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ABSTRACT

The Chapter 1 Corrective Mathematics Program provided supplementary mathematics instruction to Chapter 1-eligible students in New York City nonpublic schools. Its goals were to strengthen students' understanding of mathematical concepts, to improve their ability to perform computations and solve problems, and to assist them in applying the knowledge and skills gained to everyday life. This document reports on the implementation and evaluation of this program as carried out since the 1986-87 school year. The report is divided into five chapters. The introduction provides background information on the program, information on eligibility, program objectives, program evaluation, and the scope of the report. Chapter II describes the organization and implementation of the program providing information on the number of students served, type of instruction, including computer assisted instruction. Chapter III describes the parental involvement in the program. Chapter IV reports the student achievement outcomes. Chapter V reports the conclusions and recommendations made by the program. It is suggested that the program increase parental contact at the high school level, coordinate Corrective Mathematics parent workshops with other Chapter 1 instructional programs to maximize parental participation, assess the feasibility of publishing the "Parent Involvement Booklet" in French and Spanish, and expand the Pilot Computer Take Home Project to permit a valid evaluation of its effects. (MDH)

OREA Report

CHAPTER 1
CORRECTIVE MATHEMATICS PROGRAM
1989-90

NEW YORK CITY BOARD OF EDUCATION

DIVISION OF STRATEGIC PLANNING/RESEARCH & DEVELOPMENT

7/26/91

OFFICE OF THE CHIEF EXECUTIVE
FOR MONITORING AND SCHOOL IMPROVEMENT

BUREAU OF NONPUBLIC SCHOOL REIMBURSABLE SERVICES
CHAPTER 1 CLINICAL AND GUIDANCE PROGRAM
1989-90

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EXECUTIVE SUMMARY

BACKGROUND

The Chapter 1 Corrective Mathematics Program provided supplementary mathematics instruction to Chapter 1-eligible students in New York City nonpublic schools. Its goals were to strengthen students' understanding of mathematical concepts, to improve their ability to perform computations and solve problems, and to assist them in applying the knowledge and skills gained to everyday life.

DELIVERY OF SERVICES

On July 1, 1985, the Supreme Court ruled that instruction by public school staff on the premises of nonpublic schools was unconstitutional. Since the 1986-87 school year, students have received Chapter 1 services at public schools, leased neutral sites, mobile instruction units (M.I.U.s), and nondenominational schools. Since the 1987-88 school year, Chapter 1 students also have received computer-assisted instruction (C.A.I.). In C.A.I., teachers monitor student progress and provide instructional assistance via modems from a Board of Education administrative center.

PROGRAM OBJECTIVES

Students were expected to make statistically significant mean N.C.E. gains from pretest to posttest on the standardized mathematics tests administered by the program. First grade students were pretested on the Mathematics subtest of the Stanford Early School Achievement Test (SESAT) and posttested on the Concepts, Computation, and Applications subtests of the Stanford Achievement Test (S.A.T.). Students in grades two through eight were pretested and posttested on the subtests of the S.A.T. Students in grade nine were pretested on the subtests of the S.A.T. and posttested on the Mathematics subtest of the Stanford Test of Academic Skills (TASK). Students in grades ten through twelve were pretested and posttested on the Mathematics subtest of the TASK.

EVALUATION METHODOLOGY

Program documents, data retrieval forms, observations of staff development training workshops, interviews with program staff, and analyses of standardized tests were the sources for the evaluation of the program. The impact of the program on student achievement was determined by evaluating students' performance on the tests.

STUDENTS AND SCHOOLS SERVED

During the 1989-90 school year, the Corrective Mathematics program served 7,771 students attending 160 nonpublic schools in New York City: 3,871 students received face-to-face only instruction, 2,963 received C.A.I. only, and 928 received combination services. By the end of the 1989-90 school year, computer-assisted instruction had been implemented in 73 nonpublic schools, an increase of 27 schools over the 1988-89 school year.

In 1989-90, Chapter 1-eligible students from nonpublic schools with less than ten eligible students participated in a Pilot Computer Take Home Project. Piloting began in April 1990 with 66 students from 16 schools. Students were provided with a laptop computer, software, and instructional materials for use in their homes. Teachers monitored student progress via modems. However, since students received less than a full year of instruction, pretests and posttests were not administered, and achievement data were not collected for the pilot project.

IMPLEMENTATION

Staff Development

Staff development activities included formal conferences, regular outreach to teachers by the program coordinator and field supervisor, and informal information sharing among teachers and between teachers and supervisory staff. During 1989-90, 15 staff development training conferences were held in order to introduce teachers to innovative pedagogical techniques and materials and improve teacher effectiveness. Conference activities consisted primarily of lectures and demonstrations followed by whole or small group discussions.

The Parental Involvement Program

A well-organized and robust parental involvement program was in place. It was generally successful in achieving its goals of increasing the level and broadening the scope of parents' involvement in the education of their children. Analyses of parental involvement data showed that the parents of elementary and junior high school students were much more likely to have been involved or contacted than the parents of high school students.

Formal parent involvement activities--orientation meetings and parent workshops--helped parents understand the goals and methods of Chapter 1 programs, encouraged parents to work with their children on mathematics, and established on-going, working relationships between parents and Chapter 1 teachers. These activities were supplemented with telephone conversations and individual meetings between teachers and parents. During 1989-90, more that 300 parents attended an orientation meeting, more than 400 parents attended a parent workshop, more than 1,000 parents attended an individual meeting with a teacher, and nearly 500 parents were in contact with teachers by telephone. Parent workshops were the most comprehensive form of parental involvement, and discussions at a staff development conference on parental involvement near the end of the school year indicated that obstacles to recruiting parents to workshops remained. For example, many parents who work during school hours could not attend.

Formal outreach to parents by the program--a parent newsletter and a "Parent Involvement Booklet"--also encouraged parents to work with their children on mathematics. During 1989-90, the program sent a parent newsletter to the parents of nearly 6,000 Corrective Mathematics students and a "Parent Involvement Booklet" to the parents of more than 5,000 students. The "Parent Involvement Booklet" contained scores of activities for parents to use at home with their children. Unfortunately, while the introductory sections were written in English, French, and Spanish, activities, instructions, and bibliographic information in the booklet appeared in English only.

Student Achievement

In general, the program achieved its goals. Overall mean N.C.E. gains for face-to-face and C.A.I. students on all tests and subtests met the program criterion for success, a statistically significant mean gain. Overall effect sizes for all first grade students on the SESAT, for face-to-face students in grades two through eight on the Concepts subtest and Total Score of the SAT, and for all students in grades nine through twelve on the TASK were large and educationally meaningful. All other overall effect sizes were moderate or small. In addition, mean gains by grade on all tests and subtests were generally statistically significant. However, C.A.I. students in one grade on each of the subtests of the S.A.T. did not achieve statistically significant mean gains (eighth grade students on the Concepts subtest, fifth grade students on the Computations subtest, and fourth grade students on the Applications subtest). Moreover, due to the small number of face-to-face students in grades nine through twelve and C.A.I. students in grade twelve, it was not possible to test for statistical significance.

RECOMMENDATIONS

Based on the findings and discussions in the 1989-90 report on the Chapter 1 Corrective Mathematics program, the following recommendations for program improvement are made:

- The program should contact and increase the participation of the parents for high school students in the education of their children.

- The practice of coordinating Corrective Mathematics parent workshops with those of other Chapter 1 instructional programs so that parents have to take less time off of work should be employed as much as possible.

- The program should assess the feasibility of publishing the entire "Parent Involvement Booklet" in French and Spanish.

- The Pilot Computer Take Home Project should be expanded to permit a valid evaluation of its effects.

ACKNOWLEDGEMENTS

This report was prepared by the Office of Research, Evaluation, and Assessment/Instructional Support Evaluation Unit of the New York City Board of Education. It was prepared under the supervision of Frank Guerrero, Unit Manager, and Joy St[illegible] supervised the research, data analysis, and writing of the report. Its production is the result of a collaborative effort of full-time staff and consultants:

Ilan Talmud analyzed the data upon which this report is based. Laurie Ourlicht conducted some of the observations. Stan Davis conducted observations, interviewed program staff, interpreted the documents and data, and wrote the report.

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I. INTRODUCTION

PROGRAM BACKGROUND

The Chapter 1 Corrective Mathematics Program provides supplementary mathematics instruction to Chapter 1-eligible students in New York City nonpublic schools. Its goals are to increase students' understanding of mathematical concepts, to improve their ability to perform computations and solve problems, and to assist them in applying the knowledge and skills gained to everyday life. Secondary goals include enhancing students' self-esteem and helping them to develop a positive attitude toward mathematics. Students are taught in one of three instructional modes: face-to-face instruction; computer-assisted instruction (C.A.I.); or combination services, i.e., C.A.I. supplemented with face-to-face instruction.

ELIGIBILITY

Students are eligible for Chapter 1 services if they live in a targeted attendance area and score below a designated cutoff point on State-mandated tests or standardized reading tests. Most nonpublic schools participating in Chapter 1 instructional programs use either the Scott-Foresman Test or the Comprehensive Test of Basic Skills (C.T.B.S) as their screening instrument. Nonpublic school students must score at or below a specific grade equivalent to be eligible for Chapter 1 instructional programs. The grade equivalent is a calculation of the grade placement in years and months of students for whom a certain score is typical. It represents the level of work a student is capable of doing.

However, a ninth grade student who achieves a test score that is 11.6 grade equivalents does not belong in the eleventh grade; rather, the 11.6 grade equivalent score indicates that the student scored as well as a typical eleventh grade student would have scored on the ninth grade test. The designated cutoff point ranged from three months below grade level for students in first grade to two or more years below grade level for students in high school.

When all of the students from a nonpublic school who meet the criteria have been placed at a Chapter 1 site, the program serves additional students who meet the residency and mathematics requirements but did not score below the cut-off point on the reading test. In addition, the Chapter 1 evaluation reporting system specifies that eligible students may be selected for Chapter 1 programs on the basis of classroom performance, teacher judgement, and achievement test data.

PROGRAM OBJECTIVE

The objective for the 1989-90 program was:

- Students were expected to make statistically significant mean gains from pretest to posttest on the standardized mathematics tests administered by the program.

