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ABSTRACT

Project Special Elementary Education for the Disadvantaged (SEED) is a nationwide program in which professional mathematicians and scientists from major universities and research corporations teach abstract, conceptually oriented mathematics to full-sized classes of elementary school children on a daily basis as a supplement to their regular arithmetic programs. Instruction is through a Socratic group discovery format. In the Detroit (Michigan) public schools the program was used with all levels of students. This evaluation considers 16 SEED fourth-grade classes in 13 elementary schools. Mathematics achievement was measured with the California Achievement Test and compared with achievement in classes and schools without SEED instruction. Impact was also judged through questionnaire responses of 12 principals, 13 teachers, and 244 parents. Results suggest an immediate impact of SEED participation, with improvement in mathematics total scores, computation, and mathematical concepts. The comparison groups lost ground in everything but mathematics concepts, and growth in that area was much less than that of SEED students. Ten tables present study data. Appendixes contain the principal and teacher questionnaires. (Contains 4 references.) (SLD)

The Evaluation of Project SEED, 1991-92

DETROIT PUBLIC SCHOOLS

William J. Webster

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EXECUTIVE SUMMARY
The Evaluation of Project SEED
1991-92
Detroit Public Schools

Evaluator: William J. Webster

PROGRAM DESCRIPTION

PROJECT SEED is a nationwide program in which professional mathematicians and scientists from major universities and research corporations teach abstract, conceptually oriented mathematics to full-sized classes of elementary school children on a daily basis as an extra-period supplement to their regular arithmetic program. The mathematics is presented through the use of a Socratic group discovery format in which children discover mathematical concepts by answering a sequence of questions posed by the SEED instructor. Project SEED believes that only persons who understand mathematics in depth possess the versatility to capitalize on the unconventional and often original insights that children are capable of making in an open-ended mathematical dialogue. The initial mathematical topics are chosen from high school and college algebra to reinforce and improve the students' critical thinking and computational skills and to help equip them for success in college-preparatory mathematics courses at the secondary level. Subsequent material establishes the mathematical foundation for a number of advanced areas of study and progresses into advanced topics in abstract algebra and other areas. Project SEED teaches entire regular elementary school classes rather than specially selected groups of students. Although SEED was originally begun as a program for the educationally disadvantaged (the acronym SEED stands for Special Elementary Education for the Disadvantaged), the project now is implemented with all levels of children across the nation. In its Detroit Public Schools' implementation, SEED was used with all levels of students and was not intended as a program for a specific group of students. The Detroit Public Schools implementation of SEED also continued SEED's nationwide practice of using intact classes in the schools in which it is implemented. This study examined sixteen SEED fourth grade classes in thirteen Detroit elementary schools.

PREVIOUS STUDIES

There have been no previous studies of the implementation and impact of SEED in the Detroit Public Schools. However, since the implementation of SEED is uniform across settings, studies done in other school districts are relevant. There have been six series of studies on SEED at the 4-6 grade levels in the Dallas Independent School District. The results of these studies suggested that exposure to Project SEED contributed to:

- an immediate impact of one semester of SEED instruction on mathematics achievement as measured by the *Iowa Tests of Basic Skills (ITBS)* Math Total, Concepts, Problem Solving, and Computation subtests. This impact ranged as high as 1.48 years but generally was in the area of three to four months.
- a cumulative impact of more than one semester of SEED instruction on Mathematical Concepts, Problem Solving, Computation, and Math Total as measured by the *ITBS*.
- retention of mathematics skills by former SEED students up to four years after exposure to SEED.
- significantly greater enrollment of SEED students in middle and high school higher level mathematics courses.

EVALUATION METHODOLOGY

The major purpose of this study was to determine the impact of one semester of SEED instruction in the Detroit Public Schools at the fourth grade level on mathematics achievement as measured by the *California Achievement Test*. A related question concerned the reaction of principals, classroom teachers, and parents of SEED students to the program.

Project SEED was implemented at the fourth grade level for one semester in sixteen classrooms in thirteen schools. SEED schools were matched with comparison schools on the basis of poverty index, Math Total score in 1990, and number of students tested at the third and fourth grade levels in 1990 (size of school). Two different approaches were used in the analysis. The first compared all students for whom complete data were available who were 1) exposed to SEED, 2) enrolled in the SEED schools and not exposed to SEED, and 3) enrolled in the comparison schools. The second compared students from within the three groups who were matched on pre-treatment Math Total score, gender, ethnicity, socioeconomic status, and grade.

Analysis of covariance was used to adjust minimal pre-test differences among the groups and normal curve equivalents (NCE) were the unit of analysis.

Questionnaires were completed by 12 of 13 SEED principals, 13 of 13 SEED classroom teachers, and 244 of 378 parents of SEED students. The questions were designed to elicit opinion about the impact of SEED on students.

RESULTS

The results of this study suggest an immediate impact of one semester of SEED instruction on student mathematics achievement as measured by the *CAT*. The following table shows the pre-test and post-test mean NCE's and equivalent percentiles for the matched groups. In terms of percentiles, the SEED group went from the equivalent of the 51st percentile to the equivalent of the 58th percentile on Math Total while the comparison group from SEED schools lost one percentile point and the general comparison group lost eight.

In math computation, the SEED group went from the equivalent of the 51st percentile to the 53rd percentile while the comparison group from SEED schools lost four percentile points and the general comparison group lost fourteen. In math concepts, the SEED group went from the equivalent of the 51st percentile to the 62nd percentile while the comparison group from SEED schools gained only four percentile points and the general comparison group lost one.

Specifically,

- SEED students scored significantly better in Math Total than did non-SEED students in SEED schools and comparison students. Post-test differences showed an eight percentile difference between SEED and non-SEED students in SEED schools and a fifteen percentile point difference between SEED and comparison students.

- SEED students and non-SEED students in SEED schools scored significantly better than comparison students in Math Computation. SEED students gained two percentile points while non-SEED students in SEED schools lost four percentile points and comparison students lost fourteen.

- SEED students scored significantly better in Math Concepts than non-SEED students in SEED schools and comparison students. SEED students gained eleven percentile points while non-SEED students in SEED schools gained four percentile points and comparison students lost one.

Principals, classroom teachers, and parents of SEED students were generally very supportive of SEED. SEED teaching methods were rated as extremely effective, student enthusiasm and participation in the program were rated as excellent, and perceived student benefits included improved critical thinking, listening, and problem-solving skills, increased motivation to learn, increased academic confidence and self-esteem, and improved performance in the regular mathematics program.

