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ABSTRACT

This multi-site instructional program, in its first year of a three-year funding cycle, provided instruction in English as a Second Language (ESL) and native language arts, as well as bilingual instruction in various content areas, to 400 Spanish speaking students of limited English proficiency in grades 3-8. The functional goal of Project MAS, which was conducted at three elementary and one intermediate schools in the Bronx (New York), was to expedite students' acquisition of English language skills through specialized instruction in mathematics and science. Although the administrators of the four schools involved differed in their views of and approach to bilingual education, the program's director described its philosophy as developmental, one that promotes growth in both languages. Title VII funds supported all administrative and support staff, in addition to five paraprofessionals. Instructional services were provided by tax levy and Title I personnel. Curriculum development efforts were geared to the sciences and instructional materials were developed for physics, biology, geology, and chemistry. In addition, the program provided staff development and parent involvement activities. Quantitative analysis of student achievement indicated that (1) students at most grade levels performed well and made significant gains in English and Spanish reading; and (2) in mathematics, a mixed pattern of gains and losses was evident. Recommendations for future program effectiveness focus on meetings among site principals regarding the goals of bilingual education and the program philosophy, filling the position of science resource teacher, concentrating staff development activities on techniques for teaching language through mathematics and science, and providing more paraprofessional training activities that address the intermediate grade level. (GC)

PROJECT MAS

1982-1983

OEE Evaluation Report

O.E.E. Evaluation Report

May, 1984

Grant Number: G00-820-2689

PROJECT MAS

1982-1983

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A SUMMARY OF THE EVALUATION

FOR PROJECT MAS

(LANGUAGE LEARNING THROUGH MATHEMATICS AND SCIENCE)

1982-1983

This multi-site instructional program, in its first year of a three-year funding cycle, provided instruction in E.S.L. and native language arts, as well as bilingual instruction in mathematics, science, social studies, and a variety of other content-area courses particular to each site, to more than 400 Spanish-speaking students of limited English proficiency in grades three through eight. Project MAS was administered directly by the Office of Bilingual Education of the New York City Public Schools and operated at four sites in the Bronx -- P.S. 27, P.S. 29, I.S. 184, and C.S. 47. Almost half of the total program enrollment was from the intermediate school; the remaining half was fairly evenly distributed among the three elementary school sites. Twenty-eight percent of the program students were in the sixth grade, making it the grade with the largest number of program participants. Most of the program students were of Puerto Rican background, some born in New York City and others in Puerto Rico. Others were from Cuba, the Dominican Republic, and several other Central and South American countries. Placement in the program was based on students' scores on the Language Assessment Battery (LAB). However, those students scoring above the cut-off LAB score were also eligible for program participation upon parental request. Thus, the students varied in English language proficiency and native language ability.

The functional goal of Project MAS was to expedite students' acquisition of English language skills through specialized instruction in mathematics and science. The program's philosophy was diverse as a result of its operating at four different sites. All those involved with the program agreed that LEP students should develop basic English language skills while receiving content-area and native languge arts instruction in Spanish. Different views of bilingual education existed among the administrators of the four schools. The program director, however, described the program philosophy as developmental, one that promotes growth in both languages, as opposed to a transitional or a maintenance approach.

Three funding sources supported Project MAS: tax-levy, Title I, and Title VII. Title VII funds supported all administrative and support staff, in addition to five paraprofessionals. Instructional services were provided by tax-levy and Title I personnel. Curriculum development efforts were geared to the sciences and instructional materials were developed in the areas of physics, biology, geology, and chemistry.

Development activities for staff members included training sessions for paraprofessionals provided by the project director and resource teacher, on-site training for paraprofessionals provided by the resource teacher, university courses attended by professional and paraprofessional staff, and professional conferences, seminars, and workshops attended by the project director, resource teacher, and classroom teachers. Parents of program students were involved through the Project MAS advisory board, participation in the Hispanic Parents Conference, attendance at training sessions, and the use of services such as community referrals and translation.

Students were assessed in English language development (Language Assessment Battery and the California Achievement Test); growth in their mastery of the native language (Spanish Language Assessment Battery); and mathematics (Stanford Diagnostic Mathematics Test). Quantitative analysis of student achievement indicates that:

-- Third and fifth graders made significant gains on all LAB subtests (level 2) with large effect sizes. The total score gains were also statistically significant.

-- Seventh and eighth graders made significant gains on all LAB subtests and on the total test. Gains made by this group were especially large in reading and total score.

-- In native language achievement, third to fifth graders and seventh- and eighth-grade students made significant gains on the Spanish LAB. For all groups, the largest gains were made on the reading subtest.

-- In English reading achievement, students at all grade levels demonstrated a significant gain on the CAT, except for fifth graders.

-- The results of the S.D.M.T. show a mixed pattern of gains and losses: fourth graders performed well; fifth-grade performance dropped somewhat; seventh and eighth grades dropped in comparison to the norm, and third and sixth graders performed about average.

The following recommendations were aimed at improving the overall effectiveness of the program:

--Continuing to hold meetings for site principals regarding the goals of bilingual education in their schools and the underlying philosophy of the program;

--Filling the now vacant position of science resource teacher as quickly as possible so that those program teachers who now teach science, but are uncomfortable doing so, may be freed to teach courses in their area of expertise. Moreover, the science resource teacher would offer the support needed to strengthen this program component;

-- Focusing staff development activities on methods and techniques for teaching language through mathematics and science in order to avoid the current tendency toward presenting language and content-area as isolated units;

-- Since most of the training activities for paraprofessionals were geared for the elementary level, future training activities should place greater attention on the intermediate level.

ACKNOWLEDGEMENTS

The production of this report, as of all O.E.E. Bilingual Education Evaluation Unit reports, is the result of a cooperative effort of permanent staff and consultants. In addition to those whose names appear on the cover, Margaret Scorza has reviewed and corrected reports, coordinated the editing and production process, and contributed to the quality of the work in innumerable ways. Karen Chasin has spent many hours creating, correcting, and maintaining data files. Joseph Rivera has worked intensely to produce, correct, duplicate, and disseminate reports. Without their able and faithful participation, the unit could not have handled such a large volume of work and still produced quality evaluation reports.