PROGRAM EVALUATION

The purpose of the evaluation of the 1989-90 program by the Office of Research, Evaluation, and Assessment/Instructional Support Evaluation Unit (OREA/I.S.E.U.) was to describe the program and to assess its impact on student achievement. The following methods were used:

- analyses of data retrieval forms that report information about grade placement, number of years in the program, participation in other Chapter 1 programs, and referrals to the Clinical and Guidance program;
- a review of documents describing program organization and funding, services provided, and staff development training;
- observations of parent involvement workshops and of staff development conference workshops on parent involvement activities;
- interviews of program staff; and
- analyses of student scores on standardized mathematics tests.

SCOPE OF THE REPORT

The purpose of this report is to assess the implementation and effectiveness of the Chapter 1 Corrective Mathematics Program for 1989-90. Program organization and program implementation are described in Chapter II. The Parental Involvement Program is discussed in Chapter III. Student academic achievement is presented in Chapter IV. Conclusions and recommendations are offered in Chapter V. In addition, a brief description of Chapter 1 Nonpublic School Reimbursable Services for 1989-90 is included as an appendix.

II. PROGRAM ORGANIZATION AND IMPLEMENTATION

PROGRAM FUNDING AND NUMBER OF STAFF

During the 1989-90 school year, the Corrective Mathematics program was funded at approximately $7.4 million. Program staff consisted of one coordinator, one field supervisor, three office aides, and 71 program teachers.

THE SUPREME COURT RULING AND PROGRAM ORGANIZATION SINCE 1985

On July 1, 1985, the Supreme Court ruled that instruction or counseling by public school staff on the premises of nonpublic schools affiliated with churches--local educational agencies' most common method of serving Chapter 1-eligible students from nonpublic schools--was unconstitutional.* As a result, alternative means for providing Chapter 1 services were devised.

Face-to-Face Instruction

Since the 1986-87 school year, eligible students attending church-affiliated nonpublic schools in New York City have received face-to-face classroom instruction at public schools, leased neutral sites, and mobile instruction units (M.I.U.s). Public school sites are designated classrooms in public schools, leased neutral sites are classrooms in public buildings such as community centers, and M.I.U.s are mobile classrooms parked outside the school being served. Students are bused or otherwise

*The ruling did not affect the provision of Chapter 1 services to nondenominational nonpublic schools.

escorted from their nonpublic school to the Chapter 1 site for face-to-face classroom instruction.

Computer-Assisted Instruction

During 1987-88, a computer-assisted instruction (C.A.I.) component was established to provide remedial instruction to some nonpublic school students. C.A.I. is offered via two modes of instruction: C.A.I. only and combination services. Students receiving C.A.I. only remain at their nonpublic schools and are instructed in Chapter 1 computer labs--rooms used exclusively for computer-assisted instruction. Chapter 1 teachers are not present in Chapter 1 computer labs. Combination services combines C.A.I. with face-to-face instruction at an M.I.U. or public school site, so that the Chapter 1 teacher who monitors the students' computer-assisted instruction also provides face-to-face instruction.

In 1989-90, a Pilot Computer Take-Home Project extended services to nonpublic schools with small numbers of Chapter 1-eligible students.

NUMBER OF STUDENTS SERVED

During the 1989-90 school year, the program served 7,771 students attending 160 nonpublic schools in New York City: 3,871 students participated in the face-to-face mode of instruction, and 3,891 students received computer-assisted instruction. Of the computer-assisted instruction students, 2,963 received C.A.I. only, and 928 received combination services. Thus, one-half of the students received face-to-face instruction, more than one-third received C.A.I. only, and nearly one-eighth received combination services. Over three-quarters of the students were in grades two through six (see Table 1). Nearly three-quarters of the students participated in the program for the first time in 1989-90, and almost one-quarter participated for a second year. Less than five percent had participated in the program for three years or longer (see Table 2). The average rate of attendance was 93 percent*.

Students suffering from social or emotional problems that might have impeded their academic performance were referred to the Chapter 1 Clinical and Guida program.** During the 1989-90 school year, 2,933 Corrective Mathematics students, approximately one-third of the program total, were provided diagnostic and/or counseling services.

FACE-TO-FACE INSTRUCTION

During 1989-90, students from 89 nonpublic schools received face-to-face instruction. Students from 60 schools received instruction at mobile instruction units (M.I.U.s), students from 17 schools attended class in nearby public schools, and students from 11 schools received instruction at leased neutral sites. Students from one nondenominational school also participated in the program and received instruction at their own school.

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*Aggregate attendance information was provided by the Chapter 1 program administration.

**For a brief description, see Appendix A.

TABLE 1

Student Participation in the Corrective Mathematics Program by Grade and Mode of Instruction, 1989-90

Grade	Total N	Total %	Face-to-Face N	Face-to-Face %	Computer-Assisted[b] N	Computer-Assisted[b] %	Combination Services[c] N	Combination Services[c] %
			Mode of Instruction[a]					
1	167	2.1	81	2.1	61	2.1	25	2.7
2	1109	14.3	629	16.2	339	11.4	141	15.2
3	1333	17.2	766	19.8	411	13.9	156	16.8
4	1375	17.7	797	20.6	414	14.0	164	17.7
5	1096	14.1	573	14.8	408	13.8	115	12.4
6	981	12.6	444	11.5	407	13.7	130	14.0
7	676	8.7	243	6.3	357	12.0	76	8.2
8	410	5.3	119	3.1	253	8.5	29	3.1
9	280	3.6	55	1.4	189	6.4	36	3.9
10	265	3.4	140	3.6	89	3.0	36	3.9
11	61	0.8	19	0.5	23	0.8	19	2.0
12	18	0.2	5	0.1	12	0.4	1	0.1
Total	7,771	100.0	3,871	100.0	2,963	100.0	928	100.0
Mean Percentage				49.9		38.2		11.9

[a] Data for mode of instruction are missing for nine students.

[b] C.A.I. only.

[c] A combination of face-to-face and C.A.I.

- One-half of the students received face-to-face instruction, more than one-third received C.A.I. only, and nearly one-eighth received combination services.
- Over three-quarters of the students were in grades two through six.

TABLE 2

Student Participation in the Corrective Mathematics Program by Grade and Number of Years in the Program, 1989-90

Grade	Total Number of Students	Number of Years in the Program[a]					
		1		2		3 or more	
		N	%	N	%	N	%
1	167	158	94.6	9	5.4	0	0.0
2	1109	1034	93.6	67	6.1	4	0.3
3	1333	922	69.4	394	29.6	13	1.0
4	1375	845	61.7	427	31.2	97	7.1
5	1096	657	60.1	331	30.3	105	9.6
6	981	651	66.3	247	25.2	83	8.5
7	676	454	67.5	161	23.9	58	8.6
8	410	287	70.0	108	26.3	15	3.7
9	280	279	99.6	1	0.4	0	0.0
10	265	248	93.9	16	6.1	0	0.0
11	61	53	86.9	7	11.5	1	1.6
12	18	10	71.4	0	0.0	4	28.6
Total	7,771	5,598		1,768		380	
Mean Percentage			72.3		22.8		4.9

[a] Data for number of years in the program are missing for 25 students.

- Nearly three-quarters of the students participated in the program for the first time in 1989-90.
- Almost one-quarter of the students participated for a second year.
- Less than five percent of the students had participated in the program for three years or longer.

Learning Environment

Classrooms contain instructional materials such as math manipulatives, problem-solving charts, multiplication tables, mathematics games, measurement charts, and place value charts. In addition, classroom walls are covered with seasonal displays, the names and photographs of students, and student- and teacher-made displays reflecting past and ongoing lessons.

Curricula

Curricula vary according to grade level. First grade students participate in a "readiness" program designed to teach them basic mathematics concepts considered prerequisites for learning number computations and more advanced concepts. Students learn basic skills and mathematical facts and are introduced to concepts such as geometric shape, positional relationships, one-to-one correspondence, patterning, and ordering. The program emphasizes "learning by doing" activities in which students manipulate objects.

In grades two through twelve, curricula follow the standard New York City scope and sequence. In grades two through eight, mathematical concepts, computation, and the application of mathematics skills to every day life are stressed. At the secondary school level, curricula focus on the comprehensive development of mathematical skills.

Instructional Process

Teachers design instructional programs that meet the individual needs and learning styles of their students.

Teachers' instructional strategies include using concrete examples to illustrate concepts, connecting topics and exercises to the everyday lives of students, and using games to practice basic skills and use mathematical facts.

Teachers provided instruction to small groups of students one to five times per week. Nearly two-thirds of the students (65 percent) received two sessions of remedial instruction per week, and more than 80 percent of the students received two or more sessions of remedial instruction per week. The length of the sessions ranged from 30 to 60 minutes. However, more than 60 percent of the students received instruction in 60 minute sessions, and more than 90 percent received instruction in sessions lasting 45 minutes or longer.

COMPUTER-ASSISTED INSTRUCTION

Nonpublic school principals select the hardware/software configurations for their respective schools, and each nonpublic school employs only one configuration. By the end of the 1989-90 school year, computer-assisted instruction had been implemented in 73 nonpublic schools, an increase of 27 schools over the 1988-89 school year.

Five companies provided software packages--ESC, WICAT, CCC, PLATO, and CNS. Hardware and software cannot be diverted and cannot be used in the nonpublic schools for anything other than Chapter 1 instruction. All five packages, however, were designed for learning situations where a teacher is physically present while students work at computers and must be adapted to a learning situation where teachers are not physically present.

The software companies provide teacher manuals which contain information on operating the system, using the curriculum, and interpreting individual and class progress reports. In addition, company representatives train teachers and non-instructional technicians, provide technical assistance via hot lines, and attempt to resolve specific problems in person and by telephone.

Curricula

Curricula vary by software package but essentially follow the New York City mathematics curriculum. Since Chapter 1 students are below grade level in reading, software packages for lower grades include an audio component so that the inability to read at grade level does not interfere with learning mathematics.