Pre-test and Post-Test Mean
NCE's and Equivalent Percentiles
For Matched Groups, N = 244

	SEED		Non-SEED, SEED SCHOOLS		COMPARISON	
	PRE	POST	PRE	POST	PRE	POST
Math Total						
NCE	50.63	54.08	50.69	50.10	50.70	46.41
PCT.	51	58	51	50	51	43
Math Computation						
NCE	50.56	51.72	51.71	49.48	50.90	43.81
PCT.	51	53	53	49	52	38
Math Concepts						
NCE	50.68	56.63	49.47	51.49	50.79	49.94
PCT.	51	62	49	53	51	50

The Evaluation of PROJECT SEED, 1991-92, DETROIT PUBLIC SCHOOLS[1]

William J. Webster

This study reports the results of the implementation of Project SEED in sixteen Detroit public schools' fourth grade classrooms. Students who were exposed to one semester of SEED instruction were compared to students from the same schools who were not exposed to SEED and to students from comparable schools. SEED students outperformed students in comparison schools in mathematics computation and concepts as well as math total scores on the *California Achievement Test (CAT)*. SEED students also outperformed non-SEED students from the same schools in math concepts and math total. Non-SEED students from SEED schools outperformed students from comparable schools on math computation and math total, but not on math concepts. Principals, classroom teachers, and parents of SEED students rated SEED teaching methods as extremely effective, student enthusiasm and participation in the program as excellent, and listed student benefits from the program as including improved critical thinking, listening, and problem-solving skills, increased motivation to learn, increased academic confidence and self-esteem, and increased performance in the regular mathematics program.

PROGRAM DESCRIPTION

PROJECT SEED is a nationwide program in which professional mathematicians and scientists from major universities and research corporations teach abstract, conceptually oriented mathematics to full-sized classes of elementary school children on a daily basis as an extra-period supplement to their regular arithmetic program. The mathematics is presented through the use of a Socratic group discovery format in which children discover mathematical concepts by answering a sequence of questions posed by the SEED instructor. Project SEED believes that only persons who understand mathematics

[1] The Project SEED classes evaluated in this document are funded in the Detroit Public Schools by The Skillman Foundation, Grant 90-233.

in depth possess the versatility to capitalize on the unconventional and often original insights that children are capable of making in an open-ended mathematical dialogue. The initial mathematical topics are chosen from high school and college algebra to reinforce and improve the students' critical thinking and computational skills and to help equip them for success in college-preparatory mathematics courses at the secondary level. Subsequent material establishes the mathematical foundation for a number of advanced areas of study and progresses into advanced topics in abstract algebra and other areas. Project SEED teaches entire regular elementary school classes rather than specially selected groups of students. Although SEED was originally begun as a program for the educationally disadvantaged (the acronym SEED stands for Special Elementary Education for the Disadvantaged), the project now is implemented with all levels of children across the nation. In its Detroit Public Schools' implementation, SEED was used with all levels of students and was not intended as a program for a specific group of students. The Detroit Public Schools implementation of SEED also continued SEED's nationwide practice of using intact classes in the schools in which it is implemented. This study examined sixteen SEED fourth grade classes in thirteen Detroit elementary schools.

A Typical SEED Class

Project SEED is a supplementary program which is taught entirely by the SEED specialist assigned to a given class. The students in the class receive regular baseline instruction in mathematics from their regular teacher. (This will either be a mathematics teacher in a departmentalized setting or the classroom teacher in a self-contained setting.) The students then receive a period of SEED instruction four days a week from the SEED specialist. The fifth period is an inservice period for the SEED specialist. In this fifth period, the students work at the direction of the classroom teacher. This work may or may not be related to the material taught in Project SEED at the discretion of the teacher, but it usually is not. The teacher is present while SEED is being taught and participates in the instruction by using SEED discovery techniques.

Instruction in the SEED program will be considered in two parts, the instructional methodology of SEED and the mathematics content of the program. SEED used a group instructional methodology. The class is taught using a series of directed questions. The instructor asks questions of individuals in the class or of the class as a whole. New material is introduced at a slow pace and the majority of classroom time is usually spent in working on applications related to material previously encountered or in reviewing new and previous work. This stress upon application and review is intended to ensure that the students have a solid foundation in previously learned material before new material is introduced.

The SEED specialist uses a number of devices to manage the instruction in the classroom. The students are required to respond to most of the questions and discussions in the class. The responses are given using hand signals unless the students are asked directly to respond verbally. Signals are used to indicate agreement and disagreement with the topics of discussion and to respond to questions. The purpose of the signals is to give the instructor continual feedback about student perceptions of the material, to ensure group response which involves most (if not all) of the students in the dialogue on the material, and to maintain a degree of order in the classroom which could not be achieved using verbal responses. On the basis of the observations of SEED classes during the process evaluation in other settings, the signals seem to succeed in accomplishing these purposes.

To help ensure student involvement, each student is called upon several times each period to provide answers or comments. In the event a student is not participating in the discussions, the SEED instructor will use such devices as having the student call upon another student to provide an answer or calling upon the student to provide a number for a problem. Other devices used to keep student involvement at a high rate include having all students participate in group verbal responses to questions, having students write answers to questions on their papers and checking all or part of the papers immediately, or having all students show the answer to a question on their fingers. These methods and a number of others are all designed to keep student interest and involvement high, as well as to accomplish other instructional objectives.

To mitigate problems associated with locus of control in the classroom, the SEED instructor moves frequently in the classroom and avoids teaching and questioning from the same spot. This also helps keep students attentive since, at any moment, the instructor may be asking the next question from any part of the room. SEED classes have a higher proportion of visitors than usual, and the visitors and the teacher are utilized by the instructor. For example, the instructor might ask a visitor to call upon a student with his or her hand up to answer a question. In this fashion, the students become accustomed to visitors and enjoy sharing their knowledge with the visitors who enhance the whole experience.

The primary feature of the instructional system, however, is the set of questions asked by the SEED specialist. Almost all of the instruction is done through the use of questions. Rarely does the instructor directly tell the students anything. This is done, again, to help keep the student actively involved in the progress of the class and to avoid having the student as a passive recipient of the subject material. The instructor, in preparing for the class, thinks through the subject matter to be presented and assembles a list of sequenced questions which will be used as the basis of the questions asked of the students in class. These questions develop the content to be covered in logical and detailed sequence which is then transferred to the classroom and form the heart of SEED instructional process.

SEED Mathematics Content

The mathematics content observed in the SEED classes consisted primarily of a thorough preparation in pre-algebra mathematics and beginning concepts of abstract algebra, with examples taken from the real number system. Some of the topics observed in the full SEED 4-6 program included properties of positive and negative numbers, properties of exponents, the additive law of exponents, definition and properties of logarithms, use of the distributive law of real numbers to prove properties of positive and negative numbers, the definition and properties of additive and multiplicative identities, the definition of additive and multiplication inverses, the definition and properties of negative exponents, the definition and application of summation and product symbols, and an introduction to mathematical series.