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LANGUAGE LEARNING THROUGH MATHEMATICS AND SCIENCE INSTRUCTION (PROJECT MAS)

Location:	131 Livingston Street Brooklyn, New York 11201
Year of Operation:	1982-83, first year of a three-year cycle
Target Language:	Spanish
Number of Students:	402
Project Director:	Barbara Gerard
Sites:	P.S. 27, P.S. 29, I.S. 184, and C.S. 47

I. DEMOGRAPHIC CONTEXT

OVERVIEW

Project MAS is a multi-site program providing instructional services to approximately 400 students of limited English proficiency (LEP) in grades three through eight. The program emphasizes language learning through instruction in mathematics and science. It is administered directly by the Office of Bilingual Education (O.B.E.) of the New York City Public Schools, and is housed at four different school sites in the Bronx -- P.S. 27, P.S. 29, I.S. 184, and C.S. 47. The first three schools are located in Community School District (C.S.D.) 7, and the last in C.S.D. 12. Each site is described separately in the following section of this report, in terms of its setting, characteristics, and attendance area.

DESCRIPTION OF PROJECT SITES

P.S. 27, an elementary school encompassing kindergarten through grade six, was built more than 85 years ago, and is located in C.S.D. 7. The neighborhood has low-income apartment buildings, many in deteriorated condition and others preserving the newness of recent construction. The school is within walking distance of one of the most commercial areas of the Bronx, containing large department stores, branches of banks, small business firms, and fast-food places. Directly across the street from the school is a park that extends over eight blocks in length and two in width. Another elementary school, an intermediate school, a junior high school, and a vocational high school are among the educational institutions found in the same neighborhood.

P.S. 27 draws its student population from the immediate vicinity, and during the 1982-83 school year had a total enrollment of 454 pupils. Approximately 83 percent of the students come from homes with family income below the national poverty level. According to the principal, the school's ethnic composition is 80 percent Hispanic and 20 percent black, a distribution that reflects the ethnic make-up of the entire district. Among the Hispanic students, 144 or nearly one-third of the total school population, is of limited English proficiency. At present, the school has seven bilingual classes spanning kindergarten through sixth grade with the fourth-, fifth-, and sixth-grade classes participating in Project MAS.

P.S. 29 is located north of P.S. 27, but still within the limits of the district. The school was built approximately 15 years ago and at present, includes pupils in kindergarten through fifth grade. Across

the street are public housing projects and behind are low-income apartment buildings, many of which are burned down. According to school personnel, the neighborhood is unstable and has recently experienced several drug-related problems which prompted many families to move away.

The school draws part of its student population from the immediate vicinity, particularly from the nearby housing projects. It also attracts pupils who are bused from the entire Bronx area to receive remedial reading instruction. During 1982-83, the school gained approximately 100 new students, bringing the total enrollment to 560. Nearly 86 percent of the students, who are mostly Hispanic and black, come from homes with poverty level incomes. According to the principal, 113 pupils, or more than 20 percent of the total enrollment, are LEP. There is one bilingual class at each grade level, and those in the third, fourth, and fifth grades participate in Project MAS.

Intermediate School 184 is in the southeastern part of C.S.D. 7. It is situated near Westchester Avenue, a small business area of Hispanic-owned restaurants and grocery stores. The I.R.T. subway line is visible from the school. The area surrounding the school is completely desolate with abandoned, burned-down buildings. Nearby, there are tenement buildings and low-income housing projects.

The eight-year-old school building is kept in excellent condition. It houses a mini-planetarium that is fully equipped and has become a resource for other schools in the district. It also has a rich media center with instructional cassettes, filmstrips, records in Spanish and English, and teacher-training materials. According to the co-

ordinator of the media center, these instructional resources are frequently used by Project MAS staff.

Most students who attend I.S. 184 live within walking distance, predominantly in nearby public housing projects. The principal explained that approximately 20 percent of the total school population is comprised of pupils who moved away from the immediate school zone but who wish to remain at I.S. 184 for its academic offerings, particularly in the field of science. According to the principal, the students are predominantly of Hispanic and black backgrounds, and two-thirds are from low-income families. During 1982-83, the total enrollment of 646 included 195 LEP students. At present, I.S. 184 is considered a bilingual school since every student receives instruction in English and another language, usually Spanish.

Community School 47 is situated in the northeastern section of C.S.D. 12, a neighborhood of low- and middle-income two- and three-family housing. Family-owned stores, fast-food places, and chain stores can be found along nearby Westchester Avenue. The school encompasses kindergarten through grade six, and draws its student population from the area surrounding the school. According to site personnel, 75 percent of the pupils are Hispanic, 22 percent are black, and the remainder are of other ethnic backgrounds. During the 1982-83 year, 132 students were LEP. There was one bilingual class at each grade level, and the fourth-, fifth-, and sixth-grade classes participated in Project MAS.

Project MAS has its central location in Brooklyn at the Office of Bilingual Education of the New York City Public Schools. The program

office encompasses two rooms. One is used by the project director and the other is shared by an office aide, who is there on a daily basis, and other Title VII staff members who come to the central office for meetings and training sessions. The Title VII staff includes a resource teacher, a parent trainer, and five bilingual paraprofessionals. The facilities available to Project MAS staff at O.B.E. include two large meeting rooms, a resource room, and a bilingually stocked library.

II. STUDENT CHARACTERISTICS

ENTRY CRITERIA

Students at the four Project MAS sites who come from homes where a language other than English is spoken, are tested for native and English language proficiency with the Language Assessment Battery (LAB) as prescribed by the Aspira Consent Decree. Those pupils who score at or below the twenty-first percentile on the English portion of the test and obtain higher scores in their native language, are eligible for bilingual instruction. Pupils who score above the cut-off LAB score are also eligible for dual-language instruction upon parental request, and this is particularly so for those who previously participated in the schools' bilingual tracks. Thus, LAB scores and parental choice are two major considerations in selecting students for the bilingual program at the respective schools. A third selection factor is added as a prerequisite for participation in Project MAS -- grade level. The program is directed toward students, who after their early childhood education, appear to be falling behind in language, mathematics, and science skills. This limits Project MAS services to pupils in grades 3 through 8. Furthermore, by the mere fact of selecting sites with low reading and mathematics scores at the targeted grade levels, the project pupils are also considered to have special instructional needs in these basic skills areas.

