent in Project SEED instruction? (i.e., minutes/day; days/week; weeks/year)

30-40" day/4 days a week - once they get going.

45"/day; 4 days/week all year; if we don't get another specialist, it will end in January at semester. The SEED specialist will then work with another teacher for the second part of the year.

45"/day; 4/days/week at least through January 6. The teacher will see how it goes from there. Another 4th grade teacher took the orientation and did it the rest of the year. The former teacher felt other subjects lost too much at 45" per day; 4 days per week.

45"/day.

45"/week; might start October, November, December. . .

30"/day; 4 times/week

35-40"/day; 4 days a week.

40 minutes/day, 4 days/week, sustained for full year.

5. How much time will be spent in regular math instruction? (i.e., minutes/day; days/week; week/year)

5th: 50"/day
4th: 45"/day

40-45"/day; 4 days/week

At least 45-60"/day all year.

30-45"/day; PSM 10" additional for regular math.

55"/day

55"; daily

35-40"/day

At least 50 minutes/day.

6. How much time will be spent in Chapter I math instruction? (i.e., minutes/day; days/week; weeks/year)

15"/day Prescription Learning all year; one or two may leave during SEED.

40-45"; 3-4 days a week is designed for Chapter I support.

CCC drill and practice 10" during another time of day; aides support math instruction in regular classroom also for 45-60" per day.

Different from student to student, depending on individual needs.

No Chapter I math students in class.

30"/day, 4 days/ week; some may leave for Chapter I during regular math.

Prescription Learning math is not during regular math or SEED; about 30"/day for 5 week periods.

Probably a few kids (maybe a couple of kids) are in Chapter I math pullout at 30 minutes/day, 4 days/week.

7. How is instruction time re-allocated to allow time for Project SEED? (i.e., What is being given up? Reading, language arts, social studies, science, other time?)

It's going to cut into social studies.

Teachers will be able to tell you that.

Teacher will be able to tell you that. She said social studies, health, science and language usage were those she gave up.

Some science, social studies, health.

Planning periods, (not out of music, P.E.) Language Arts, (including reading) math, are not touched.

Individual teacher will have to decide.

Taking a little time out of Language Arts and reading.

We have so much fragmentation to begin with, we've been trying to decrease (to have fewer people with kids and a more integrated curriculum so everything fits). I have been insistent that other programs not be in the school and that we have control. SEED may have merit in many contexts, but this is not necessarily the one.

8. What student outcomes do you expect as a result of participation in Project SEED?

Given an outstanding instructor, I believe the kids are in a position to make above average gains in achievement - the teachers would be more versed in method and use it.

Higher self-esteem; greater ability to grasp concepts quicker; improved thinking skills; classroom behavior; willingness to be supportive of others. Achievement and learning from mistakes; improvement in math skills.

Because of self-esteem we could see some increase in achievement. They really appear to be having fun. Two ESL children may not be enjoying it - students with serious behavior problems are able to be engrossed during the SEED specialist instruction. I see mature problem solving happening in and out of class.

Teaches kids thinking skills, self-esteem, logic and some math skills.

If specialists come and teach on a regular consistent basis, students might have better feeling about their math learning.

Raised interest in math; feeling of being able to participate more; introduction of Socratic method to teachers.

I think kids would be more interested in math and different process in math; more eager to learn; have a positive experience. A better understanding of math and a positive self-concept.

I had no expectations.

9. How does Project SEED interface with the regular and/or other supplementary math curriculum and instruction?

PSM will come very close and there's a certain logic to both SEED and PSM and they can't help apply it to SEED math - can't help but have an effect on the Heath program.

Told instructional specialist we could use 2 Specialists; told we can only have one.

It complements the regular curriculum but doesn't directly supplement it; SEED and regular math do supplement one another, but no more directly than literature complements the regular reading basal.

I have an expectation for teacher outcomes - teacher practices e.g., calling on every child; hand signals for numbers operations are nonaudible and helpful signals. Instruction in algebra isn't something we need to be doing in grades 4, 5; exponentiation is a part of the curriculum. If SEED had been for 30" instead of 45", we could have had several teachers participate. Six said they would.