The Detroit Public Schools has an underlying goal in instituting the SEED program. This goal is to encourage more students to participate in the high school algebra sequence and the mathematics sequences following algebra. The hope is that participation in the SEED program will give more students the motivation to take the course sequence and will equip them with the necessary mathematical skills to succeed in this goal. One of the objectives of the longitudinal part of this study is, within the limitations discussed in the Methods section, to determine if this phenomenon can be documented.

PREVIOUS STUDIES

Project SEED has been implemented in the upper elementary grades in the Dallas Independent School District (DISD) since the 1982-83 school year. For 1982-83 and 1983-84 it was implemented in selected elementary schools for one semester at either grade 4 or grade 5. In 1984-85 the program became part of the curriculum of the District's grade 4-6 Learning Centers where students received three semesters of SEED, one semester in each of grades 4, 5, and 6. These studies are relevant to the SEED studies in the Detroit Public Schools since the implementation of Project SEED is consistent across settings.

Six series of studies on the impact of SEED on student achievement and associated variables were conducted in the DISD between 1982-83 and 1990-91. All studies focused on the immediate and longitudinal impact of SEED instruction on achievement in and attitudes about mathematics. All studies were conducted on students in grades 4 through 6. All studies used theoretical comparison groups. That is, each student in each of the SEED groups was systematically matched to a non-SEED comparison student. Comparison students were drawn from many District schools and thus represent many different math treatments. All matching was done in the year prior to exposure to SEED. Variables used in the matching process were gender, ethnicity, grade, socioeconomic status as indicated by free or reduced lunch, and mathematics achievement levels.

Series 1. The first study of SEED in the DISD was conducted in 1982-83 and examined the impact of one semester of SEED instruction in a non-Center environment at the fourth or fifth grade level. Schools in which SEED was implemented, included Walnut Hill, Preston Hollow, Thornton, Burleson, Lisbon, U. Lee, Roberts, Lakewood, Patton, Moseley and Longfellow. According to the evaluation report (Mendro, 1983), the program was well managed and produced significant impact on student self-concept and achievement in mathematics.

Series 2. A second series of studies examined the impact of one semester of SEED instruction on mathematics achievement and attitude. Six different SEED groups drawn from the non-Center schools specified under Series 1 and their respective theoretical comparison groups were compared relative to post-SEED achievement trend mathematics course enrollment. The design was set up so that each study was replicated within the design. Analyses were performed on two separate and distinct groups of fourth, fifth, and sixth graders, each being followed for a period of five years. Further replication studies were accomplished by examining the immediate impact of SEED instruction on student achievement in the year that SEED was offered, thus examining the impact of SEED on a group of students that did not exhibit the mortality of the five-year longitudinal groups.

In the case of this series of studies, SEED students were exposed to regular math plus SEED instruction, while comparison students were exposed only to regular math.

Thus, part of the treatment ..as additional exposure to mathematics (45 minutes). Longitudinal group sizes ranged from 32 to 87. Short-term group sizes ranged from 245 to 295. Initial groups were chosen in 1982-83 and 1983-84.

The results of this second series of studies suggested strong and consistent immediate impact of SEED instruction on mathematics achievement as measured by the Concepts, Problem Solving, Computation, and Total sections of the *Iowa Tests of Basis Skills (ITBS)*. These improved scores were generally present at least one year after students had been exposed to SEED. The results also suggested greater impact of SEED on the achievement of lower socioeconomic students. In addition, former SEED students clearly took higher percentages of advanced courses than did their matched comparisons. (Webster and Chadbourn, 1988).

Series 3. The third series of studies examined the achievement trends of students who were enrolled in SEED three semesters: one in the fourth grade in 1984-85, one in the fifth grade in 1985-86, and one in the sixth grade in 1986-87.

Project SEED has been implemented in three special schools since the 1984-85 school year. Although the schools had many special programs and arrangements, they were primarily designed to raise student achievement levels in reading. Classes were self-contained and the homeroom teacher generally taught all subject areas except music and art. Instructional treatment in mathematics represented an extra 45-minutes of SEED instruction per day for four days a week. Comparison students had mathematics instruction by either self-contained teachers or mathematics specialists for 60-minutes per day. SEED students had instruction by self-contained teachers (non-mathematics specialists) plus the instruction by SEED instructors. These were the best comparisons that were available, since all students in the special schools had SEED.

As in the series of studies outlined as Series 2 of this investigation, comparison groups were selected from groups of students similar to those who received SEED instruction. The same selection criteria were used as were used in Series 2 of the investigation except, of course, the comparison groups matched the characteristics of the Series 3 SEED students.

Two major questions were examined. First, were the post-SEED instruction achievement trends of SEED students different from those of comparison students who were not exposed to SEED? This question was examined separately using the Math Concepts, Math Problem Solving, Math Computation, and Math Total scores on the *ITBS*.

Second, given that the schools studied were Learning Centers and had many special arrangements over other schools, the same type of longitudinal analysis was done on reading. The case for a treatment effect of Project SEED would be greatly enhanced if math trends among Center students were more positive than reading trends. The Reading subtest of the *ITBS* was used for this analysis. In addition, SEED data bases were established so that SEED student achievement as well as mathematics course selection versus that of comparison students could be analyzed over succeeding years.

The cohort samples for this series of studies required four years of test data. There were 517 SEED and 517 comparison students. The samples were one hundred percent Black and Hispanic, and seventy-nine percent on free and reduced lunch. Their pre-1984 achievement levels ranged from the first to the tenth decile.

The results of this series suggested an immediate impact of SEED at the fourth grade level on mathematics achievement. This impact increased at grade 5 and further accelerated at grade 6. Thus, students who entered the fourth grade about even with their peers left the sixth grade about one-half year ahead of their peers in Problem Solving and almost one year ahead in Concepts. In addition, they were at or above grade level in Concepts, Computation, and Total Math scores.

Both the SEED and comparison samples had Spring, 1984, mean scores of 3.33 in Reading. During the succeeding three years of instruction, the SEED sample advanced to a mean score of 5.98 while the comparison sample advanced to a mean score of 5.55. Thus, the SEED sample gained 2.65 grade equivalent units in reading while the comparison sample gained 2.22 grade equivalents in reading. Compare this to a mean gain of 3.18 grade equivalent units in mathematics for the SEED students versus 2.36 grade equivalents for the comparison group. (Webster and Chadbourn, 1988).