Instructional Process

Chapter 1 teachers monitor student progress through the curriculum and provide instructional assistance from a Board of Education administrative center; noninstructional technicians maintain and operate equipment and maintain order and safety in the Chapter 1 computer labs at the nonpublic school sites. Modems connect the administrative center with the computer labs, and Chapter 1 teachers speak to noninstructional technicians by telephone. At the administrative center, Chapter 1 teachers preview student lessons, evaluate printouts of student progress, and adjust the difficulty level of the software.

A student must master material at one level of difficulty before moving on to the next level. In general, about 80 percent of the questions in a module must be answered correctly for a student to proceed. If a student consistently fails to meet the mastery criterion or if the criterion is consistently exceeded, then the teacher must adjust the difficulty level of the lesson.

C.A.I. only. Students from 68 nonpublic schools received C.A.I. only. They worked in Chapter 1 computer labs in their nonpublic schools from one to five days a week, but more than 80 percent of these students received instruction at least twice a week. The length of the sessions ranged from 20 to 60 minutes. More than 60 percent of the students, however, received instruction in 30 minute sessions, and more than 85 percent received instruction in sessions lasting 30 minutes or longer.

Combination services. Students from 19 nonpublic schools received combination services. They worked one or two days a week in computer labs in sessions lasting 20 to 50 minutes, but more than three-quarters of them received C.A.I. in classes lasting 30 to 40 minutes. Nearly three-quarters of the students received face-to-face instruction once a week, and nearly one-fifth received it twice a week. Classes for the face-to-face component lasted 30 to 60 minutes, but more than three-quarters of the students received instruction in classes lasting at least 45 minutes.

PILOT COMPUTER TAKE-HOME PROJECT

In 1989-90, 66 Chapter 1-eligible students from 16 nonpublic schools in grades one through eight participated in a Pilot Computer Take-Home Project. Participating students were provided with a laptop computer, the CCC software package, and instructional materials for use in their home. Piloting of the project began in April 1990 with students from schools with less than ten Chapter 1-eligible students. However, since students received less then five months of instruction and since pretests and posttests were not administered, achievement data were not collected and are not reported for the pilot project. During the 1990-91 school year, the Computer Take-Home Project will expand to serve nonpublic schools which are unable to provide Chapter 1 services to all of their eligible students.

Curricula

The curriculum is organized into 12 content areas or "strands": Addition, Number Concepts, U.S. Measurement, Subtraction, Equations, Applications, Metric Measurement, Multiplication, Problem Solving, Division, Fractions, and Decimals. The content of the curriculum varies by grade level. For example, at the beginning of grade level one, students do exercises in the Addition and Number Concepts strands, and at the middle of grade level one, begin working with the U.S. Measurement and Subtraction strands. As students progress from grade level to grade level, new content areas are incorporated so that at the beginning of grade level four, students begin exercises with fractions and decimals and are now working in all twelve content areas.

Instructional Process

In daily, ten-minute sessions in their homes, students develop their mathematical skills through extensive, individualized practice. Students are given 30 seconds to complete each digit of an answer. If the time limit is exceeded in any part of the exercise, the exercise is declared a "Time Out," and it is counted as incorrect. In addition, the computer evaluates each digit of the answer separately, providing early error analysis and immediate feedback. At the end of a session, the computer gives the number of exercises attempted, the number correct, and a rounded percent score for the session.

Teachers monitor student progress via modems, contact students, parents, and nonpublic school principals by telephone, and send students worksheets through the mail. At any time, a teacher may request a computer-generated Course Report. Each report lists information about the student's most recent session and about the student's overall performance. Teachers use this information to identify areas of difficulty, adjust the time limit, and discuss student progress with the student, parents, and/or nonpublic school principal.

STAFF DEVELOPMENT TRAINING

Staff development training included formal conferences, regular outreach to program teachers by the program coordinator and field supervisor, and informal information-sharing among teachers and between teachers and supervisory staff. During outreach sessions, supervisors observed classroom instruction, discussed their observations with the teacher, and demonstrated new instructional techniques and materials. Teachers shared information among themselves during visits to each other's classrooms.

Staff Development Conferences

During the 1989-90 school year, 15 staff development training conferences were held. The conferences were held on days in which nonpublic schools had holidays, and teachers were expected to attend if the nonpublic school they served was not in session. Thus, attendance varied by holiday, ranging from 27 to 80, but typical conferences had 45 or more participants.

The purposes of the staff development training conferences were to introduce teachers to innovative pedagogical techniques and materials and improve teacher effectiveness. Conference activities consisted of lectures, demonstrations, and whole group or small group discussions. The lectures and demonstrations were presented by program staff, teachers, and other education and mathematics professionals. Teacher guides and informational materials were distributed to participants.

This year's conference workshops included presentations on instructional materials and tests by vendors, demonstrations of curriculum materials and mathematics activities, discussions of higher order thinking skills and of strategies for developing the relationship between teachers and students, presentations on promoting increased parent involvement in the education of their children, an update on recent research in mathematics education, and a presentation on "Addressing the Problem of Child Abuse" by the New York City Board of Education Child Abuse Team.

III. PARENTAL INVOLVEMENT PROGRAM

BACKGROUND

The Corrective Mathematics Program established its formal parental involvement program in 1975. The purpose is to increase the level and broaden the scope of parents' involvement in the education of their children. The program was designed to ensure that parents understand the goals and methods of Chapter 1 programs, to encourage parents to work with their children on mathematics and to enhance their ability to do so, and to establish on-going, working relationships between parents and Chapter 1 teachers. During 1989-90, regular parental involvement activities included orientation meetings, parent workshops, a "Parent Involvement Booklet," and a parent newsletter. These activities were supplemented with meetings and telephone conversations between teachers and the parents of individual students.

ORGANIZATION OF PARENTAL INVOLVEMENT PROGRAM

The Orientation Meeting

Orientation meetings are for parents with children new to Chapter 1 programs. They are held once a year, early in the school year. The meeting provides parents with an introduction to nonpublic school Chapter 1 services and the individual instructional programs--Corrective Reading, Corrective Mathematics, English as a Second Language, and the Reading Skills Center (see Appendix). Meeting participants include parents, Chapter 1 teachers and program staff, Chapter 1 clinical and guidance services staff, and/or the nonpublic school principal. The goals are to ensure that parents understand how the programs operate and why their children have been selected to participate.

The meeting was designed to give parents an opportunity to meet the teachers and clinical and guidance staff who will be working with their children during the school year. Topics usually include the history and purpose of Chapter 1 programs, student eligibility and selection, instructional programs and clinical and guidance services, program objectives and activities, student progress and the measurement of student achievement, curricula and course materials, the role of parents in reinforcement and motivation, and a description of parental involvement materials and activities.

Parent Workshops

Parent workshops are planned for parents with children who are participating in the Corrective Mathematics program. The workshops are designed to increase parents' understanding of the program, to identify their concerns about the program and their children's participation in it, and to provide parents with information and materials that could be used in the home to reinforce and motivate children's learning in the classroom. The purpose of the workshop is to establish and strengthen face-to-face, working relationships between parents and instructional staff.

Workshops are held at the Chapter 1 site, and parents are notified of the date, time, place, and name of the teacher giving the workshop by a written invitation, usually sent home with students. Participants include parents, teachers, clinical and guidance staff members, paraprofessionals, and/or the nonpublic school principal. Workshops are held throughout the school year, and while the frequency may vary from site to site, teachers are expected to hold at least one workshop each school year.

The "Parent Involvement Booklet"

The "Parent Involvement Booklet," a revised version of the "Parent Involvement Kit," is a resource for parents to use at home. It is organized into two major sections. A section on lower grade activities contains games, puzzles, pictures, and exercises designed to develop students' knowledge of mathematical facts, improve their computation skills, and strengthen their ability to solve word problems, use calculators, and recognize spatial relationships. In the section on upper grade activities, the exercises are designed for students to practice their knowledge of mathematics and geometry facts, test their ability to construct graphs and solve word problems, and challenge their capacity to use calculators or apply their mathematics knowledge and skills to everyday life.

In the booklet, letters of introduction, lists of mathematics activities that parents and children can do together, lists of language activities to improve communication between parents and children, suggestions for enhancing a child's selfconcept, ideas for family trips, and checklists of supplies are written in English, French, and Spanish. Unfortunately, all of the mathematics activities, instructions for the activities, and bibliographic information appear in English only--making the booklet difficult to use for parents with limited English proficiency.

The Parent Newsletter

The parent newsletter, "You Count," which connects parents to the program office, the Board of Education, and social and educational resources in the larger community, was published in the fall of 1989. The issue was four pages long, and it contained a letter of introduction from the program staff, tips on improving work and study habits, an exercise on the importance of following directions, several games and puzzles, a recipe for an easy to prepare snack, and listings of various educational resources in the community.

A "Trips" page contained useful information for taking family trips to the Brooklyn Children's Museum and the Hall of Science in Queens: namely, their address and phone number, transportation instructions for car and subway, their days and hours of operation, the suggested contribution or admission fee, and a listing of current exhibits of interest to children. In addition, a "For You to Discover" column identified a specific exhibit at each museum and offered parents tips on what to look for and questions to ask their children about the exhibit.

Individual Meetings and Telephone Conversations

Individual meetings and telephone conversations between teachers and the parents of individual students supplement other parental involvement activities. They can be initiated by either the teacher or the parent, although they tend to be initiated by parents. For example, parents may contact teachers to discuss their children's progress, to ask specific questions about students' work in mathematics, or to learn what occurred at a parent workshops which they were unable to attend. In contrast, teachers usually initiate the contact when a student is experiencing a particular problem in the classroom.

IMPLEMENTATION OF PARENTAL INVOLVEMENT PROGRAM

Program documents, data retrieval forms, interviews of program staff, and observations of parental involvement activities were the sources for the assessment of program implementation. OREA/I.S.E.U. evaluators observed two parent workshops, and an OREA/I.S.E.U. team attended the staff development training conference on parental involvement.

Parental Involvement Activities in 1989-90

Data on formal parental involvement activities--orientation meetings, parent workshops, the "Parent Involvement Booklet," and the parent newsletter--and supplementary activities--individual meetings and telephone conversations--were collected for the parents of each student in the program. Teachers were asked to indicate whether or not the parents attended an orientation meeting or parent workshop, whether or not the program had sent or otherwise transmitted a "Parent Involvement Booklet" or parent newsletter to the parent, and whether or not the teacher and parent had met individually or been in contact by phone.