COMPOSITION

The program consists of 402 Hispanic students, and Table 1 presents their distribution by site and grade level. In terms of sites,

it can be noted that 333 pupils, or 83 percent of the total program enrollment, are from C.S.D. 7. The remaining 69 students, or 17 percent of the total enrollment, are from C.S. 47, the single site in C.S.D. 12. Among the sites in C.S.D. 7, the distribution of program students was the following: P.S. 27 with 72; P.S. 29 with 66; and I.S. 184 with 195. Thus, nearly half of the total program enrollment is from the intermediate school, and the other half is fairly evenly distributed among the three elementary school sites. In terms of grade level, it can be seen that only 30 pupils (or 7 percent of the total enrollment) were in the third grade. The sixth grade had most students, with a total of 109 or 27 percent of the program enrollment. Finally, the remaining 263 pupils were almost equally distributed among the fourth, fifth, seventh, and eighth grades.

TABLE 1

Distribution of Program Students by Site and Grade Level

Grade	District 7			District 12	Total
	P.S. 27	P.S. 29	I.S. 184	C.S. 47	
3	--	30	--	--	30 (7%)
4	26	17	--	26	69 (17%)
5	23	19	--	22	64 (16%)
6	23	--	65	21	109 (27%)
7	--	--	65	--	65 (16%)
8	--	--	65	--	65 (16%)
Totals:	72	66	195	69	402
Percents:	(18%)	(16%)	(49%)	(17%)	(100%)

Source: Information provided by program director and/or principals at the target sites during interviews.

According to individuals interviewed at the sites, most students were of Puerto Rican background, some born in New York City and others on the Island. Other pupils who were born outside the United States were from Cuba, Santo Domingo, Ecuador, and several Central American countries, including Honduras and Nicaragua.

LANGUAGE PROFICIENCY

Determination of students' language proficiency at each site is made primarily on the basis of pupils' scores on the LAB. Those pupils who score at or below the twenty-first percentile are considered LEP students, while those who score above are referred to as English proficient. However, within the category of English proficient pupils, there is a wide range of language skills that the present category system obscures. This notwithstanding, Table 2 presents information on the students' linguistic designation by site. It can be seen that 295 pupils, or approximately three-fourths of the total program enrollment are LEP students and the remaining one-fourth are opted-in pupils with varying degrees of proficiency in the English language. A closer examination of the information reveals that all 72 pupils at P.S. 27 are of limited English proficiency. There are approximately 50 percent LEP students and 50 percent opted-in pupils at P.S. 29 and C.S. 47. Finally, I.S. 184 has 80 percent LEP students and 20 percent opted-in pupils.

TABLE 2

Students' Linguistic Designation by Program Site

Site	Linguistic Designation			
	Students who scored at or below 21st percentile on the LAB (LEP students)		Students who scored above the 21st percentile on the LAB (opted-in students)	
	n	%	n	%
P.S. 27	72	(100)	0	--
P.S. 29	33	(50)	33	(50)
I.S. 184	156	(80)	39	(20)
C.S. 47	34	(49)	35	(51)
Total:	295	(73)	107	(27)

Source. Information provided by program director and/or principals at the target sites during interviews.

III. PROGRAM DESCRIPTION

PROGRAM OBJECTIVES

Following is a list of objectives for evaluation during the 1982-83 school year:

1. As a result of participating in the program, at least 75 percent of the target student population will demonstrate a significant increase ($p < .05$) in understanding skills in English as measured by a comparative analysis of pre-test and post-test raw and percentile scores on the understanding language subtest of the Language Assessment Battery.

2. As a result of participating in the program, at least 75 percent of the target student population will demonstrate a significant increase ($p < .05$) in reading skills in English as measured by a comparative analysis of pre-test and post-test raw and percentile scores on the Language Assessment Battery, Levels 2 and 3.

3. As a result of participating in the program, at least 75 percent of the target student population will demonstrate a significant increase ($p < .05$) in writing skills in English, as measured by a comparative analysis of pre-test and post-test raw and percentile scores on the Language Assessment Battery, Levels 2 and 3.

4. As a result of participating in the program, at least 75 percent of the target student population will demonstrate a significant increase ($p < .05$) in Spanish language arts, as measured by a comparative analysis of pre-test and post-test raw and percentile scores on the Spanish Language Assessment Battery, Levels 2 and 3.

5. As a result of participating in the program, at least 75 percent of the target student population will demonstrate a significant increase ($p < .05$) in mathematics concepts and skills in the native language, as measured by a comparative analysis of pre-test and post-test raw and percentile scores on the Stanford Diagnostic Mathematics Test.

6. As a result of participating in the program, at least 75 percent of the target student population will demonstrate a significant increase ($p < .05$) in science concepts and skills in the native language as measured by a comparative analysis of pre-test and post-test raw scores on a locally-developed science test.

7. By the end of the first year of the project, the resource teacher, assisted by selected bilingual teachers, will develop 15 instructional science units that will be integrated within existing bilingual education curriculum for LEP students, as evident in the examination of 15 instructional packets.

8. Paraprofessionals in Project MAS will participate in a minimum of 10 training workshops offered by project staff aimed at enhancing their skills for teaching students of limited English proficiency. A content analysis will be performed of the following data sources:

    a. list of workshop topics
    b. copies of materials distributed at workshops
    c. lists of attendance
    d. participants' evaluation forms.

9. Paraprofessionals in the program will enroll in a degree-granting bilingual education program at an institution of higher education in New York State. They will register for at least two courses in such programs.

10. Bilingual teachers in the program will register and attend a credit-bearing mini-course in science education and a credit-bearing mini-course in mathematics education, taught through an institution of higher education in New York State. A content analysis will be performed of the discriptions of each course, and the attendance records will be examined.

11. Participating bilingual teachers in the program will increase their mastery of teaching strategies for math and science instruction as measured by a self-report questionnaire.

12. Participating paraprofessionals in the program will increase their mastery of teaching strategies for mathematics and science, measured by teachers' assessment of their development as reported in a questionnaire.

13. At least 25 percent of the parents of pupils in the program will participate in a minimum of one project-sponsored parental activity as measured by attendance records for activities.

PROGRAM PHILOSOPHY

Information obtained through interviews with the program director and principals at the four sites revealed that the schools that Project MAS serves have a diversified philosophy of bilingual education. All individuals interviewed agreed that it is essential to have LEP students develop listening, speaking, reading, and writing English language skills and while doing so, to receive content-area instruction in Spanish. Furthermore, there is support for development of native language skills, and that native language studies should be taught concurrently with instruction in English as a second language (E.S.L.).