Series 4. The fourth series of studies replicated the Series 2 studies plus added an additional outcome variable, a criterion-referenced test entitled the *Survey Tests of Essential Elements/Learner Standards (STEELS)*. This series of studies also examined retention rates, enrollment in higher level mathematics classes, withdrawal rates, and long-term impact of SEED. Four different samples were used. These samples included: students who had SEED instruction in the Learning Centers in grades 4-6 in 1985 through 1988; students who had SEED instruction in the Learning Centers in grades 4-6 in 1986 through 1989; follow-up of students who had one semester of SEED in 1982-83 or 1983-84 as well as Learning Center students who had three semesters of SEED in 1984-87.

This series of studies on SEED took an indepth look at the impact of SEED instruction on mathematics achievement as measured by the *ITBS* and *STEELS* and on student attitudes toward mathematics as measured by the enrollment of students in advanced math courses. Most of the students in the SEED group were also Learning Center students, thus introducing an intervening variable into the process of interpreting the results. Analyses of Learning Center Reading achievement were conducted to provide some measure of the impact of the Centers independent of SEED. Early non-Center SEED groups were also studied for this purpose.

Although the primary focus of this series of investigations was to examine the impact of Project SEED in the Learning Center environment, part of the study focused on non-Learning Center students who had only one semester of SEED in the fourth, fifth, or sixth grade. Although the achievement impact of this strategy appeared to wash out after two years, former SEED students still appeared to enroll in more higher level math classes, withdraw from the District less, and be retained fewer times than did their matched comparison groups.

The results of this series of studies suggested that SEED instruction in the Learning Centers contributed substantially to increased mathematics achievement as measured by the *ITBS* and *STEELS*, increased enrollment in higher level mathematics courses, lowered grade retention and District withdrawal rates, a cumulative impact on mathematics achievement, that is, longer exposure to SEED (up to three semesters) appeared to accelerate measured mathematics achievement growth, and, retention of mathematics gains for at least two years after exposure to SEED. (Webster and Chadbourn, 1989).

Series 5. The fifth series of studies replicated the Series 4 studies and followed up students who had been included in the Series 1 and Series 2 studies to determine longitudinal impact on mathematics achievement and enrollment in higher level mathematics courses. Eight different samples were used to implement three different studies.

The first was a study of students who were exposed to one, two, or three semesters of SEED instruction in the Centers culminating in the Spring of 1990. These students were compared with their matched comparison groups on the *ITBS* Math Total, Concepts, Problem Solving and Computation subtests, as well as the *STEELS* Mathematics test. All comparisons were significant, $p \leq .01$, in favor of the SEED groups.

The second study was a longitudinal follow-up of these students who had three semesters of SEED in the Centers in 1984-87, 1985-88, or 1986-89. These students were compared with their matched comparison groups on the Math Total, Concepts, Problem Solving, and Computation subtests of the *ITBS*. The results of this study replicated the finding of a cumulative impact on mathematics achievement of increasing semesters of SEED (up to three), of continued mathematics achievement impact up to two years after SEED instruction was completed, and of more SEED students enrolling in higher level mathematics courses.

The third study completed the follow-up of students who had had one semester of SEED in a non-Learning Center environment in 1982-83 or 1983-84. These students enrolled in more higher level mathematics courses than their matched comparisons. (Webster and Chadbourn, 1990).

Series 6. The sixth series of studies replicated Series 5 studies and extended the follow-up of grade 4-6 Center students to the tenth grade. Once again, SEED students demonstrated increased mathematics achievement levels as well as improved mathematics achievement up to four years after exposure to SEED (Webster and Chadbourn, 1991).

Summary. In summary, six series of studies on SEED at the grades 4-6 level took an indepth look at the impact of SEED instruction on mathematics achievement as measured by the *ITBS* and *STEELS* , and on student attitudes toward mathematics as measured by the enrollment of students in advanced math courses. Most of the students in the SEED group were also Learning Center students, thus introducing an intervening variable into the process of interpreting the results. Analyses of Learning Center Reading achievement was conducted to provide some measure of the impact of the Centers independent of SEED. Early non-Center SEED groups were also studied for this purpose.

Although the primary focus of this series of investigations was to examine the impact of Project SEED in the Learning Center environment, part of the study focused on non-Learning Center students who had only one semester of SEED in the fourth, fifth, or sixth grade. The achievement impact of only one semester of SEED instruction was present after two years and former SEED students enrolled in more higher level math classes than did their matched comparison groups.

The results of these studies in the Learning Centers suggested that SEED instruction in the Learning Centers contributed substantially to increased mathematics achievement as measured by the *ITBS* and *STEELS*, increased enrollment in higher level mathematics courses, a cumulative impact on mathematics achievement (longer exposure to SEED appeared to accelerate measured mathematics achievement growth), and retention of mathematics gains for at least four years after exposure to SEED.

DETROIT STUDY DESCRIPTION

The purpose of this study is to determine the short-term and long-term impact of SEED instruction on student mathematics achievement and attitudes. In addition, parents, classroom teachers, and principals of the thirteen schools that have SEED classes in this study were surveyed to determine their perceptions of program implementation and impact on student mathematics achievement and attitudes.

Major Evaluation Questions

Evaluation questions were necessarily divided into two categories: short-term that were addressed by this study during the 1991-92 school year, and long-term that will be addressed in future years. Data bases have been established during the 1991-92 school year that will enable the investigation of the long-term questions in future studies.

For the 1991-92 school year, the impact of one semester (a minimum of fourteen weeks) of SEED instruction at the fourth grade level on student mathematics achievement, as measured by the *California Achievement Test* (*CAT*), was investigated as was the reaction to the program of principals, classroom teachers, and parent, from schools where SEED was implemented. Specifically, questions investigated in this first phase of the study were:

- What is the impact of one semester of SEED instruction at the fourth grade level on mathematics achievement as measured by the *California Achievement Test?*

- What is the reaction of Project SEED principals, classroom teachers, and parents of SEED students to the program?

Investigations relating to the long-term impact of SEED, the enrollment of former SEED students in higher level mathematics courses, and the cumulative impact of more than one semester of SEED instruction, must be reserved for future studies when longitudinal data will be available.

Sample

Project SEED was implemented at the fourth grade level for one semester in thirteen schools in the Detroit Public Schools. Ten of the sample schools had one SEED class, three had two classes. Thus a total of sixteen classes were used in the study.

For purposes of drawing treatment and comparison groups, two levels of sampling occurred. The first involved matching at the school level. Comparison schools were matched to SEED schools on the basis of poverty index, Math Total, and size of school as presented by the number of students tested at the third and fourth grade levels. Results of the matching procedure at the school level are shown in Table 1. Two series of analyses were then completed. First, all students were used in the analyses. Secondly, students from within the various schools were matched. In both analyses, three groups were formed: 1) students who were exposed to SEED, 2) students who were enrolled in SEED schools but were not formally exposed to SEED, and, 3) students who were enrolled in the comparison schools. Details of the sampling procedures are included in the Method sections under each evaluation question.