Data on orientation meetings, parent workshops, individual meetings, and telephone conversations measure the quantity of active involvement in the program by parents. Data on the "Parent Involvement Booklet" and the parent newsletter, in contrast, measure the amount of outreach to parents by the program, since the data only reflect the number of parents to whom booklets and newsletters were sent, not the number of parents who received them or used them.

Table 3 presents data on the number and percentage of students whose parents were involved in specific parental involvement activities by type of activity and by the grade of the student, one through eight or nine through twelve. While data were initially analyzed by grade, they have been aggregated in the table into lower and higher grade clusters to illustrate the central finding of the grade-by-grade analysis, which was the substantial difference in the amount of parental involvement activities between the parents of elementary and junior high school students and the parents of high school students (see Table 3).

Table 3 also shows that sending parents the "Parent Involvement Booklet" and the parent newsletter were the most frequently reported type of parental involvement activity. In contrast, only five percent of all parents participated in the

TABLE 3

Parent Participation in the Corrective Mathematics Program
by Type of Parental Involvement and Grade of the Student, 1989-90

Grade	Number of Parents[a]	Orientation Meeting		Parental Workshop		Parent Booklet		Parent Newsletter		Individual Meeting		Telephone Contact	
1-8	7147	317	4.4	406	5.7	5211	72.9	5750	80.5	1134	15.9	495	6.9
9-12	624	0	0	0	0	240	38.5	201	32.2	16	2.6	13	2.1
Total	7771	317	4.1	406	5.2	5451	70.1	5951	76.6	1150	14.8	508	6.5

[a] Data represent the number of students whose parents were involved in parental involvement activities.

- Sending parents the "Parent Involvement Booklet" and the parent newsletter were the most frequently reported type of parental involvement activity.
- Parents were two to three times as likely to meet with teachers as they were to attend an orientation meeting or parent workshop or contact teachers by telephone.
- For all types of parental involvement activities, the parents of elementary and junior high school students were much more likely to have been involved or contacted than the parents of high school students.
- Only roughly one-third of the parents of high school students were sent the "Parent Involvement Booklet" or the parent newsletter, and there were no reported cases of the parents of high school students attending orientation meetings or parent workshops.

orientation meetings or parent workshops. Moreover, scheduling individual meetings was the preferred form for parents to discuss their concerns or learn about the program. Parents were two to three times as likely to meet with teachers as they were to attend an orientation meeting or parents' workshop or to contact teachers by telephone (see Table 3).

The Staff Development Training Conference on Parental Involvement

Near the end of the school year, an afternoon session and a morning session of a two-day staff development conference were devoted to parental involvement. In the afternoon of the first day, teachers divided into small groups to discuss aspects of the program's parental involvement activities. Topics included teaching mathematics in a multi-cultural society, recruiting parents to attend parent workshops, helping parents feel comfortable at the workshops, teaching parents to use mathematics and thinking games and "mathematics in every day life" activities at workshops, using "make and take" activities in workshops, and providing parents with "math tool kits." On the morning of the second day, one or two representatives of each group made presentations to the conference as a whole.

The presentations and discussions were based on teachers' individual and collective experiences with parental involvement activities, and thus, they were also descriptions of the ways the parental involvement program was implemented in this and preceding years. The presentations and discussions also offered suggestions for ways that parental involvement activities could be developed in the future. A summary of the presentations, discussions, and suggestions is presented below.

Teaching mathematics in a multi-cultural community. Many students are immigrants or the children of immigrants and may have learned alternative ways to perform computations or to conceptualize mathematics facts. For example, in Haiti, the Dominican Republic, and Italy long division is done differently than in the United States. In England, "billion" is used for the North American term for "trillion" and "one thousand million" is used for the North American term for "billion." The discussions emphasized that teachers need to be aware of and sensitive to cultural differences. The alternative methods and conceptions are not wrong; they are simply different.

Recruiting parents to workshops. Many of the ideas for improving the recruitment process involved improving the invitation and/or offering parents incentives to attend which could be mentioned on the invitation. First, the invitation should be written in all the languages necessary to communicate with parents. Second, the principal could be invited, and mentioning her/his name on the invitation would add her/his prestige to the workshop. Third, incentives such as refreshments, door prizes, and an offer to teach games at the workshops could be mentioned in the invitation. Other ideas included the suggestions that it might be better to send invitations through the mail rather than send them home with students, that the nonpublic school principal could be consulted for her/his opinion on the best way of contacting parents, and that perhaps the PTA could help mobilize parents to come to the workshops.

Teachers noted other common obstacles to recruiting parents to workshops. For example, many parents work during school hours and cannot attend. There were two suggestions for making it easier to recruit parents who work during the school day. Corrective Mathematics and other Chapter 1 instructional programs could be coordinated so that parents would be asked to attend fewer workshops and thus have to take less time off of work. Workshops could be held before school begins and/or in the evening.

Helping parents feel comfortable. The presentation, entitled "Ice-breaking," stressed that teachers must try to make parents feel comfortable with and welcome to both workshops and the program more generally. After parents have been notified of their children's eligibility for and enrollment in the program, teachers should send them a letter introducing themselves, explaining the program, and inviting parents to visit the classroom and/or discuss any concerns that they may have about the program or their children. At the workshops, teachers can reduce parent anxieties by personally welcoming them; greeting non-English speakers in their native language; conducting the workshop in the appropriate languages, if possible; and having a translator to help communicate to speakers of another language, when necessary. In the discussion, there was a consensus that every effort should be made to make all parents feel comfortable.

Mathematics and thinking games. Mathematics and thinking games reinforce the learning of computation, mathematics facts, and problem solving. Playing games is one way for parents to work with their children at home. For example, "Concentration," a game in which players match pairs of cards with identical or complementary information on them, can be used to practice mathematics facts, problem solving, geometric shapes, and/or mathematics vocabulary. The discussion leader emphasized that mathematics and thinking games should be used in parent workshops to give parents a chance to learn the game before playing it with their children.

Mathematics in everyday life. Parents can increase their involvement in their children's mathematics education by involving their children more deeply in the adult world of bank accounts, checking accounts, credit cards, payroll stubs, and household budgets. Parents can also use items from the everyday life of their children: money, prices, weight-watching materials, sports statistics, menus, recipes, maps, weather reports, calendars, and train, bus, and television schedules. In the discussion, there was a consensus that workshops should help parents learn to use everyday life situations to increase their children's interest in mathematics and strengthen their mathematics skills.

"Make and Take" activities. Slower children learn through activities that require touching, manipulation, and movement. By devoting time in workshops to the making of games and manipulatives with common household items such as egg cartons, paper plates, paper cups, and hangers, teachers can help parents meet the educational needs of their children without having to invest money in expensive materials. In addition, by making and using manipulatives in the home, parents with under-developed mathematics and literacy skills can still work with their children at home. The discussion leader suggested that "Make and take" activities should be coordinated with classroom activities. Parents and children should learn how to use the manipulative or play the game before they use them at home.

Mathematics tool kits. Mathematics tool kits contain measuring instruments, manipulatives, and instructional aids to be used in the home by children and parents. A proposed tool kit for students in grades one through four included thermometers, rulers, number tapes, yarn, clocks, maps, blocks, beads, dice, playing cards, flash cards, digit cards, and pencils. Tool kits for higher grades would contain these items and additional ones necessary for the higher level course work. Two alternative ways of distributing tool kits were discussed. Tool kits could be handed out at the beginning of the school year or in workshops over the course of the year and thus be used as an incentive for parents to attend.

Parent Workshops

A Corrective Mathematics workshop and a combined Corrective Mathematics and Corrective Reading workshop were observed. Both were held in mobile instructional units, and both were held in mid-June. They were the second and last and the fourth and last parent workshops of the year, respectively. The Corrective Mathematics workshop was held in the afternoon, and the combined Corrective Mathematics and Corrective Reading workshop was held in the morning. Parents were recruited by written invitations carried home by students.

The workshops were designed to help parents sustain the progress their children had made in mathematics and/or reading during the school year. At the mathematics workshop, the topic was "mathematics in everyday life." At the combined mathematics and reading workshop, the focus was on "make and take" activities. The workshops ended with individual parents and the teacher or teachers discussing the progress of the child or children.

Recruiting parents. Seven parents attended the Corrective Mathematics workshop. However, discussions during the workshop indicated that some of the parents had two or more children enrolled in the program. Thus, while only seven parents attended the workshop, they probably represented 11-13 students or roughly 20-25 percent of the 52 students participating in the Corrective Mathematics Program at the site.

The reading and mathematics teachers had combined their parent workshops because most of the parents worked and could not attend two workshops in the morning. Eight parents and the older sister of one student attended the workshop. However, the invitation had requested that parents sign and return it if they planned to attend, and 18 parents responded positively to the invitation. Thus, only 50 percent of the parents who had indicated an interest in the workshop actually attended it.

Making parents feel comfortable. At the mathematics workshop, the teacher, a paraprofessional, a social worker and guidance counselor from the Clinical and Guidance Program, and an E.S.L. teacher were present at the beginning of the workshop. Many of the parents greeted them by name. Several of the parents spoke Spanish, and the E.S.L. teacher who was about to begin a parent workshop in the other section of the M.I.U. welcomed them in Spanish.

At the combined workshop, both teachers and the nonpublic school principal greeted parents and welcomed them to the workshop. At this site, the majority of the students at the site were from Haiti, and the M.I.U. driver (who had been specifically requested by the teachers because he is Haitian and speaks Haitian Creole and English) was present to translate for the Creole-speaking parents. Both workshops were conducted in English.

"Make and Take" activities. The mathematics teacher introduced the "make and take" session by distributing markers and index cards to the parents and stating that the parents would make and learn to play games that their children knew and enjoyed. Using the markers and index cards, parents made (and then played) "math word concentration," "tic-tac-toe," and a game which involved adding, subtracting, multiplying, and dividing numbers under ten. Then, the reading teacher explained how to play concentration and tic-tac-toe word games. Parents also received the Corrective Mathematics Program parent newsletter and the Corrective Reading Program summer reading list.