9. How does Project SEED interface with the regular and/or other supplementary math curriculum and instruction? (continued)

Skills in SEED are important in any area; not just math. It may create and sustain high interest, catch a lot of kids and keep them with math.

I would like to see more alignment with other subject matter and teaching teachers the instructional strategies used in SEED.

At this time the effectiveness of the SEED program is dependent on the abilities of the SEED instructor.

Not at all - no correlation between programs or goals, their ability in school; may provide fleeting knowledge of (introduction to) concepts; not concrete.

The instructor gave up on our class - said that the students were too hard to teach, and pulled out. We had the class give SEED feedback on the problems. They (SEED) did not listen, and blamed the problems on the "bad" kids. I question having people with this attitude in our buildings and at such a cost.

May have to split the interface of attitude and curriculum; there is not a curriculum interface at this point and teachers don't see one. We rather expected SEED to use Heath text in Socratic method.

I think it does not, but it reinforces some of the things; the SEED curriculum is over and above. They do have time to talk to SEED either daily or weekly.

I don't see a great interface. It perhaps fits in with problem-solving to help kids use those processes.

6812E

1985-86 Project SEED Evaluation
Interview Questionnaire for
Teachers of "Long-Term" SEED Classes

1. How does Project SEED interface with your regular math program? In terms of curriculum? In terms of instruction?

2. How much scheduled time do you have for whole-class instruction? What instructional time have you reallocated to provide time for SEED instruction?

   Reading:

   Math:

   Language Usage:

   Science:

   Social Studies:

   Other:

3. When and how does the SEED specialist coordinate his instructional delivery with your regular math program?

Nature of Interaction	Time: Minutes/Days/Weeks	Mode
Conversation		
Consultation		
Lesson Planning		
Team Teaching		
Other:		

4. What outcomes do you expect for your students as a result of their participation in Project SEED?

5. What have you gained as a result of your observation/participation in Project SEED?

Summary of Teacher Responses
1985-86 Project SEED Evaluation

Interview Questionnaire for Teachers

1. How does Project SEED interface with your regular math program? In terms of curriculum? In terms of instruction?

   I seem to be using techniques all the time. It gives kids problem-solving ideas -- fits in because my expectations grow.

   They have done things that feed into and go along with what we're studying at the time, e.g. fractions.

   It only connected a little; I use some of the same techniques.

   We've worked at it. We have spent a lot of time on fractions. The specialist used them a little bit every day. He's real quick and he understands.

   SEED supplements in terms of curriculum techniques/signals; some were helpful in the classroom. The specialist was losing them, going over and over the same material; he had no discipline.

   He's done some work with fractions that helped kids understand what I'm doing with them better. Kids pay attention, challenge me when I'm at board and interact more than other math classes. His drill in multiplication facts and concepts has complemented my work.

   It fits in because you can use group cooperation methods and interest children in math. We sat down and decided what he'd teach besides exponentiation, e.g. fractions, decimals, numbers. He taught addition, subtraction, skills and terminology; that's in the math book.

   SEED is a reinforcer of basic operations; they used some problem-solving techniques.

2. How much scheduled time do you have for whole-class instruction? What instructional time have you reallocated to provide time for SEED instruction?

   3 hours/day. Social Studies: It took time from social studies.

   5 hours/day. Science: I had a little less health.

   2 hours, 15 minutes/day. Social Studies: I had a little less social studies.

   5 hours/day. Science and Social Studies: The time was taken from science, health and social studies.

   2-1/2 hours/day. Social Studies: Sometimes I took time from social studies. I didn't hit some subjects as often as I should, but coordinated.

2. How much scheduled time do you have for whole-class instruction? What instructional time have you reallocated to provide time for SEED instruction? (continued)

Too hard to explain because students are constantly regrouped. Language Usage: I took time from spelling and literature.

2-1/2 to 3 hours/day. Language Usage, Science and Social Studies: I took a little time out of language, science and social studies.

2 hours/day. Math: I took 10 minutes out of math (normally math is 50 minutes; SEED 40 minutes) and some from science and health.

2-1/2 hours/day. Science and Social Studies: SEED came out of science and social studies.

3. When and how does the SEED specialist coordinate his instructional delivery with your regular math program?

He first introduced "E"; he went to fractions and decimals because was on those topics. We had a meeting every other week for 30to 45 minutes.