Despite the above described agreement, there are differences among administrators regarding the goals of bilingual education. One assistant principal emphasized that the program's ultimate end is for students to make a smooth transition into English monolingual classrooms. The principal at another site highlighted that bilingualism is the over-riding goal and hence, dual-language instruction is an institutionalized option within his elementary school. Still, two other principals insisted that it is the parents' right to determine if, and when, their children should be exited from the bilingual program into an English monolingual classroom.

According to the program director, the focus of Project MAS is for students to acquire English language skills through specialized instruction in mathematics and science. She explained that this goal is attainable whether there is a transitional or maintenance bilingual education philosophy in effect at the different sites. She also suggested that the

use of a developmental approach to teaching both Spanish and English was common to all sites. She described the program philosophy as developmental, one that promotes growth in both languages, rather than transitional or maintenance.

Information obtained through interviews with Project MAS instructional staff lends support to the notion of a developmental program philosophy. Teachers and paraprofessionals repeatedly stated that the program's goal is to develop pupils' Spanish and English language skills through content-area instruction, particularly in mathematics and science.

ORGANIZATION AND STRUCTURE

The program director is responsible for the implementation of proposed activities. She reports to the director of the Center for Staff Development, Instruction and Supportive Services at the Office of Bilingual Education of the New York City Public Schools. Her responsibilities include administrative, supervisory, and fiscal matters pertaining to the program. Directly under her supervision is the Title VII staff consisting of one resource teacher, one parent trainer, and one office aide.

Official communication regarding Project MAS goes from the director of O.B.E. to superintendents at C.S.D. 7 and 12 and site principals. Communication pertains to such topics as funding, proposal writing, changes in approved activities, and testing students. The program director communicates directly with site principals on matters related to the implementation of approved program activities.

The principals, with the support of appropriate supervisory staff, supervise the instructional staff at their individual sites. In total,

there are 19 full- and part-time project teachers supported by tax-levy and Chapter I funds. Additionally, there are five paraprofessionals, whose positions are funded by Title VII.

Figure 1 summarizes Project MAS' organizational arrangement within the multi-site structure.

FUNDING

Three funding sources support Project MAS -- tax levy, Chapter I, and Title VII. Table 3 presents information on funding for the instructional component. It can be seen that the positions of program teachers are supported by a combination of Chapter I and tax-levy funds. There are 14 tax-levy teachers who dedicate their entire instructional time to the program and three reading teachers who spend 20 percent of their time instructing program students. Two Chapter I reading teachers give 20 percent of their time to Project MAS. Five Title VII educational assistants provide direct instruction to program pupils for 80 percent of their time, and attend training sessions provided by program staff for the remaining time. Information on funding for the non-instructional component of the program is shown on Table 4. It can be seen that Title VII supports the following positions: the program director, two resource teachers (one position was vacant during 1982-83), one parent trainer, and one office aide.