"Mathematics in Everyday Life" activities. The mathematics teacher stressed the role parents can play in motivating their children to do well in mathematics. He suggested that using items or experiences from everyday life could motivate students while they practiced skills and applied knowledge. For example, sports statistics such as batting averages could be used to practice division, fractions, and decimals, and growth charts could be used to practice measurement and subtraction.

The teacher then distributed a weight-lifting conversion chart to show how an interest from everyday life could be used to practice mathematics. The teacher had used his own interest in weight lifting to develop a pounds-to-kilograms conversion chart. The chart included questions that practiced mathematics knowledge and skills: adding, subtracting, multiplying, dividing, solving word problems, and identifying quantitative relationships.

IV. STUDENT ACHIEVEMENT OUTCOMES

METHODS USED TO EVALUATE STUDENT ACHIEVEMENT

The impact of the Corrective Mathematics program on student achievement in mathematics was determined by comparing students' performance on norm-referenced tests against the program objectives, a statistically significant mean gain between the pretest and the posttest. Pretests were administered in fall 1989, and posttests were administered in spring 1990. Test score data were analyzed for all students who were in the Chapter 1 program for at least five months and had complete test information.

The tests administered varied by grade. First grade students were pretested on the Mathematics subtest of the Stanford Early School Achievement Test (SESAT) and posttested on the Concepts, Computation, and Applications subtests of the Stanford Achievement Test (S.A.T). Students in grades two through eight were pretested and posttested on the Concepts, Computation, and Applications subtests of the S.A.T. Students in grade nine were pretested on the Concepts, Computation, and Applications subtests of the S.A.T. and posttested on the Mathematics subtest of the Stanford Test of Academic Skills (TASK). Students in grades ten through twelve were pretested and posttested on the Mathematics subtest of the TASK.

Measuring Student Achievement

Students' raw scores were organized by grade and converted to normal curve equivalents (N.C.E.s).* Statistical analyses were carried out on the converted N.C.E. scores, and correlated *t*-tests were used to determine whether mean differences were statistically significant.

Statistical significance indicates whether the changes in achievement are real or occur by chance. However, achieving statistically significant mean gains does not address the issue of whether the mean gains are important to the students' educational development. For example, the importance of achieving statistically significant mean gains can be exaggerated for large groups of students because even small mean gains by large groups of students will generally be statistically significant. Similarly, the importance of not achieving statistically significant mean gains can be overstated for small groups of students because it is more difficult for small groups to achieve mean gains that are statistically significant. Thus,

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*Normal curve equivalent scores are similar to percentile ranks but, unlike percentile ranks, are based on an equal-interval scale ranging from 1 to 99, with a mean of 50 and a standard deviation of approximately of 21. Because N.C.E. scores are equally spaced, mathematical and statistical calculations such as averages are meaningful; in addition, comparisons of N.C.E. scores may be made across different achievement tests.

an effect size (E.S.)* is reported for each mean difference to indicate whether each mean gain or loss was educationally meaningful.

Student Achievement by Mode of Instruction

Student scores also were analyzed by mode of instruction: face-to-face, C.A.I. only, and combination services (i.e., face-to-face instruction combined with computer-assisted instruction). Analyses of covariance were conducted to determine whether there were statistically significant differences in student achievement by mode of instruction.

ACHIEVEMENT FINDINGS

Face-to-Face Instruction

Table 4 through 9 present the results of student achievement on various norm-referenced tests for students who received face-to-face instruction. For each test or subtest, mean differences and effect size were calculated for each grade and for the overall score, and mean differences were measured against the program objective, a statistically significant mean gain.

The data show that students receiving face-to-face instruction met the program objective: overall mean gains for each test and subtest were statistically significant, and, with the exception of the small number of students in grades nine

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*The effect size, developed by Jacob Cohen, is the ratio of the mean gain to the standard deviation of the gain. This ratio provides an index of improvement irrespective of the size of the sample. According to Cohen, .2 is a small effect size, .5 is a moderate effect size, and .8 is a large effect size. Only effect sizes of .8 and above are considered educationally meaningful.

TABLE 4

Mean N.C.E. Difference on Standardized Tests for First Grade Students in the Corrective Mathematics Program Receiving Face-to-Face Instruction, Fall to Spring Analysis, 1989-90[a]

Grade	N	Pretest		Posttest[b]		Difference[c]		Effect Size
		Mean	S.D.	Mean	S.D.	Mean	S.D.	
1	54	9.4	9.2	27.4	16.5	18.0	16.2	1.1

[a] Students were pretested on the Mathematics subtest of the SESAT and posttested on the Concepts, Computation, and Applications subtests of the S.A.T.

[b] Total score on the subtests of the S.A.T.

[c] The mean difference was statistically significant at the $p \leq .05$ level.

- The mean gain of 18 N.C.E.s was statistically significant and represented an educationally meaningful effect size.

TABLE 5

Mean N.C.E. Difference by Grade on the Concepts Subtest
of the Stanford Achievement Test
for Students in Grades Two through Eight
in the Corrective Mathematics Program
Receiving Face-to-Face Instruction,
Fall to Spring Analyses, 1989-90

Grade	N	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Difference[a] Mean	Difference[a] S.D.	Effect Size
2	531	13.6	13.2	32.8	17.0	19.2	16.4	1.2
3	654	16.4	12.9	35.1	15.1	18.7	14.4	1.1
4	689	24.0	13.6	35.4	14.2	11.4	14.3	0.8
5	506	23.9	13.8	34.8	16.2	10.9	16.4	0.7
6	379	25.7	13.8	37.5	13.6	11.8	15.0	0.8
7	206	26.8	15.2	37.6	13.1	10.8	14.0	0.8
8	96	31.8	15.5	36.1	12.6	4.3	14.4	0.3
Total	3061	21.2	14.5	35.2	15.1	14.0	15.7	0.9

[a] Mean differences were statistically significant at the $p \leq .05$ level.

- The overall mean gain of 14 N.C.E.s was statistically significant and represented an educationally meaningful effect size.

- Mean gains ranged from 4.3 N.C.E.s for students in the eighth grade to 19.2 N.C.E.s for students in the second grade.

- With the exception of students in grades five and eight, effect sizes were educationally meaningful.

- Mean posttest scores for students in grades three, four six, seven, and eight and overall were above 35 N.C.E.s, the State Education Department (S.E.D.) threshhold for educationally disadvantaged students.

TABLE 6

Mean N.C.E. Difference by Grade on the Computation Subtest of the Stanford Achievement Test for Students in Grades Two through Eight in the Corrective Mathematics Program Receiving Face-to-Face Instruction, Fall to Spring Analyses, 1989-90

Grade	N	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Difference[a] Mean	Difference[a] S.D.	Effect Size
2	531	23.2	17.0	37.0	17.0	13.8	19.4	0.7
3	656	24.5	15.5	40.3	18.6	15.8	19.4	0.8
4	687	25.9	15.3	37.7	16.8	11.8	17.0	0.7
5	504	29.4	14.8	36.1	17.1	6.7	16.4	0.4
6	380	26.1	14.9	38.7	15.4	12.6	16.8	0.8
7	203	26.5	15.0	39.4	14.5	12.9	16.1	0.8
8	96	30.4	17.2	37.2	14.4	6.8	15.2	0.4
Total	3057	25.9	15.7	38.1	17.0	12.2	18.0	0.7

[a] Mean differences were statistically significant at the $p \leq .05$ level.

- The overall mean gain of 12.2 N.C.E.s was statistically significant and represented a moderate effect size.
- Mean gains ranged from 6.7 N.C.E.s for students in the fifth grade to 15.8 N.C.E.s for students in the third grade.
- With the exception of students in grades two, five, and eight, effect sizes were educationally meaningful.
- Mean posttest scores for students in each grade and overall were above 35 N.C.E.s, the S.E.D. threshhold for educationally disadvantaged students.

TABLE 7

Mean N.C.E. Difference by Grade on the Applications Subtest of the Stanford Achievement Test for Students in Grades Two through Eight in the Corrective Mathematics Program Receiving Face-to-Face Instruction, Fall to Spring Analyses, 1989-90

Grade	N	Pretest		Posttest		Difference[a]		Effect
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Size
2	519	19.1	14.9	30.8	17.4	11.7	16.9	0.7
3	650	15.4	13.6	34.0	14.5	18.6	15.1	1.2
4	684	27.2	11.3	31.4	14.2	4.2	14.4	0.3
5	507	22.9	11.4	28.8	14.0	5.9	13.8	0.4
6	379	18.3	10.8	32.3	14.2	14.0	14.6	1.0
7	204	26.1	12.4	37.4	13.2	11.3	13.5	0.8
8	96	25.8	12.1	33.6	12.7	7.8	12.4	0.6
Total	3039	21.4	13.3	32.0	14.9	10.6	15.7	0.7

[a] Mean differences were statistically significant at the $p \leq .05$ level.

- The overall mean gain of 10.6 N.C.E.s was statistically significant and represented a moderate effect size.
- Mean gains ranged from 4.2 N.C.E.s for students in the fourth grade to 18.6 N.C.E.s for students in the third grade.
- Effect sizes were educationally meaningful for students in grades three, six, and seven.
- The mean posttest score for students in grade seven was above 35 N.C.E.s, the S.E.D. threshhold for educationally disadvantaged students.

TABLE 8

Mean N.C.E. Difference by Grade on the Total Score of the Stanford Achievement Test for Students in Grades Two through Eight in the Corrective Mathematics Program Receiving Face-to-Face Instruction, Fall to Spring Analyses, 1989-90

Grade	N	Pretest		Posttest		Difference[a]		Effect Size
		Mean	S.D.	Mean	S.D.	Mean	S.D.	
2	529	14.6	13.3	32.6	17.0	18.0	15.4	1.2
3	653	14.9	13.2	35.1	15.1	20.2	14.2	1.4
4	685	23.2	13.0	33.3	14.0	10.1	13.2	0.8
5	506	21.8	12.3	31.0	14.9	9.2	13.1	0.7
6	379	20.4	12.3	35.1	13.0	14.7	13.0	1.1
7	206	25.0	12.2	37.4	12.4	12.4	11.6	1.1
8	96	27.2	13.7	34.5	12.4	7.3	10.3	0.7
Total	3054	19.6	13.5	33.7	14.8	14.1	14.3	1.0

[a] Mean differences were statistically significant at the $p \leq .05$ level.