The first specialist used to come in the morning; every 3rd week or so for 20 minutes. I had less with the 2nd specialist, mainly informal conversation.

He only coordinated a little bit; we had a conversation once in a while (about once every 2 months) for about half an hour.

We spoke in passing, less than 5 minutes on 2 or 3 days during the project.

The specialist came earlier about twice a week and also Fridays. We used my prep time.

It doesn't happen; it did at the beginning for about the first 3 weeks, then it ended.

We spent 20 minutes/week after school; talked about student weaknesses. I asked them to include subjects and he could/he would. We talked about students.

We spent time fairly regularly once a week for about 20 minutes.

4. What outcomes do you expect for your students as a result of their participation in Project SEED?

I expect them to be able to go into grade 6 and be comfortable/not frightened with algebra.

I believed they would enjoy math better, but it hasn't turned out. I would recommend the same specialist all year; the second had problems with the kids and so I have too.

4. What outcomes do you expect for your students as a result of their participation in Project SEED? (continued)

I hoped that their math scores would increase and that their opinion of math and their ability to attack math problems would improve.

Their confidence has increased immensely. They look at different (more than 1) ways to solve problems. They see problems through not just how to do a problem. The specialist has been good about differentiating between the why and the how. Kids need reinforcement at distinguishing between these two.

A double dosage (lots of math) will contribute to achievement gain.

I don't expect any; I see some willingness to question each other and interact more.

A more postive attitude toward math.

What I was hoping for was that they'd feel more comfortable, more open to math, to problem-solving. As I watch, I see more volunteering during problem-solving time; more creative solutions.

5. What have you gained as a result of your observation/participation in Project SEED?

I am real comfortable with the "E" form and logarithms. You get a different idea about your expectations.

The main thing has been the signals and subtler things that happen in my and the children's operation. When you live it day by day it becomes a natural part of the operation.

I don't feel I have gained anything. Last year, initially I learned new techniques, but I had that last year.

I gained lots of techniques/signals (I picked that up a long time ago), giving examples and letting kids infer. I also used that before though it's wonderful to see it reinforced. I haven't done these things so much in math and I am delighted to see it there. SEED was fun for them.

What I gained I gained last year; a little in questioning strategies. I gained all I could gain in 2 weeks exposure last year.

More ideas in methods; involving students; chance to sit back and look at what's going on in kid's head and realizing that could be happening when I'm teaching a lesson. It's a chance to get to know them better to see how I could help them.

New classroom strategies, e.g., head problems which kids enjoyed and it was a good way of focusing them, like a management strategy plus a good math reinforcer that brought the kids back to the problem at hand.

I learned a little more algebra than I knew.

PORTLAND PUBLIC SCHOOLS MATH QUESTIONNAIRE

1. I know math will always be easy.
2. My math is right most of the time.
3. I can understand math.
4. I understand math well enough to help others.
5. Math is difficult.
6. Most people can do math better than I can.
7. I am smart in math.
8. My teacher thinks I am good in math.
9. I could help my friends do math.
10. I can learn to do new math problems.
11. Math is too easy for me.
12. Math is cool.
13. Math is easy.
14. No matter how hard math gets, I will be able to do it.
15. I am the last one to finish math.
16. Math is hard to do.
17. Math is easy for me.
18. I have given up on math.
19. Math is hard to remember.
20. I can answer most math problems.
21. I can use math to do hard problems.
22. I am able to help others with math.
23. I must have help in math.
24. I can do math without writing it down.
25. My parents think I am good in math.
26. I will probably be great at math in high school.
27. I can keep up in math.
28. I find new ways to do math problems.
29. I can do math, if I try.
30. My friends ask me to help them with math.
31. Math is not easy.
32. Math is very hard.

MATH QUESTIONNAIRE (Continued)

33. Math is hard.
34. Math games are easy to win.
35. Math is the easiest thing I do in school.
36. I can do better in math.
37. I get mixed up when I do math.
38. Other students in class think I am great at math.
39. I can do math fast.
40. Math is very easy.
41. I can do my math.
42. I am a math superstar.
43. I can work most math problems.
44. It would be easy for me to learn decimals.
45. Other kids are better at math than I am.