FIGURE 1

Project MAS' Organizational Structure

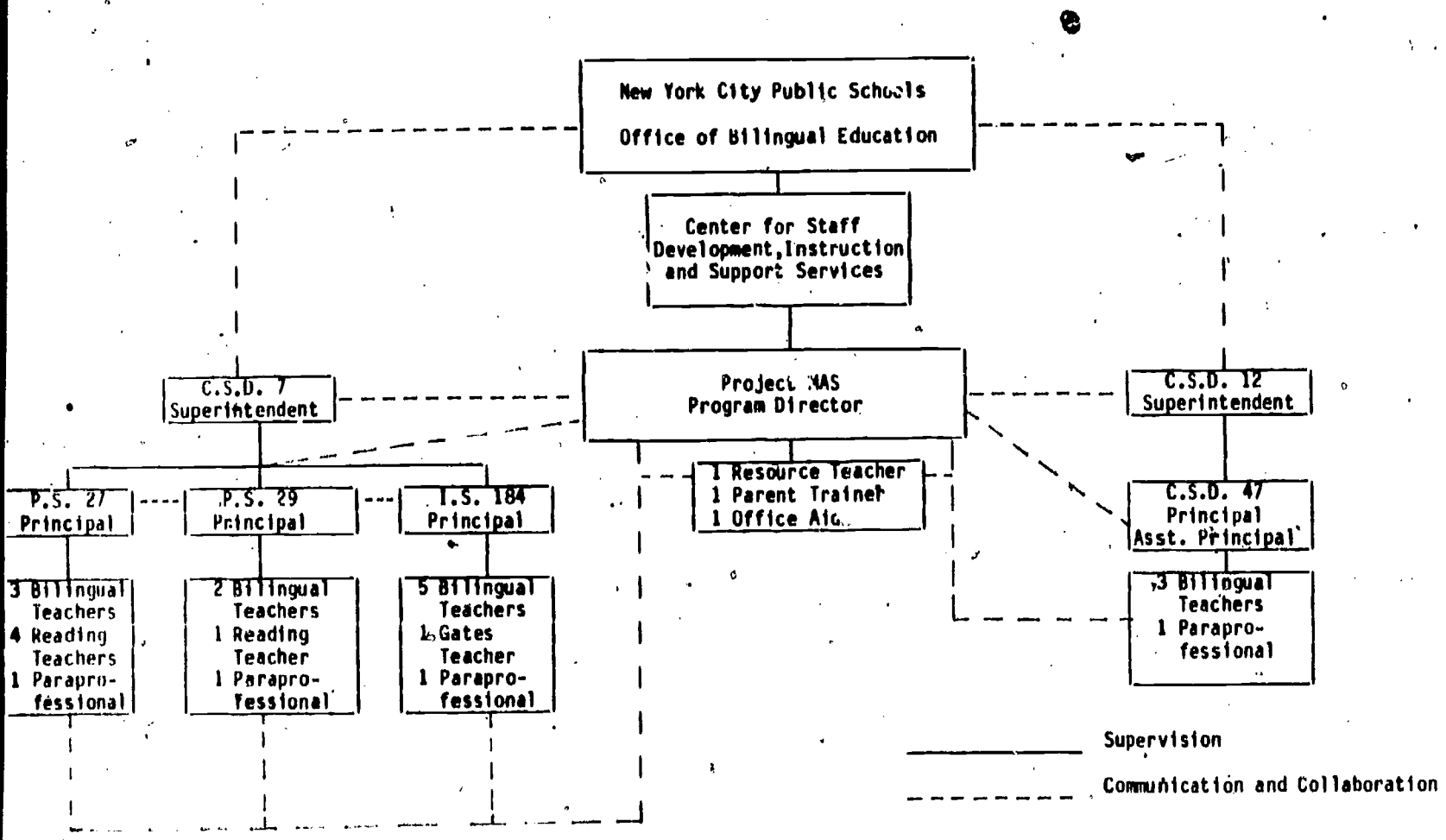


TABLE 3

Funding of Instructional Staff

Position	Funding Source	Portion of Time in Program
1 Bilingual Teacher (4th: P.S. 27)	Tax-levy	100%
1 Bilingual Teacher (5th: P.S. 27)	Tax-levy	100%
1 Bilingual Teacher (6th: P.S. 27)	Tax-levy	100%
1 Reading Teacher (P.S. 27)	Chapter I	20%
3 Reading Teachers (P.S. 27)	Tax-levy	20%
1 Bilingual Ed. Assis. (P.S. 27)	Title VII	80% (Classroom) 20% (training)
1 Bilingual Teacher (3rd: P.S. 29)	Tax-levy	100%
1 Bilingual Teacher (4/5: P.S. 29)	Tax-levy	100%
1 Reading teacher (P.S. 29)	Chapter I	20%
1 Bilingual Teacher (P.S. 29)	Title VII	80% (Classroom) 20% (training)
3 Mathematics Teachers (I.S. 184)	Tax-levy	100%
2 Science Teachers (I.S. 184)	Tax-levy	100%
1 Gates Teacher (I.S. 184)	Tax-levy	100%
2 Bilingual Ed. Assis. (I.S. 184)	Tax-levy	80% 20%
1 Bilingual Teacher (4th: C.S.47)	Tax-levy	100%
1 Bilingual Teacher (5th: C.S.47)	Tax-levy	100%
1 Bilingual Teacher (6th: C.S.47)	Tax-levy	100%
1 Bilingual Ed. Assis. (C.S. 47)	Title VII	80% (classroom) 20% (training)

TABLE 4

Funding of Non-Instructional Staff

Position	Funding Source	Portion of Time in Program
Program Director	Title VII	100%
Resource Teacher (Math)	Title VII	100%
Resource Teacher (Science)	Title VII	Vacant
Parent Trainer	Title VII	100%
Office Aide	Title VII	100%

STAFF CHARACTERISTICS

Information on characteristics of central support service professional and paraprofessional staff is detailed in Appendix A. It can be noted that the range of educational assistants' classroom experience is from seven months to nine years. All have experience in monolingual classrooms, but none in E.S.L. classrooms. The major part of their experience is in dual-language settings. The resource teacher, who serves a staff development function, has a master's degree and a New York City license in bilingual education. She is a seven-year teaching veteran in bilingual settings. The parent trainer has extensive college training in education, and a total of eight years' experience in the field, five of which have been in bilingual situations. The program director has degrees in education and in administration. She has a total of 18 years' experience in monolingual, bilingual, and E.S.L. instruction.

IV. INSTRUCTIONAL COMPONENT

INSTRUCTIONAL APPROACH

The instructional design for Project MAS calls for the integration of mathematics and science subject matter with the students' English language learning experience. Such an instructional approach capitalizes on previously acquired subject-matter knowledge, taught in the native language, as a bridge to mastering English communication skills. This interdisciplinary method for language teaching is based on the widely accepted notion that language should not be taught in isolation and that language is best learned when used for a functional purpose within a linguistically controlled environment.

Site-Specific Descriptions of the Instructional Component

While the primary focus of Project MAS is language learning through mathematics and science, program students also receive instruction in other curricular areas. Site-specific information on the full instructional component of the program is detailed in Tables 5, 6, 7, and 8.

Table 5 presents information on the instructional program for Project MAS classes at P.S. 27. A total of three self-contained classes participate in the program at this school and these include a fourth, fifth, and sixth grade. According to the principal, the three classes follow a similar program. Students have five instructional periods per week in each of the following areas: mathematics, science, social studies, and Spanish reading. Instruction in these areas is provided by the bilingual teachers in Spanish.

TABLE 5

Instructional Program at P.S. 27

Subject Matter	Language	Instructional Time
Mathematics	Spanish	5 periods per week
Science	Spanish	5 periods per week
Social Studies	Spanish	5 periods per week
English Reading	English	4 periods per week
Spanish Reading	Spanish	5 periods per week
Music/Art Physical Education	English	1 period per week

Pupils also have four instructional periods per week of English reading, which is conducted exclusively in English by the bilingual teachers and a reading specialist at the school's reading lab. They also get a minimum of one period per week in music, art, and physical education, all in English.

The instructors follow the science and social studies curriculum for their grade level, as specified in the guides provided by the New York City Public Schools. For mathematics and reading, teachers diagnose the needs of students in their classes and provide instruction at the appropriate grade level.

A bilingual Title VII paraprofessional is assigned to the school for four days a week (Monday through Thursday). His daily schedule is divided among the three Project MAS classrooms. While in the classrooms, he provides

direct instruction to program students in mathematics and science on an individualized or small-group basis. According to the paraprofessional, the teachers do most of the planning and provide support for his teaching, which is always done under their supervision. His instructional role is primarily one of reinforcing the concepts and skills already presented by the teachers. This individual has an extensive background in science and art, which he brings to bear on his classroom presentations. On his own initiative, he has constructed a variety of creative instructional games for use by program pupils.

A member of the evaluation team observed one class in this school. There were 21 pupils present for this whole-group lesson. The aim of the lesson was to review fractions. The teacher moved the students quickly through the initial review that was developed by using manipulative materials. Students were alert and responsive throughout the review. Pupils were then given a one-page assignment on fractions from their mathematics textbook. They were asked to copy all the work in their notebooks and instructed not to write in their texts. Students appeared somewhat confused regarding the written task, which consumed the major portion of the observation period. The teacher and paraprofessional assisted individual pupils who appeared to have difficulties in completing their work. The lesson was conducted entirely in Spanish.

Examination of Table 6 reveals that the instructional program at P.S. 29 varies according to students' linguistic characteristics. On a weekly basis, LEP students receive ten instructional periods of communication language arts, five periods of mathematics, two of science, and three

of social studies. Instruction in these areas is provided in Spanish. Additionally, LEP students get five weekly periods of E.S.L. and two of art, music, and physical education, all in English. Opted-in students are more proficient in English than their LEP counterparts, and therefore are mainstreamed for ten periods per week for instruction in communication language arts in English. These pupils receive instruction in mathematics (five periods per week), science (two periods per week) and social studies (three periods per week) in Spanish. They get five other periods per week of mathematics instruction with vocabulary presented in English, and two periods of art, music and physical education.