- The overall mean gain of 14.1 N.C.E.s was statistically significant and represented an educationally meaningful effect size.
- Mean gains ranged from 7.3 N.C.E.s for students in the eighth grade to 20.2 N.C.E.s for students in the third grade.
- With the exception of students in grades five and eight, effect sizes were educationally meaningful.
- Mean posttest scores for students in grades three, six, and seven were above 35 N.C.E.s, the S.E.D. threshhold for educationally disadvantaged students.

TABLE 9

Mean N.C.E. Difference by Grade
on the Mathematics Subtest
of the Stanford Test of Academic Skills
for Students in Grades Nine through Twelve
in the Corrective Mathematics Program
Receiving Face-to-Face Instruction,
Fall to Spring Analyses, 1989-90

Grade	N	Pretest[a]		Posttest		Difference		Effect
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Size
9	9[b]	33.1	12.4	77.2	13.9	44.1	19.7	NA
10	7[b]	25.6	12.0	28.0	17.2	2.4	21.3	NA
11	3[b]	5.0	6.9	27.3	16.3	22.3	10.0	NA
12	0[b]	0.0	0.0	0.0	0.0	0.0	0.0	NA
Total	19	25.9	14.9	51.2	29.3	25.3[c]	26.8	0.9

[a] Students in grade nine were pretested on the subtests of the S.A.T. The total score is reported.

[b] There were not enough cases to make valid tests for statistical significance.

[c] The mean difference was statistically significant at the $p \leq .05$ level.

- The overall mean gain of 25.3 N.C.E.s was statistically significant and represented an educationally meaningful effect size.
- For students in grades nine through twelve, there were not enough cases to make valid tests for statistical significance.
- The posttest mean score of 77.2 N.C.E.s for students in ninth grade and the total mean posttest score of 51.2 N.C.E.s exceeded grade level, 50 N.C.E.s.

through twelve for whom there were not enough cases to make valid tests for statistical significance, mean gains by grade for each test and subtest were statistically significant (see Tables 4 through 9).

Computer-Assisted Instruction

Tables 10 through 15 present the results of student achievement on various norm-referenced tests for students who received computer-assisted instruction. For each test or subtest, mean differences and effect size were calculated for each grade and for the overall score, and mean differences were measured against the program objective, a statistically significant mean gain.

The data show that students receiving computer-assisted instruction generally met the program objective: overall mean gains for each test and subtest were statistically significant, and mean gains by grade for each test and subtest were generally statistically significant. Exceptions to this pattern included eighth grade students on the Concepts subtest of the S.A.T., fifth grade students on the Computations subtest of the S.A.T., fourth grade students on the Applications subtest of the S.A.T., and the small number of students in grades twelve for whom there were not enough cases to make valid tests for statistical significance (see Table 10 through 15).

Student Achievement by Mode of Instruction

Table 16 through 18 present data of student achievement by mode of instruction: face-to-face, C.A.I. only, and combination

TABLE 10

Mean N.C.E. Difference on Standardized Tests
for First Grade Students
in the Corrective Mathematics Program
Receiving Computer-Assisted Instruction,
Fall to Spring Analysis, 1989-90[a]

Grade	N	Pretest		Posttest[b]		Difference[c]		Effect Size
		Mean	S.D.	Mean	S.D.	Mean	S.D.	
1	37	10.6	11.5	38.8	22.9	28.2	17.0	1.7

[a] Students were pretested on the Mathematics subtest of the SESAT and posttested on the Concepts, Computation, and Applications subtests of the S.A.T.

[b] Total score on the subtests of the S.A.T.

[c] The mean difference was statistically significant at the $p \leq .05$ level.

- The mean gain of 28.2 N.C.E.s was statistically significant and represented an educationally meaningful effect size.

TABLE 11

Mean N.C.E. Difference by Grade on the Concepts Subtest of the Stanford Achievement Test for Students in Grades Two through Eight in the Corrective Mathematics Program Receiving Computer-Assisted Instruction, Fall to Spring Analyses, 1989-90

Grade	N	Pretest Mean	Pretest S.D.	Posttest Mean	Posttest S.D.	Difference Mean	Difference S.D.	Effect Size
2	358	15.3	13.7	28.9	17.7	13.6[a]	16.9	0.8
3	397	16.8	13.1	31.0	15.6	14.2[a]	15.0	0.9
4	429	24.2	13.3	31.4	13.9	7.2[a]	14.0	0.5
5	390	25.7	14.8	32.5	14.6	6.8[a]	15.9	0.4
6	387	27.0	15.2	29.4	14.8	2.4[a]	15.3	0.2
7	298	22.6	14.9	32.1	13.4	9.5[a]	14.3	0.7
8	177	27.4	12.9	28.8	13.7	1.4	13.4	0.1
Total	2436	22.4	14.7	30.7	15.0	8.3[a]	15.7	0.5

[a] The mean difference was statistically significant at the $p \leq .05$ level.

- The overall mean gain of 8.3 N.C.E.s was statistically significant and represented a moderate effect size.
- Mean gains ranged from 1.4 N.C.E.s for students in the eighth grade to 14.2 N.C.E.s for students in the third grade.
- Effect sizes were educationally meaningful for students in grades two and three. For students in all other grades, effect sizes were small or moderate.

TABLE 12

Mean N.C.E. Difference by Grade on the Computation Subtest of the Stanford Achievement Test for Students in Grades Two through Eight in the Corrective Mathematics Program Receiving Computer-Assisted Instruction, Fall to Spring Analyses, 1989-90

Grade	N	Pretest		Posttest		Difference		Effect Size
		Mean	S.D.	Mean	S.D.	Mean	S.D.	
2	355	24.6	17.0	31.8	18.0	7.2[a]	19.8	0.4
3	402	23.0	15.4	31.9	18.9	8.9[a]	18.7	0.5
4	426	26.0	15.3	32.7	16.7	6.7[a]	18.0	0.4
5	388	29.5	15.1	30.9	16.5	1.4	15.6	0.1
6	388	23.9	15.4	29.1	15.8	5.2[a]	16.4	0.3
7	295	26.6	16.2	33.1	13.9	6.5[a]	15.5	0.4
8	177	25.4	14.5	29.1	13.3	3.7[a]	14.8	0.3
Total	2431	25.6	15.8	31.4	16.6	5.8[a]	17.4	0.3

[a] The mean difference was statistically significant at the $p \leq .05$ level.

- The overall mean gain of 5.8 N.C.E.s was statistically significant and represented a small effect size.
- Mean gains ranged from 1.4 N.C.E.s for students in the fifth grade to 8.9 N.C.E.s for students in the third grade.
- Effect sizes were moderate for students in grade three. For students in all other grades. effect sizes were small.

TABLE 13

Mean N.C.E. Difference by Grade on the Applications Subtest of the Stanford Achievement Test for Students in Grades Two through Eight in the Corrective Mathematics Program Receiving Computer-Assisted Instruction, Fall to Spring Analyses, 1989-90

Grade	N	Pretest		Posttest		Difference		Effect
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Size
2	355	21.0	15.1	27.0	17.2	6.0[a]	17.6	0.3
3	400	16.0	13.6	29.4	14.1	13.4[a]	15.9	0.8
4	423	27.5	11.2	27.6	13.5	0.1	14.2	0.0
5	386	24.1	11.8	25.8	13.6	1.7[a]	14.7	0.1
6	388	19.3	11.9	26.6	13.9	7.3[a]	14.7	0.5
7	293	22.8	12.6	28.8	14.4	6.0[a]	15.3	0.4
8	177	22.6	10.1	28.8	14.6	6.2[a]	15.2	0.4
Total	2422	21.9	13.0	27.6	14.5	5.7[a]	16.0	0.4

[a] The mean difference was statistically significant at the $p \leq .05$ level.

- The overall mean gain of 5.7 N.C.E.s was statistically significant and represented a small effect size.
- Mean gains ranged from 0.1 N.C.E.s for students in the fourth grade to 13.4 N.C.E.s for students in the third grade.
- Effect sizes were educationally meaningful for students in grade three and moderate for students in grade six. For students in all other grades, effect sizes were small.

TABLE 14

Mean N.C.E. Difference by Grade on the Total Score of the Stanford Achievement Test for Students in Grades Two through Eight in the Corrective Mathematics Program Receiving Computer-Assisted Instruction, Fall to Spring Analyses, 1989-90

Grade	N	Pretest		Posttest		Difference[a]		Effect
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Size
2	358	16.4	14.2	27.3	16.7	10.9	15.6	0.7
3	403	14.6	13.3	28.7	15.6	14.1	14.7	1.0
4	427	23.4	13.0	28.5	13.2	5.1	12.6	0.4
5	392	23.1	13.8	27.0	14.3	3.9	13.7	0.3
6	388	20.0	13.2	26.3	13.5	6.3	12.6	0.5
7	298	22.3	13.7	30.0	12.7	7.7	12.2	0.6
8	177	22.2	11.3	27.1	13.0	4.9	12.0	0.4
Total	2443	20.1	13.8	27.8	14.3	7.7	14.0	0.6

[a] Mean difference were statistically significant at the $p \leq .05$ level.

- The overall mean gain of 7.7 N.C.E.s was statistically significant and represented a moderate effect size.

- Mean gains ranged from 3.9 N.C.E.s for students in the fifth grade to 14.1 N.C.E.s for students in the third grade.

- The effect size was educationally meaningful for students in grade three. For students in all other grades, effect sizes were small or moderate.