TABLE 1
SEED And Comparison Schools
Included In The Sample

SEED Schools						Comparison Schools					
No.	School	PI	Gr.3	Gr.4	N	No.	School	PI	Gr.3	Gr.4	N
A114	Ferry (1)	83.70	3.5	5.0	129	A282	Owen	77.02	3.3	4.7	136
B238	Marsh (1)	71.54	3.6	5.0	66	C135	Gompers *	70.80	3.4	5.0	87
C035	Burns (1)	70.52	4.3	5.8	282	D029	Brady	75.27	3.8	5.6	154
D198	Keiden (1)	84.11	3.3	4.3	250	F170	Howe	88.17	3.3	4.4	133
D324	Sanders (1)	76.55	3.5	4.8	139	D040	Birney	69.32	3.4	4.4	147
D118	Fitzgerald (2)	69.55	3.7	3.9	213	E378	Wilkins	76.36	3.9	3.8	304
E139	Greenfield Pk. (2)	86.30	3.5	4.2	143	E140	Greenfield Un.	83.50	3.8	4.4	194
E165	Holmes, A. L. (1)	84.94	3.9	4.1	178	B070	Coolidge	73.49	3.4	4.1	311
F038	Bellevue (1)	77.91	2.9	3.7	104	B351	Thirkell	78.95	2.9	3.8	122
F174	Hutchinson (2)	76.51	3.4	3.9	171	D219	Loving	78.97	3.4	3.9	131
A078	Campbell (1)	79.63	3.1	3.7	95	A105	Edmonson	71.02	3.1	3.9	110
F337	Scripps (1)	82.29	3.0	3.6	153	F167	Hosmer	80.12	3.2	3.6	180
A296	Priest (1)	69.33	3.3	4.0	252	A166	Holmes, O. W.	66.62	3.5	5.0	144

Where:
No. = School Number
School = School Name
PI = School Poverty Index
( ) = The number of SEED classes
Gr. 3 = School Spring, 1990, Grade 3 grade equivalent
Gr. 4 = School Spring, 1990, Grade 4 grade equivalent
N = Number of students tested in grades 3 and 4

* Data provided by DPS included only second and third graders so campus was not used in the study.

RESULTS

> What is the impact of one semester of SEED instruction at the fourth grade level on mathematics achievement as measured by the *California Achievement Test (CAT)*?

Method

Sample. Three groups of students were drawn from the schools specified in the previous section. All students had to have pre- and post-test *CAT* data to be included in the sample. The Treatment Group consisted of those students in the 13 treatment schools who were formerly exposed to SEED instruction. There were 378 students in this group. Comparison Group 1 consisted of students in the 13 treatment schools who were not formally exposed to SEED. There were 636 students in this group. Comparison Group 2 consisted of all students who had the necessary data from the twelve comparison schools. There were 789 students in this group.

The second series of studies utilized the same three groups but matched students from each group on pre-treatment *Math Total*, gender, ethnicity, socioeconomic status, and grade. There were 244 students from each group who achieved perfect matches. This second series of analyses was done because the test for homogeneity of regression yielde . statistically significant F in the Series 1 *Math Computation* analysis.

Instrumentation. The *Math Total*, *Math Concepts*, *Math Computation*, and *Reading Total* subtests of the *CAT* were the criterion variables used in this study. The metric used was the Normal Curve Equivalent (NCE). The covariates used were the previous year's *Math Total*, *Math Concepts*, *Math Computation*, and *Reading Total* test scores, respectively.

Analysis. Analysis of Covariance was used for both sets of data. Where statistically significant differences were found, Scheffe' post-hoc analyses were conducted. All F statistics yielded by the analysis of covariance were required to be statistically significant, $p \leq .01$. Since the Scheffe' test is extremely conservative, $p \leq .05$ was sufficient to ascribe differences between groups.

Table 2 shows the results of the analysis of covariance for *Math Total* for all students. The test for homogeneity of regression yielded an F of 2.887 (not statistically significant). The adjusted treatment means were 54.022 for SEED, 49.465 for non-SEED in SEED schools, and 45.771 for non-SEED schools. Scheffe' post-hoc analyses yielded differences between each of the three groups ($p \leq .05$). Thus the SEED group scored significantly better than both the non-SEED group in SEED schools and the non-SEED group in non-SEED schools while the non-SEED group in SEED schools scored significantly better than the non-SEED group in non-SEED schools.

Table 2
Analysis of Covariance
Math Total,
All Students

Source	SS	df	MS	F
Between Groups	17779.04	2	8889.52	36.76 **
Within Groups	434997.57	1799	241.80	
Total	452776.61	1801		

** $p \leq .01$
ss = sum of squares
df = degrees of freedom
ms = mean square

Table 3 shows the results of the analysis of covariance for the *Math Computation* subtest for all students. The test for homogeneity of regression yielded an F of 7.869, suggesting that the regression lines for the three groups were not parallel. This suggested the need for different analyses that are reported later. The adjusted treatment means were 51.754 for SEED, 48.623 for non-SEED in SEED schools, and 43.821 for non-SEED schools. Scheffe' post-hoc analyses yielded the same results as were reported for *Math Total.* Thus the SEED group scored significantly better than both the non-SEED group in SEED schools and the non-SEED group in non-SEED schools while the non-SEED group in SEED schools scored significantly better than the non-SEED group in non-SEED schools.

Table 3
Analysis of Covariance,
Math Computation,
All Students

Source	SS	df	MS	F
Between Groups	18091.94	2	9045.97	40.06 **
Within Groups	406269.15	1799	225.83	
Total	424361.09	1801		

** p≤.01

Table 4 shows the results of the analysis of covariance for the *Math Concepts* subtest for all students. The test for homogeneity of regression yielded a non-significant F of 0.50. The adjusted treatment means were 56.752 for SEED, 50.52 for non-SEED in SEED schools, and 48.87 for non-SEED in non-SEED schools. Scheffe' post-hoc analyses yielded differences between the SEED and both non-SEED groups, however no differences were found between the two non-SEED groups.

Table 4
Analysis of Covariance,
Math Concepts,
All Students

Source	SS	df	MS	F
Between Groups	16143.90	2	8071.95	26.91 **
Within Groups	539623.67	1799	299.96	
Total	555767.57	1801		

** p≤.01

Table 5 shows the results of the analysis of covariance for the *Reading Total* subtest for all students. The test for homogeneity of regression yielded a non-significant F of 0.19. The adjusted treatment means were 46.164 for SEED, 44.179 for non-SEED in SEED schools, and 44.43 for non-SEED in non-SEED schools. There were no statistically significant differences between the three groups in Reading.