According to the bilingual teachers, the program incorporates the use of New York City Public Schools curricular guides. Activities outlined in the guides are enriched by supplementary materials.

A bilingual Title VII paraprofessional is assigned to P.S. 29 from Monday through Thursday. He stated that he works with Spanish-dominant pupils in the morning on reading, mathematics, and geography. In the afternoon, he instructs English proficient students in reading and mathematics. Additionally, he is also involved in extracurricular activities for pupils in the school. Although the paraprofessional was not observed in the classroom, it was evident from his interactions with program students and staff, that he is well liked and respected by all.

Two lessons were observed by a member of the evaluation team in this school, one in Spanish and the other in English. In one classroom, the teacher was working with approximately 25 students. The class was divided into two groups: one group reviewed multiplication tables with

TABLE 6

Instructional Program at P.S. 29

Subject Matter	Language	Instructional Time*
	LEP Students	
Communication language arts	Spanish	10 periods per week**
Mathematics	Spanish	5 periods per week
Science	Spanish	2 periods per week
Social Studies	Spanish	3 periods per week
E.S.L.	English	5 periods per week
Art/Music/ Physical Education	English	2 periods per week
	Opted-in Students	
Communication language arts	English	10 periods per week**
Mathematics	Spanish	5 periods per week
Science	Spanish	2 periods per week
Social Studies	Spanish	periods per week
Mathematics (with emphasis on vocabulary in English)	Spanish/ English	5 periods per week
Art/Music/ Physical Education	English	2 periods per week

Source. Information obtained through interview with program director and site principal.

*Instructional periods are 45 minutes in duration, unless otherwise indicated.

**Communication language arts instructional periods are 40 minutes in duration.

the assistance of the teacher; the other worked on an individualized writing activity. Those pupils with the writing task had brought in a Spanish newspaper. Their assignment was to select an article, read it, make a list of unfamiliar words, look up the definitions in the dictionary, and copy them in their notebooks. Students, although working on their own, were on-task as they followed the assignment to its completion.

Students in another classroom were engaged in a lesson that combined science, language development, and penmanship. The teacher presented vocabulary with the use of pictures, and then led the class through oral reading of a story she had printed on the board. Students were then asked to copy the story in their notebooks. As they did so, the instructor reviewed vocabulary with individual students. Those pupils who finished took out an English reading skills book and worked on previously assigned pages.

The observations revealed that both teachers have highly developed classroom management skills. Students appeared to know exactly what was required of them. They were observed on-task and involved with their work.

Students at I.S. 184 have departmentalized academic programs and thus receive instruction from various teachers throughout the day. Each of the six Project MAS classes has a block program so that pupils within a class share the same schedule and are kept as a group for nearly the entire day. Classes are split, however, for shop and physical education. Although the schedule varies by class, all students are offered the same program. As seen in Table 7, pupils receive on a weekly basis, five instructional periods in each of the following subject areas: E.S.L.,

English reading, social studies, mathematics, Spanish reading, and shop. In addition, they are programmed to take music and physical education. Spanish is used as the primary medium of instruction for social studies, mathematics, and science, while English is used for other subject areas. Two program paraprofessionals are assigned to I.S. 184 where they spend four days per week. While at the school, they work with small groups of students providing instruction in science, mathematics, and English language development. According to the paraprofessionals, Spanish and English are used during instruction in mathematics and science. Their primary goal was reported to be developing language skills while reinforcing subject-area knowledge.

Both paraprofessionals were observed by a member of the evaluation team teaching small groups of pupils. During a mathematics period, one paraprofessional instructed four eighth-grade pupils working on the calculation of percentages. She guided the students effectively through several practice exercises that required applying the skill to a sales situation. At the end of the class period, a homework assignment was explained in a clear manner. The entire lesson was conducted in Spanish.

The other paraprofessional assigned to the school was observed teaching an English reading lesson to a group of five pupils. She kept the students moving at a steady pace through their reading of the day and provided a variety of activities that retained the pupils' interest. Although the paraprofessional used English exclusively, the pupils occasionally switched to Spanish particularly when asked to define vocabulary words. At times, it became evident that although pupils provided appropriate definitions for particular words, they could not yet use them successfully in sentences.

TABLE 7

Instructional Program at I.S. 184

Subject Matter	Language	Instructional Time*
E.S.L.	English	5 periods per week
English Reading	English	5 periods per week
Social Studies	Spanish	5 periods per week
Mathematics	Spanish	5 periods per week
Spanish Reading	Spanish	5 periods per week
Shop	English	5 periods per week
Music	English	1 period per week
Physical Education	English	3 periods per week

Source. Information obtained through interview with program director and site principal.

*Instructional periods are 40 minutes in duration.

Information on the instructional program for the three Project MAS classrooms at C.S. 47 is shown in Table 8. All three classes are self-contained, although pupils are placed in English reading classes throughout the school on the basis of academic level. According to the assistant principal who supervises the bilingual program at the school, Project MAS students are "departmentalized" for English reading instruction to avoid the adverse consequences of isolation from mainstream pupils.

A paraprofessional is assigned to the school from Monday through Thursday, dividing her time among the three classes. She teaches mathematics and science to program students on an individual or small-group basis.

There are slight differences in the academic programs across classes. While they each provide instruction in English reading, Spanish reading, mathematics, science, and social studies, they vary on the amount of time allocated to the subject areas. All classes have five scheduled periods of English reading and mathematics. However, there are differences in the time allocated to Spanish reading, science, and social studies.

One lesson was observed in this school. The sixth-grade teacher was working with her class on measuring triangles. She outlined the lesson before proceeding, demonstrated how to do the tasks, questioned students to check their understanding, and summarized what was presented. The instructor established and maintained students on tasks through rapid questioning and continuously monitoring their responses. Although Spanish was the predominant language of instruction, both students and teachers switched into English on different occasions.

Another class was visited at this program site. During the observation period, two students who had recently won second prize in the district's science fair presented their winning project on sounds to their classmates. One student made the presentation in Spanish and the other in English.

TABLE 8

Instructional Program at C.S. 47

	4th Grade		5th Grade		6th Grade	
Subject Matter	Language	Pds/Wk*	Language	Pds/Wk*	Language	Pds/Wk*
English Reading	English	5	English	5	English	5
Spanish Reading	Spanish	2	Spanish	5	Spanish	3
Mathematics	Spanish/ English Vocab.	5	Spanish/ English Vocab.	5	Spanish English	5
Science	Spanish (LEP) English (opted-in)	4	Spanish	3	Spanish/ English	3
Social Studies	Spanish	5	Spanish	3	Spanish/ English	5
Art/Music/ Physical Education	English	2	English	2	English	2

Source. Information obtained through interviews with program director and site staff.