TABLE 15

Mean N.C.E. Difference by Grade on the Mathematics Subtest of the Stanford Test of Academic Skills for Students in Grades Nine through Twelve in the Corrective Mathematics Program Receiving Computer-Assisted Instruction, Fall to Spring Analyses, 1989-90

Grade	N	Pretest[a]		Posttest		Difference		Effect
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Size
9	73	29.9	12.4	79.6	15.0	49.7[b]	14.6	3.4
10	45	27.4	11.9	27.8	12.6	0.4	12.4	0.0
11	12	22.5	12.7	31.8	10.1	9.3[b]	11.7	0.8
12	6[c]	20.2	6.5	40.2	11.0	20.0	9.7	NA
Total	136	28.0	12.2	56.5	28.5	28.5[b]	26.8	1.1

[a] Students in grade nine were pretested on the subtests of the S.A.T. The total score is reported.

[b] The mean difference was statistically significant at the $p \leq .05$ level.

[c] There were not enough cases to make valid tests for statistical significance.

- The overall mean gain of 28.5 N.C.E.s was statistically significant and represented an educationally meaningful effect size.
- Mean gains ranged from 0.4 N.C.E.s for students in the tenth grade to 49.7 N.C.E.s for students in the ninth grade.
- The posttest mean score of 79.6 N.C.E.s for students in ninth grade and the total mean posttest score of 56.5 N.C.E.s exceeded grade level, 50 N.C.E.s.
- Effect sizes for students in grades nine and eleven were educationally meaningful; for students in tenth grade, it was small, and for students in grade twelve, the small number of students did not permit a valid calculation of effect sizes.

services (i.e., face-to-face instruction combined with computer-assisted instruction). Analyses of covariance were conducted to determine if there were statistically significant differences in student achievement by mode of instruction. Results are reported for students in grade one, grades two through eight, and grades nine through twelve.

First grade. Table 16 presents data on student achievement by mode of instruction for students in grade one. Students were pretested on the Mathematics subtest of the SESAT and posttested on the Concepts, Computation, and Applications subtests of the S.A.T. Thus, mean gains are between the Mathematics subtest of the SESAT and the total score on the subtests of the S.A.T. Table 16 shows that students who received combination services instruction made mean gains that were significantly higher than those for face-to-face students. No other differences were statistically significant (see Table 16).

Grades two through eight. Table 17 presents data on student achievement by mode of instruction for students in grades two through eight on the total score of the S.A.T. Students were pretested and posttested on the Concepts, Computation, and Applications subtests of the S.A.T. Mean gains were calculated and analyzed for each of the subtests and for the total score. Results for the total scores are illustrated in Table 17.

Table 17 shows that students receiving face-to-face instruction made mean gains that were significantly higher than those for C.A.I. only or combination services students. In

TABLE 16

Mean N.C.E. Difference on Standardized Tests for First Grade Students in the Corrective Mathematics Program by Mode of Instruction, Fall to Spring Analysis, 1989-90[a]

Mode of Instruction	Number of Students	Mean Gain	Standard Deviation	Effect Size
Face-to-Face	54	18.0	16.2	1.1
C.A.I. Only	18	26.7	20.2	1.3
Combination Services	19	29.6	13.4	2.2

[a] Students were pretested on the Mathematics subtest of the SESAT and posttested on the Concepts, Computation, and Applications subtests of the S.A.T. Mean gains are between the Mathematics subtest of the SESAT and the total score on the subtests of the S.A.T.

- Students who received combination services instruction made mean gains that were significantly higher than those for face-to-face students.
- There were no statistically significant differences in mean gains between students receiving face-to-face and C.A.I. only, and between students receiving C.A.I. only and combination services modes of instruction.
- Effect sizes for all modes of instruction were educationally meaningful. However, the effect size for combination services students was twice as large as that for face-to-face students.

TABLE 17

Mean N.C.E. Difference on the Total Score of the Stanford Achievement Test for Students in Grades Two through Eight in the Corrective Mathematics Program by Mode of Instruction, Fall to Spring Analysis, 1989-90[a]

Mode of Instruction	Number of Students	Mean Gain	Standard Deviation	Effect Size
Face-to-Face	3054	14.1	14.3	1.0
C.A.I. Only	1733	6.8	13.8	0.5
Combination Services	710	10.1	14.1	0.7

[a] Students were pretested and posttested on the Concepts, Computation, and Applications subtests of the S.A.T. Mean gains were calculated and analyzed for each of the subtests and for the total score. Results of the analysis of total scores are illustrated.

- Students who received face-to-face instruction made mean gains that were significantly higher than those for C.A.I. only or combination services students.
- Students who received combination services instruction made mean gains that were significantly higher than those for C.A.I. only students.
- The effect size students receiving face-to-face instruction was educationally meaningful. For students receiving C.A.I. only and combination services, effect sizes were small and moderate.

addition, students who received combination services instruction made mean gains that were significantly higher than those for C.A.I. only students (see Table 17).

Grades nine through twelve. Table 18 presents data on student achievement by mode of instruction for students in grades nine through twelve. Ninth grade students were pretested on the subtests of the S.A.T. and posttested on the Mathematics subtest of the TASK. Students in grades ten through twelve were pretested and posttested on the Mathematics subtest of the TASK. For ninth grade students, mean gains are between the total score on the subtests of the S.A.T. and the Mathematics subtest of the TASK. Table 18 shows there were no statistically significant differences in mean gains between students receiving face-to-face, C.A.I. only, and combination services modes of instruction.

COMPARISON WITH PAST YEARS

For comparisons of student achievement with that in previous years, the number of students, mean gain, standard deviation of the mean gain, and effect size are reported. Through the 1987-88 school year, the program's criterion for success was a mean gain of five N.C.E.s from pretest to posttest. In 1988-89, the criterion for success was changed to a statistically significant mean gain from pretest to posttest.

During the 1987-88 school year, computer-assisted instruction was introduced to the program and implemented in a small number of nonpublic schools. However, implementation among the schools was uneven, and students' time on task in computer-

TABLE 18

Mean N.C.E. Difference
on the Mathematics Subtest
of the Stanford Test of Academic Skills
for Students in Grades Nine through Twelve
in the Corrective Mathematics Program
by Mode of Instruction,
Fall to Spring Analysis, 1989-90[a]

Mode of Instruction	Number of Students	Mean Gain	Standard Deviation	Effect Size
Face-to-Face	19	25.3	26.8	0.9
C.A.I. Only	91	30.4	27.9	1.1
Combination Services	45	24.7	24.2	1.0

[a] Ninth grade students were pretested on the subtests of the S.A.T., and thus, mean gains are between the total score on the subtests of the S.A.T. and the Mathematics subtest of the TASK.

- There were no statistically significant differences in mean gains between students receiving face-to-face, C.A.I. only, and combination services modes of instruction.

- Effect sizes for all modes of instruction were educationally meaningful.

assisted instruction was insufficient to produce meaningful achievement results for the first year of computer-assisted instruction. In addition, during 1988-89 there were no first grade students receiving C.A.I.

Face-to-Face Instruction, 1987-88 through 1989-90

First grade. Table 19 presents the results of student achievement on standardized tests for students receiving face-to-face instruction. During 1989-90, students were pretested on the Mathematics subtest of the SESAT and posttested on the Concepts, Computation, and Applications subtests of the S.A.T.. The mean gain, however, was calculated using the SESAT score and the total score on the subtests of the S.A.T. In earlier years, students were pretested and posttested on the Mathematics subtest of the SESAT. Table 19 shows that the program criterion for success was met in each of the three years evaluated (see Table 19).

Grades two through eight. Table 20 presents the results of student achievement on the Concepts, Computation, and Applications subtests of the S.A.T. for students receiving face-to-face instruction. Mean gains, however, were calculated using the total score on the subtests of the S.A.T. Table 20 shows that the program criterion for success was met in each of the three years evaluated (see Table 20).

Grades nine through twelve. Table 21 presents the results of student achievement on the Mathematics subtest of the TASK for students receiving face-to-face instruction. However, during 1989-90, students in ninth grade were pretested on the Concepts,

TABLE 19

Mean N.C.E. Differences for Full-Year First Grade Students Receiving Face-to-Face Instruction in the Corrective Mathematics Program on the Total Score of the SESAT, Fall to Spring Analysis, 1987-88 through 1989-90

Year	Number of Students	Mean Gain[a]	Standard Deviation	Effect Size
1987-88	83	28.7	17.2	1.7
1988-89	88	26.6	15.2	1.8
1989-90	54	18.0	16.2	1.1

[a] Mean differences were statistically significant at the $p \leq .05$ level.

- The mean gain for the 1987-88 school year met the program criterion for success, a five mean N.C.E. gain.
- Mean gains for the 1988-89 and 1989-90 school years met the program's criterion for success, a statistically significant mean gain.
- Effect sizes for 1987-88, 1987-88, and 1989-90 were large and educationally meaningful.

TABLE 20

Mean N.C.E. Differences for Full-Year Students
in Grades Two through Eight
Receiving Face-to-Face Instruction
in the Corrective Mathematics Program
on the Total Score of the SAT,
Fall to Spring Analysis, 1987-88 through 1989-90

Year	Number of Students	Mean Gain[a]	Standard Deviation	Effect Size
1987-88	3,699	16.5	14.0	1.2
1988-89	3,166	13.9	13.3	1.0
1989-90	3,054	14.1	14.3	1.0

[a] Mean differences were statistically significant at the $p \leq .05$ level.

[b] The 1987-88 data for students in grades one through twelve. However, 3,570 of the 3,699 students were in grades two through eight.

- The mean gain for the 1987-88 school year met the program criterion for success, a five mean N.C.E. gain.
- Mean gains for the 1988-89 and 1989-90 school years met the program's criterion for success, a statistically significant mean gain.
- Effect sizes for 1987-88, 1987-88, and 1989-90 were large and educationally meaningful.

Computation, and Applications subtests of the S.A.T.. The mean gain was calculated using the total score on the subtests of the S.A.T and the TASK score. In earlier years, students were pretested and posttested on the Mathematics subtest of the TASK. Table 21 shows that the program criterion for success was met in each of the three years evaluated (see Table 21).

Computer-Assisted Instruction, 1988-89 and 1989-90

Grades two through eight. Table 22 presents the results of student achievement on the Concepts, Computation, and Applications subtests of the S.A.T. for students receiving computer-assisted instruction. Mean gains, however, were calculated using the total score on the subtests of the S.A.T. Table 22 shows that mean gains for the 1988-89 and 1989-90 school years met the program's criterion for success, a statistically significant mean gain (see Table 22).