Table 5
Analysis of Covariance,
Reading Total,
All Students

Source	SS	df	MS	F
Between Groups	1028.53	2	514.26	2.89
Within Groups	319654.69	1799	177.69	
Total	320683.22	1801		

The next series of analyses used theoretical comparison groups. Students from each of the three groups were systematically matched on pre-treatment *Math Total*, gender, ethnicity, socioeconomic status, and grade. All tests for homogeneity of regression yielded non-significant results in this series of studies. There were 244 students in each of the three groups.

Table 6 shows the results of the analysis of covariance for *Math Total* for matched students. The adjusted treatment means were 54.080 for SEED, 50.101 for non-SEED in SEED schools, and 46.412 for non-SEED in non-SEED schools. The Scheffe' post-hoc analyses yielded identical results to those reported for all students (Table 2). The SEED group scored significantly better than the non-SEED group in SEED schools and the non-SEED group in non-SEED schools while the non-SEED group in SEED schools scored significantly better than the non-SEED group in non-SEED schools.

Table 6
Analysis of Covariance,
Math Total,
Matched Students

Source	SS	df	MS	F
Between Groups	7206.92	2	3603.46	16.18 **
Within Groups	162091.44	728	222.65	
Total	169298.36	730		

** $p \leq .01$

Table 7 shows the results of the analysis of covariance for *Math Computation* for matched students. The adjusted treatment means were 51.723 for SEED, 49.478 for non-SEED in SEED schools, and 43.814 for non-SEED in non-SEED schools. The Scheffe' post-hoc analyses yielded the following results. The SEED group and the non-SEED group in SEED schools scored significantly better than the non-SEED group in non-SEED schools. There was no difference between the SEED group and the non-SEED group in the SEED schools.

Table 7
Analysis of Covariance,
Math Computation,
Matched Students

Source	SS	df	MS	F
Between Groups	8130.63	2	4065.31	20.27 **
Within Groups	147779.00	728	202.99	
Total	155909.63	730		

** $p \leq .01$

Table 8 presents the results of the analysis of covariance for *Math Concepts* for matched students. The adjusted treatment means were 56.632 for SEED, 51.485 for non-SEED in SEED schools, and 49.989 for non-SEED in non-SEED schools. The Scheffe' post-hoc analyses yielded significant differences between the SEED group and the non-SEED group in SEED schools as well as the non-SEED group in non-SEED schools.

Table 8
Analysis of Covariance,
Math Concepts,
Matched Students

Source	SS	df	MS	F
Between Groups	6024.17	2	3012.09	10.32 **
Within Groups	212382.58	728	291.73	
Total	218406.75	730		

** p≤.01

Table 9 presents the results of the analysis of covariance for *Reading* for matched students. Adjusted means were 46.693 for SEED, 44.982 for non-SEED in SEED schools, and 45.828 for non-SEED in non-SEED schools. There were no differences between the groups in Reading.

Table 9
Analysis of Covariance,
Reading Total,
Matched Students

Source	SS	df	MS	F
Treatments	358.60	2	167.56	1.07
Error	122319.08	728	168.02	
Total	122677.68	730		

Discussion

The results of this series of studies suggest an immediate impact of SEED instruction on student mathematics achievement as measured by the *CAT*. They further suggest that, in the area of mathematical computation, there is an impact of SEED instruction on students who are not enrolled in SEED classes but are enrolled in the same schools as students enrolled in SEED classes. This impact does not carry over to math concepts where SEED students clearly outperform all comparison students.

What is the reaction of Project SEED principals, classroom teachers, and parents of SEED students to the program.

Method

Sample. Questionnaires were completed by principals, classroom teachers, and parents of SEED students. The questionnaires were administered in January and February of 1992 and queried the various groups about the perceived effectiveness and impact of Project SEED on students.

Instrumentation. Questionnaires were developed by the evaluator in consultation with SEED staff and were designed to straightforwardly elicit participant attitudes about SEED.

Analysis. Descriptive statistics are reported for each of the three surveyed groups.

Principal Reaction

Twelve of the thirteen SEED principals responded to the SEED survey. Most principals had had SEED classes in their schools for about two years. Ten of the twelve respondents had observed at least one SEED class during the 1991-92 school year. Eleven of the twelve principals rated the teaching methods employed by the SEED instructor as extremely effective, the other did not respond. Twelve out of twelve principals rated student enthusiasm and participation during SEED instruction as excellent and felt that the SEED lessons stimulated student achievement in mathematics a great deal. Principals also thought that SEED lessons improved students' critical thinking and problem-solving skills, helped motivate students to learn, helped build student self-concept, and positively affected the regular classroom teacher. Eleven of the twelve principals even noticed significant improvement in students' communications skills as a result of exposure to SEED.

When asked to respond to a five point scale about various aspects of the SEED specialists, principals gave the specialists the highest marks on every category about which they were asked. SEED specialists were rated as professional, positive, enthusiastic, having high expectations of students, prepared, motivating, and friendly.

Finally, principals were asked if they would like to see Project SEED in their particular schools next year. All twelve said yes. Further, when asked if they would like to see the type of instruction provided by Project SEED in more schools, all twelve answered affirmatively.

Principals were also permitted to provide open-ended responses to several questions. These responses were also very positive. Among these responses were:

- It's a terrific program. More children should be exposed to it.
- Outstanding model for active participation of students.
- Teachers enjoy assisting the SEED specialist and discovering strategies that get 100% participation from students.

- Increased self-esteem that is evident in other classes.
- Science teacher stated that students who had received SEED instruction were highly motivated and were more intellectually capable in handling abstract ideas.
- Project SEED challenges students and provides positive feedback. Successful students think more highly of themselves.

Summarized results of the SEED Principal Survey are presented in Appendix A.

Classroom Teacher Reaction

Thirteen classroom teachers responded to the survey. Eleven of thirteen teachers rated the teaching methods employed by the SEED instructors as extremely effective. Eleven of thirteen teachers rated student enthusiasm and participation during SEED instruction as excellent, while two rated it good. Eleven of thirteen teachers also had shy or withdrawn students who participated actively in SEED lessons.

Teachers were then asked a series of questions about the direct impact of SEED instruction on student attitudes and performance. Most of these questions involved a four point scale which ran from "a great deal" through "quite a lot" and "somewhat" to "not much". When asked about the extent to which SEED lessons stimulated student interest in mathematics, six teachers responded "a great deal", four responded "quite a lot", and three responded "somewhat". When asked about student improvement in critical thinking and problem-solving skills, six teachers responded "a great deal", four responded "quite a lot", and three responded "somewhat". When asked about the extent to which SEED motivates students to learn, six teachers responded "a great deal", six responded "quite a lot:, and one responded "not much". Four teachers felt that SEED helped build student self-confidence "a great deal", eight responded "quite a lot", and one responded "somewhat". Six teachers believed that Project SEED helped students relate to their peers "a great deal" more positively, five responded "quite a lot:", and two responded "somewhat". Six teachers detected "a great deal" of improvement in student communication skills, three felt that their students improved in this area "quite a lot", and four felt students improved "somewhat". Finally, six teachers believed that the SEED lessons improved their students' performance in the regular math program "a great deal", three believed that SEED exposure improved student regular math performance "quite a lot", and four believed that performance was improved "somewhat".