*Instructional periods are 45 minutes in duration.

V. NON-INSTRUCTIONAL COMPONENT

CURRICULUM AND MATERIALS DEVELOPMENT

One major program objective centered on curriculum and materials development. It was proposed that project staff develop 15 science instructional units in Spanish. According to the project director, the need for Spanish-language materials is more pressing in science than in mathematics. She explained that the Department of Curriculum and Instruction of the New York City Public Schools has recently produced some Spanish-language mathematics materials. Additionally, project staff members consider that there are suitable commercially-prepared mathematics textbooks in Spanish. For these reasons, Project MAS directed its materials development efforts to the area of science.

A materials development committee was organized and its members worked together during July, 1983 to produce 15 instructional science units. The group consisted of several bilingual teachers with experience in science instruction at the elementary and intermediate school levels. In selecting these teachers, attention was given to their experience in curriculum development, preparation in science, and knowledge of Spanish.

After discussion and reorganization of their task, the committee opted for a strategy that encompassed four science areas: physics, biology, geology, and chemistry. Each of the four areas was considered an organizing unit composed of modules. In terms of modules, there were seven in physics, six in biology, five in geology, and seven in chemistry. Examination of the modules revealed them to be organized in a manner that facilitates their use by teachers and pupils. The section, in-

cluding a glossary of scientific terms, is a valuable resource for bilingual teachers, particularly for those who obtained their academic and professional preparation in an all-English environment and therefore lack the appropriate science terminology in Spanish. Unit objectives are specified clearly and scientific concepts are developed comprehensively through a variety of motivating activities.

During the school year, Project MAS made great strides toward the establishment of a bilingual science and mathematics resource room at each of its sites. Space has been set aside at each school and a variety of manipulative, visual, and audio-instructional materials have been ordered. According to the principal at one of the sites, the Project MAS resource room is intended to be a learning area where students will receive instruction with a hands-on approach.

STAFF DEVELOPMENT

During 1982-83, Project MAS staff participated in four types of staff development activities: a series of training sessions for paraprofessionals provided by the project director and resource teacher at the central office; on-site training for paraprofessionals provided by the resource teacher; university courses attended by professionals and paraprofessional staff; and professional conferences, seminars, and workshops organized by various support service agencies in New York and attended by the project director, resource teacher, and classroom teachers.

The program paraprofessionals report one day per week to the central office to participate in a series of training sessions. The following topics were covered at these sessions during the 1982-83 school year:

an overview of the mathematics curriculum with an emphasis on cultural games; integrating language learning and mathematics instruction; the role of the paraprofessional in the school; basic concepts in geometry; discipline in the classroom; instructional needs of learning disabled students; open education and learning centers; and pupils' cumulative record cards. The sessions were organized and led by the resource teacher who stated that the training topics emerged from her daily observation of the paraprofessionals' needs at their respective sites.

The paraprofessionals concurred in their positive assessment of the training series. They found the presentations well organized and effective, and considered that the topics discussed and the materials distributed were useful in carrying out their program responsibilities. It was suggested, however, that future training include more sessions directed toward the intermediate level.

A member of the evaluation team reviewed a file including a packet of materials used in the training sessions. The file contained a list of strategies for maintaining discipline in the classroom, a guide for writing instructional objectives, suggestions for creating a developmentally sequential mathematics program, and a description of 30 mathematics games for students in the elementary grades. The materials reviewed were of high quality and practical value.

The resource teacher spends one day per week at each site. During that time, she meets with paraprofessionals and assists with their lesson planning. She also observes the paraprofessionals working with their assigned group of students and provides feedback based on her observations. On occasion, she has given demonstration lessons in order to

model a particular teaching technique or method for the paraprofessionals.

Information on courses given by the City University of New York and attended by the program's instructional staff is presented in Appendix B. Two of the courses, each bearing one credit, were especially designed for Project MAS teachers and paraprofessionals. Both courses focused on the teaching of language, one through science and the other through mathematics. A total of 21 teachers and paraprofessionals attended the mini-course in science and 19 in mathematics. The paraprofessionals also registered and attended three, three-credit courses at the college: contrastive linguistics, sociocultural foundations of bilingual education, and inquiry in education. Additionally, they participated in a three-credit institute on open education. The teachers and paraprofessionals unanimously agreed that the two mini-courses had been motivating and practical. One teacher stated that as a consequence of his participation in the science mini-course, two of his pupils had entered projects in the district science fair, and had won second prize. The paraprofessionals also considered the other college courses to be helpful in understanding complex issues in bilingual education.

The project director, the resource teacher, and a few bilingual teachers also attended several staff development activities held outside the schools (see Appendix C). These activities centered on computers in education, assessment of students' needs, and curriculum development.

Several program teachers reported that as a consequence of participating in Project MAS staff development activities, they had improved their presentations of mathematics and science instructional materials,

establishe and maintained students' interest in instruction, and monitored students' progress. They also reported improvements in instructional strategies among paraprofessionals, and attributed these to in-school and outside school program training. The program director reported that in her judgement, all training activities had been very effective.

The evidence clearly suggests that the program's training activities were effectively implemented, and the staff development objectives were fully attained.

PARENTAL AND COMMUNITY INVOLVEMENT

Three major strategies were used by Project MAS staff to involve program student's parents in matters related to their children's education. The strategies included: seeking parental advice on educational issues through representative participation at program and city-wide advisory organizations; offering training on the role of parents in the educational process through classes and workshops held at each site, and city-wide conferences; and providing parents with individual services such as referrals or translations.

A total of 10 parents are members of the Project MAS advisory board. According to the director, the parents met in February, 1983 at which time they received up-to-date information on the program, reviewed the Title VII continuation application, discussed issues related to the resource center, and requested that the parental component of the 1983-84 continuation application include training in E.S.L and high school equivalency. Three parents also participated in the city-wide advisory

board for Project Parents. This group met in October, 1982 and March, 1983. Their primary function is to review proposals written by the Central Board.