Grades nine through twelve. Table 23 presents the results of student achievement on the Mathematics subtest of the TASK for students receiving computer-assisted instruction. However, during 1989-90, students in ninth grade were pretested on the Concepts, Computation, and Applications subtests of the S.A.T.. The mean gain was calculated using the total score on the subtests of the S.A.T and the TASK score. In 1988-89, students were pretested and posttested on the Mathematics subtest of the TASK. Table 31 shows that mean gains for the 1988-89 and 1989-90 school years met the program's criterion for success, a statistically significant mean gain (see Table 22).

TABLE 21

Mean N.C.E. Differences for Full-Year Students
in Grades Nine through Twelve
Receiving Face-to-Face Instruction
in the Corrective Mathematics Program
on the Total Score of the TASK,
Fall to Spring Analysis, 1987-88 through 1989-90

Year	Number of Students	Mean Gain[a]	Standard Deviation	Effect Size
1987-88	3,699	16.5	14.0	1.2
1988-89	36	10.4	7.6	1.4
1989-90	19	25.3	26.8	0.9

[a] Mean differences were statistically significant at the $p \leq .05$ level.

[b] The 1987-88 data for students in grades one through twelve. However, 3,570 of the 3,699 students were in grades two through eight.

- The mean gain for the 1987-88 school year met the program criterion for success, a five mean N.C.E. gain.
- Mean gains for the 1988-89 and 1989-90 school years met the program's criterion for success, a statistically significant mean gain.
- Effect sizes for 1987-88, 1987-88, and 1989-90 were large and educationally meaningful.

TABLE 22

Mean N.C.E. Differences for Full-Year Students
in Grades Two through Eight
Receiving Computer-Assisted Instruction
in the Corrective Mathematics Program
on the Total Score of the SAT,
Fall to Spring Analysis, 1987-88 through 1989-90

Year	Number of Students	Mean Gain[a]	Standard Deviation	Effect Size
1988-89	1,438	7.4	13.0	0.6
1989-90	2,443	7.7	14.0	0.6

[a] Mean differences were statistically significant at the $p \leq .05$ level.

- Mean gains for the 1988-89 and 1989-90 school years met the program's criterion for success, a statistically significant mean gain.

- Effect sizes for 1987-88 and 1989-90 were moderate.

TABLE 23

Mean N.C.E. Differences for Full-Year Students
in Grades Nine through Twelve
Receiving Computer-Assisted Instruction
in the Corrective Mathematics Program
on the Total Score of the TASK,
Fall to Spring Analysis, 1987-88 through 1989-90

Year	Number of Students	Mean Gain[a]	Standard Deviation	Effect Size
1988-89	336	5.5	10.4	0.5
1989-90	136	28.5	26.8	1.1

[a] Mean differences were statistically significant at the $p \leq .05$ level.

- Mean gains for the 1988-89 and 1989-90 school years met the program's criterion for success, a statistically significant mean gain.

- The effect size for 1987-88 was moderate, and for 1989-90, the effect size was large and educationally meaningful.

V. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

During the 1989-90 school year, the Corrective Mathematics program achieved its goals--strengthening and increasing students' understanding of mathematical concepts, improving their ability to perform computations and solve problems, and assisting them in applying the knowledge and skills gained to everyday life. During the year, the program served 7,771 students attending 160 nonpublic schools in New York City: 3,871 students received face-to-face only instruction, 2,963 received C.A.I. only, and 928 received combination services. In addition, by the end of the 1989-90 school year, a Pilot Computer Take-Home Project had been introduced into 16 nonpublic schools, and computer-assisted instruction had been expanded to service 73 nonpublic schools, an increase of 27 schools over the 1988-89 school year. Finally, staff development training was implemented as proposed.

The Parental Involvement Program

A well-organized and robust parental involvement program was in place and was generally successful in achieving its goals--increasing the level and broadening the scope of parents' involvement in the education of their children. For example, during 1989-90, more than 300 parents attended an orientation meeting, more than 400 parents attended a parent workshop, more than 1,100 parents attended an individual meeting with a teacher, and nearly 500 parents were in contact with teachers by telephone. In addition, the program sent a "Parent Involvement Booklet" to more than 5,000 parents and a parent newsletter to nearly 6,000 students.

Nevertheless, for all types of parental involvement activities, the parents of elementary and junior high school students were much more likely to have been involved or contacted than the parents of high school students. While parent workshops were successful in enhancing the ability of attending parents to work with their children on mathematics, significant obstacles to recruiting parents to workshops remain. For example, many parents work during school hours and cannot attend. Finally, the "Parent Involvem nt Booklet" contained scores of activities for parents to use at home with their children. It was sent to nearly three-quarters of all parents. Unfortunately, while the introductory sections were written in English, French, and Spanish, activities, instructions, and bibliographic information in the booklet appeared in English only.

Student Achievement

Overall mean gains for all tests and subtests in both modes of instruction were statistically significant and met the program criterion for success. In addition, mean gains by grade on all tests and subtests in both modes of instruction were generally statistically significant. There were two kinds of exceptions to this pattern: the small numbers of face-to-face students in grades nine through twelve and C.A.I. students in grade twelve for whom there were not enough cases to make valid tests for statistical significance; and C.A.I. students in one grade on each of the subtests of the S.A.T. who did not achieve statistically significant mean gains (eighth grade students on the Concepts subtest, fifth grade students on the Computations subtest, and fourth grade students on the Applications subtest).

The results of analyses of mean gains by mode of instruction were ambiguous. While there were no differences by mode of instruction for students in grades nine through twelve, face-to-face only students in grades two through eight made mean gains that were significantly higher than those for C.A.I. only or combination services students on the Total Score of the S.A.T. In contrast, combination services students in first grade made mean gains that were significantly higher than those for face-to-face only students. However, too much emphasis should not be placed on this result, as there were only 19 first grade students who received combination services instruction.

RECOMMENDATIONS

The following recommendations for program improvement are made:

- The program should contact and increase the participation of the parents of high school students in the education of their children.
- The practice of coordinating Corrective Mathematics parent workshops with those of other Chapter 1 instructional programs so that parents have to take less time off of work should be employed as much as possible.

- The program should assess the feasibility of publishing the entire "Parent Involvement Booklet" in French and Spanish.
- The Pilot Computer Take Home Project should be expanded to permit a valid evaluation of its effects.

APPENDIX A

Brief Description of Chapter I Nonpublic School Reimbursable Programs, 1989-90

Chapter I Nonpublic School Reimbursable programs provide supplementary, individualized instruction to students attending nonpublic schools in New York City. Students are eligible for Chapter I services if they live in a targeted attendance area and score below a designated cutoff point on State-mandated standardized reading tests.

On July 1, 1985, the Supreme Court held that instruction by public school teachers on the premises of nonpublic schools--local educational agencies' most common method of serving Chapter I-eligible children--was unconstitutional. As a result, alternative methods for providing Chapter I services to eligible nonpublic school students were devised. Students attending nonpublic schools now receive Chapter I services at mobile instruction units, public school sites, leased neutral sites, and nondenominational schools and via computer-assisted instruction in designated classrooms in nonpublic schools.

CORRECTIVE READING PROGRAM

The Corrective Reading program provides instruction in reading and writing. The goal is to enable students to reach grade level in reading. During 1989-90, the program served 9,689 students in grades one through twelve in 177 nonpublic schools. The total included 3,824 students receiving computer-assisted instruction and 4,647 students receiving face-to-face instruction. In addition, 1,218 students received a combination of services. Program staff included one coordinator, four field supervisors, and 87 Corrective Reading teachers. Instruction was provided to small groups of students, one to five days a week, in sessions lasting 20 to 60 minutes. Chapter I funding totaled $10.7 million.

READING SKILLS CENTER PROGRAM

The Reading Skills Center program provides instruction in reading and writing to students in grades four through eight. The goal is to enable students to reach grade level in reading. During 1989-90, the program served 284 students from six nonpublic schools. Program staff included a coordinator and eight teachers. Instruction was provided to small groups of about five students, three to five days per week, for sessions lasting from 45 to 60 minutes. Chapter I funding totaled $667,572.

CORRECTIVE MATHEMATICS PROGRAM

The Corrective Mathematics program provided instruction in mathematics. The goals are to deepen students' understanding of mathematical concepts and to improve their ability to perform computations and solve problems. During 1989-90, the program served 7,771 students attending 160 nonpublic schools. The total included 3,871 students receiving face-to-face instruction and 3,891 students receiving computer-assisted instruction. Program staff included a coordinator, one field supervisor, and 71 Corrective Mathematics program teachers. Instruction was provided to small groups of students, one to five days per week, in sessions ranging from 45 to 60 minutes. Chapter I funding totaled more than $7.4 million.

ENGLISH AS A SECOND LANGUAGE

The English as a Second Language program provides intensive English language instruction to limited English proficient students. The goal of the program is to help students gain the listening, speaking, reading, and writing skills necessary to improve their performance in school. During 1989-90, the program served 3,017 students in kindergarten through eighth grade in 77 nonpublic schools. The total included 2,286 receiving face-to-face instruction, and 731 students receiving computer-assisted instruction. In addition, a Read-Along component provided some students with tape recorders, storybooks, and audio tapes for home use. Program staff included a coordinator, two field supervisors, and 37 teachers. Instruction was provided to small groups of students two to three days a week in sessions ranging from 30 to 60 minutes. Chapter I funding totaled $3.4 million.

CLINICAL AND GUIDANCE PROGRAM

The Clinical and Guidance program provides diagnostic and counseling services to students enrolled in Chapter I nonpublic school programs--Corrective Reading, Reading Skills Center, Corrective Mathematics, and English as a Second Language. The goal of the program is to alleviate emotional or social problems that interfere with the students' ability to profit from remedial education. During 1989-90, the program served 6,203 students from 150 nonpublic schools. The staff included two coordinators, two field supervisors, 62 guidance counselors, 43 psychologists, one psychiatrist, and 21 social workers. Chapter I funding totaled $6.7 million.