When given the opportunity to respond to an open-ended question about SEED impact on students, the following teacher comments were made:

- Students are much more respectful as they disagree with each other. Communication skills are improved as they learn to address the class when speaking.

- Students are showing more positive ways to disagree with classmates in all other subject areas.

- Signals (agree, disagree, etc.) are employed in other subject areas. Communication skills have improved.

- More respect for each others opinion, ability to add to the given answer. In cases where we are giving answers they will use the hand signals without being told.

- Other lessons bring out quiet response signals and support. Also some of the terms used in SEED, such as "defend my answer, Class I think"... etc.

- Students' interest in learning in all subjects has improved, especially the shyness.

- We have groups of children. We use the hand signals in these groups. It works out quite well and keeps the noise down.

- Students use support and agreement signals in language arts classes.

Teachers were then asked about the effect of SEED instruction on their teaching. When asked whether or not the SEED lessons provided them with any new or insightful ways of teaching math concepts, ten teachers responded "yes", two responded "no", and one didn't respond.

When asked about SEED instructional strategies that they used in their classrooms, twelve teachers stated that they used agreement and disagreement signals and having a student call on another student, nine said they gave credit for thoughtful wrong answers even though they were technically incorrect, five used deliberate errors and chorus reading strategies, and four had students indicate answers on their fingers.

Finally, teachers were asked if they would like to see this type of instruction in more classrooms. Twelve teachers responded "yes" and one didn't respond. When asked about ways in which they would improve the program, responses included:

- Hate to see it end.
- Great like it is.
- Year long for all elementary grades - especially carry-over to Middle Schools - 7th thru 12th grades.
- Class all year. Monitor success rate on the *CAT* test. If not, I would prefer to have the class begin in January rather than September.

One teacher felt that the class time should be shortened to thirty minutes, three times a week.

Results of the SEED Teacher Survey are presented in Appendix B.

Parent Reaction

Parents of SEED students were sent a short questionnaire about their perceptions of the impact of SEED instruction on their children. Table 10 displays their responses, by question, to the survey. In all, 244 of 378 parents of SEED students responded to the survey. Where responses to individual questions do not total 244, there was some amount of non-response to the question. The questions were as follows:

1. Has your child ever discussed being in a special algebra class with Project SEED?

2. Has your child been excited about studying Algebra through Project SEED?

3. Has your child expressed not wanting to miss the SEED Algebra class?

4. Do you believe that your child is more confident about his or her ability since he or she has been in SEED?

5. Do you believe that Project SEED has improved your child's math ability?

6. Would you like other children to be able to study algebra with Project SEED?

7. Did you observe a SEED lesson at school?

8. Has Project SEED had any other positive effects on your child?

Question 1 is the only question that is not tabled in Table 10. That question attempted to determine if the child had ever discussed being in a special Algebra class with Project SEED, and, if so, how and with whom. Every parent responding checked at least one answer that showed that the child had talked with the parent about the program.

Table 10 presents information on each school's parent's responses to questions 2 through 8 as well as a total of all responses. The results are overwhelmingly positive. 97.9% of respondents said that their children were at least somewhat excited about studying Algebra through Project SEED, with 68.4% responding that their children exhibited a great deal of excitement. 75.2% of parents said their children did not want to miss the SEED class. 97.9% of respondents felt their children were at least somewhat more confident since SEED exposure, with 56.1% feeling that their children were a great deal more confident. Fully 92.9% of responding parents felt that SEED had improved their children's math ability and 98.3% felt that other children should be able to study Algebra with Project SEED. 27.4% of parents had actually observed a SEED class and 70.5% felt that SEED instruction had had other positive effects on their children.

Parent comments were too numerous to record in this document but were overwhelmingly in favor of SEED. Some of the more common comments included:

- Project SEED gives child confidence to work independently.

- Has caused child to be more motivated and interested in math.
- Patience of the SEED Instructor has helped child.
- Child is now doing better in all classes.
- Has helped child's memory and self-esteem.
- Improved study habits.
- Has helped child's learning and listening skills.

Discussion

Principals, classroom teachers, and parents of SEED students were generally very supportive of SEED. SEED teaching methods were rated as extremely effective, student enthusiasm and participation in the program were rated as excellent, and perceived student benefits included improved critical thinking, listening, and problem-solving skills, increased motivation to learn, increased academic confidence and self-esteem, and improved performance in the regular mathematics program.

Table 10

Results of Project SEED
Parent Survey

Quotation	Response	Bellevue	Burns	Campbell	Ferry	Fitzgerald	Greenfield Park	Holmes	Hutchinson	Keldan	Marsh	Priest	Sanders	Scripps	TOTAL	%
Child excited about studying Algebra through SEED	Yes, A Great Deal	12	13	14	13	16	19	13	21	12	7	9	6	12	157	68.4
	Yes, Quite a Lot	5	3	5	3	11	4	0	4	9	2	3	5	3	57	23.4
	Yes, Somewhat	1	1	2	1	0	1	0	1	3	0	2	0	3	15	6.1
	No, Not Much	0	2	1	0	0	1	0	0	1	0	0	0	0	5	2.0
Child not wanting to miss SEED classes	Yes	12	14	14	13	19	22	13	22	16	6	8	9	14	182	73.2
	No	5	5	8	4	8	3	0	4	8	3	6	2	4	60	24.8
Child more confident since SEED exposure	Yes, A Great Deal	9	12	10	9	13	14	10	14	11	6	8	8	13	137	56.1
	Yes, Quite A Lot	7	4	7	7	9	9	3	10	10	0	3	3	3	75	30.7
	Yes, Somewhat	2	2	4	1	4	2	0	2	4	3	1	0	2	27	11.1
	No, Not Much Difference	0	1	1	0	1	0	0	0	0	0	2	0	0	5	2.0
Improved math ability	Yes	18	18	20	16	25	23	12	25	20	8	12	10	17	224	92.9
	No	0	0	1	0	1	1	0	0	2	0	1	0	0	6	2.5
	No Opinion	0	1	1	1	1	0	0	1	3	0	1	1	1	11	4.6
Other children should be exposed to SEED	Yes	[illegible]	19	21	17	27	23	13	25	[illegible]	9	[illegible]	11	18	236	98.3
	No	0	0	0	0	0	2	0	0	1	0	1	0	0	4	1.7
Observed SEED	Yes	4	7	5	4	6	9	3	12	5	1	2	2	6	66	27.4
	No	14	12	16	13	21	15	10	14	19	8	12	9	12	175	72.6
Other Positive Effects of SEED	No	5	7	7	5	6	6	1	7	10	0	[illegible]	2	6	67	29.5
	Yes	13	12	14	10	17	16	12	17	11	9	9	8	12	160	70.5

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APPENDIX A

PROJECT SEED PRINCIPAL QUESTIONNAIRE RESULTS
DETROIT PUBLIC SCHOOLS

1. How many years have you had SEED classes?

1 year	1
1 1/2 years	1
2 years	6
3 years	2
10 years	1
NO RESPONSE	1

2. Did you observe SEED this year?

Yes, once	7
Yes, more than once	3
No	2

3. How effective are the teaching methods employed by the SEED instructor?

Extremely effective	11
Somewhat effective	
Not very effective	
Not effective	
NO RESPONSE	1

4. How would you rate student enthusiasm and participation during the SEED instruction?

Excellent	12
Good	
Fair	

5. How well do the SEED lessons stimulate student interest in mathematics?

A great deal	12
Quite a lot	
Somewhat	
Not much	

6. Have the SEED lessons helped students improve their critical thinking and problem solving skills?

Yes, a great deal	10
Yes, quite a lot	2
Yes, somewhat	
No, not much	

7. Does Project SEED help motivate students to learn?

Yes, a great deal	11
Yes, quite a lot	1
Yes, somewhat	
No, not much	

8. How well do the SEED lessons build student self confidence?

A great deal	11
Quite a lot	1
Somewhat	
Not much	

9. Does Project SEED help students to relate to their peers more positively?

Yes, a great deal	10
Yes, quite a lot	2
Yes, somewhat	
No, not much	

10. Have you seen improvement in the communication skills of students: good listening, speaking clearly, using vocabulary, etc.?

A great deal	7
Quite a lot	4
Somewhat	1

11. Do you feel that the SEED program affects the classroom teacher positively?

Yes	12
No	

12. If you have noticed any carry over into the other areas of the school, please describe.

Comments in prose of the report.

13. On a five point scale, how would you describe the SEED specialist. Five being the top of the scale.

Professional	
5	12
Positive	
5	12
Enthusiastic	
5	12
High expectations	
5	11
4	1
Prepared	
5	12
Motivating	
5	12
Friendly	
5	12

14. Would like to see Project SEED in your school next year?

Yes	12
No	

15. Would you like to see this kind of instruction in more classrooms in other schools?

Yes	12
No	

APPENDICES

APPENDIX B

PROJECT SEED TEACHER SURVEY RESULTS
DETROIT PUBLIC SCHOOLS

1. How effective are the teaching methods employed by the SEED instructor?

EXTREMELY EFFECTIVE	11
SOMEWHAT EFFECTIVE	2

2. How would you rate students enthusiasm and participation during the SEED instruction?

EXCELLENT (80% of the class or more)	11
GOOD (60% of the class or more)	2

3. Do you have any shy or withdrawn students who participated actively in the SEED lessons?

YES	11
NO	2

Comments to Question 3:

1. Withdrawn students are now more active in class.
2. These students are much more outgoing in the SEED lessons and this also carries over into other areas.
3. Some have lost interest.
4. Have children who raise their hands for SEED but not during regular class.
5. Quite a few.
6. A student just tested to be placed in Learning Disabled actively took part and showed some understanding.
7. SEED has encouraged a child who has a speech problem to participate.

4. How well do the SEED lessons stimulate student interest in mathematics?

A GREAT DEAL	6
QUITE A LOT	4
SOMEWHAT	3

5. Have the SEED lessons helped your students improve their critical thinking and problem solving skills?

YES, A GREAT DEAL	6
YES, QUITE A LOT	4
NO, NOT MUCH	3

6. Does Project SEED motivate students to learn?

YES, A GREAT DEAL	6
YES, QUITE A LOT	6
NO, NOT MUCH	1

7. How well do the SEED lessons build students' self-confidence?

A GREAT DEAL	4
QUITE A LOT	8
NOT MUCH	1

8. Does Project SEED help students to relate to their peers more positively?

YES, A GREAT DEAL	6
YES, QUITE A LOT	5
NO, NOT MUCH	2

9. Have you seen improvement in the communication skills of students: good listening, speaking clearly, using vocabulary, etc.?

YES, A GREAT DEAL	6
YES, QUITE A LOT	3
NO, NOT MUCH	4

10. Did the SEED lessons improve your student's performance in their regular math program?

YES, A GREAT DEAL	6
YES, QUITE A LOT	3
NO, NOT MUCH	4

11. If you have noticed any carryover into other subjects, please describe. For example, respectfulness, interest in learning, communication skills.
    1. Students interest in learning in all subjects has improved especially the shyness.
    2. Students are showing more positive ways to disagree with classmates in all other subject areas.
    3. More respect for each others opinion, ability to add to the given answer. In cases where we are giving answers they will use the hand signals without being told.
    4. We have groups of children. We use the hand signals in these groups. It works out quite well and keeps the noise down.
    5. Other lessons bring out quiet response signals and support. Also some of the terms used in SEED, such as "defend my answer, Class I think"... etc.
    6. Signals (agree, disagree, etc.) are employed into other subject areas. Communication skills have improved.
    7. Students are much more respectful as they disagree with each other. Communication skills are improved as they learn to address the class when speaking.
    8. Students use support and agreement signals in language arts classes.

12. Did the seed lessons provide you with any new or insightful ways of teaching math concepts?

YES	10
NO	2
NO RESPONSE	1

13. Which of the techniques have you employed in your own teaching?

Agreement And Disagreement Signals	12
Deliberate Errors	5
Chorus Reading	5
Having Students Indicate Answers On Their Fingers	4
Having A Student Call On Another Student	12
Exploring The Thinking Being "Wrong Answers" So As To Give Credit For Thoughtful Answer Even Though It May Be Technically Incorrect	9

Comments: Giving Support To Others

14. Would you like to see this type of instructions in more classrooms?

YES	12
NO RESPONSE	1

15. RECOMMENDATIONS:

1. Shorten classtime to 30 minutes - 3 times per week. Class became bored and restless. Class has regular math 5 times per week and it's just too much.
2. Hate to see it end.
3. Great like it is.
4. Year long for all elementary grades - especially carry-over to Middle Schools - 7th thru 12 grades.
5. Class all year. Monitor success rate on the *CAT* test. If not, I would prefer to have the class begin in January rather than September.