In terms of training, 10 program parents participated in the Hispanic Parents Conference, organized by the Office of Bilingual Education at the Central Board. The conference is an annual event aimed at raising parents' awareness of the functioning of New York City public schools. According to the program director, the 1983 conference addressed the following concerns: the role of teachers and paraprofessionals; seeking counseling services; and bilingual education as a parallel alternative to mainstream instruction.

Parent training was also provided through Project MAS at each program site. Training sessions were primarily organized and delivered by the parent trainer under the supervision of the program director and with the assistance of the resource teacher. The trainer spends one day each week per site, and she stated that parental activities at each school vary based on parents' needs. At P.S. 27, parents were given three sessions of leadership training aimed at enabling them to perform different functions in the Parent Teacher Association. Three workshops were given on the importance of homework, teen-age problems, and drug problems. Additionally, a workshop on new mathematics was given by the resource teacher in response to parents' request. Weekly exercise and diet and nutrition classes were also given, and individual services such as referrals to social service agencies, writing letters in English, and translations were also provided.

Parents at P.S. 29 received weekly exercise and diet and nutrition

classes. They participated in training workshops on the importance of homework, teenage problems, and drug-related problems. They also received weekly E.S.L. classes and individual services. Additionally, 20 parents went on a program-sponsored trip.

Parents at I.S. 184 received adult education services offered through the school. Project MAS, therefore, provided less direct services to them. Still, they were given two training workshops, one on drug problems and the other on the selection of an appropriate high school for their children. They also participated in weekly exercise classes and received individualized services. Parents at C.S. 47 were given exercise and E.S.L. classes on a weekly basis.

Examination of attendance records reveals that on the average, each training session was frequented by approximately ten people. More than 75 percent of those present were parents of program pupils. The director reported that in her judgement, the parents' opinion of the training activities was very positive.

VI. FINDINGS: STUDENT ACHIEVEMENT

The following section presents the assessment instruments and procedures used in evaluating the attainment of program objectives.

ASSESSMENT PROCEDURES AND INSTRUMENTS

Students were assessed in English language development, native language development, English reading achievement, and mathematics achievement. The following are the program's instructional objectives and the assessment instruments used to determine student achievement:

Objective	Assessment Instrument
Significant increase in understanding, reading, and writing skills in English	Language Assessment Battery(LAB), English, Levels 2 and 3
Significant increase in Spanish language arts skills	Language Assessment Battery, Spanish, Levels 2 and 3
Significant increase in reading skills in English	California Achievement Test(CAT) Levels 12 through 18
Significant increase in math concepts and skills	Stanford Diagnostic Mathematics Test (S.D.M.T.), Levels 2 through 8
Significant increase in science concepts and skills	Assessment not performed because the curriculum was not in place.

These instruments were administered once each academic year on a city-wide basis. To assess program students' achievement, a pre/post correlated t-test was computed using the students' scores from the previous year as the pre-test and their most recent scores as the post-test. This statistical analysis demonstrates whether the difference between pre- and post-test mean scores (gain) is significantly greater that would be expected from

chance variation alone. However, this analysis does not represent an estimate of how students would have performed in the absence of the program.

The "effect size" (E.S.),* which expresses the mean gain divided by the standard deviation of the gains, was also computed. Unlike the t-test, the E.S. is not affected by sample size. It became desirable to establish such an estimate because substantial differences frequently fail to reach statistical significance if the sample size is small. Conversely, small differences can be statistically significant if the sample size is large. The E.S. indicates whether there is meaningful change. If the E.S. is below 0.2, the standard deviation of the gains is at least five times greater than the mean gain. Therefore, mean gain may be due to the very large gains of a few students combined with small gains of many students, and the gain is not very meaningful. If the E.S. is 0.8 or greater, the mean gain and the standard deviation of the gains are about equal, so that most students have made similar gains; therefore the gain is considered meaningful.

Of the instruments used, the California Achievement Test and the Stanford Diagnostic Mathematics Test are described and critiqued in Buros' Mental Measurement Yearbooks. The Language Assessment Battery is a series of tests developed by the New York City Public Schools to identify students of limited English proficiency (LEP). The items for the English subtests were selected to provide sufficient "floor" and "ceiling" for LEP students, while being easy for English proficient students. The tests were normed on

*Jacob Cohen. Statistical Power Analysis for the Behavioral Sciences (Revised Edition). New York: Academic Press, 1977 Chapter 2.

the New York City Public Schools population and are divided into four levels:

	Grades
Level 1	K - 2
Level 2	3 - 5
Level 3	6 - 8
Level 4	9 - 12

The Spanish LAB has items similar to those on the English LAB and is divided into the same four levels. The attempt was to make tests which are equivalent across languages. The Spanish LAB was normed on New York City Public School students with Hispanic surnames. More information on psychometric properties may be obtained from the New York City Public Schools, Office of Testing, 131 Livingston Street, Brooklyn, New York, 11201.

ENGLISH LANGUAGE ACHIEVEMENT

Complete LAB data were available on 215 of the 363 students reported:

-- 32 students were pre- and post-tested on level 2 (grades 3 to 5)

-- 141 students were pre- and post-tested at level 3 (grades 7 to 8)

-- 14 third-grade students were pre-tested at level 1 (grade 2) and post-tested at level 2 (grade 3)

-- 28 sixth-grade students were pre-tested at level 2 (grade 5) and post-tested at level 3 (grade 6)

A t-test analysis was performed for those students who had complete pre- and post-data and is presented in Tables 9 and 10. Means and standard deviations are reported in Table 11 for those third-grade students who were pre-tested at level 1 and post-tested at level 2 and for sixth-grade students who were pre-tested at level 2 and post-tested at level 3. Gain scores could not be computed for students who changed levels, as scaled scores were not available.

As seen in Table 9, students in grades three through five who were pre- and post-tested on level 2 made significant gains on all LAB subtests ranging from 3.6 to 6.7 raw score points. These gains were of large effect sizes ranging from 0.84 to 0.99 standard deviations (s.d.). The total score gains were 15.5, which were statistically significant and had an effect size of 1.15 s.d. Correlations on pre-post scores were fairly high (0.65 - 0.79) indicating that gains were fairly consistant, i.e. the students who performed well at pre-test performed well at post-test. In this respect, the program objective was achieved.

Students in grades seven and eight made significant gains on all subtests and on the total test (see Table 10). The gains were especially

large in reading (7.6) and total score (10.5), which reflected effect sizes of 0.88 and 0.79, respectively. The gains in listening and writing were less spectacular (1.5) and of lower effect sizes. The correlations were high, indicating consistency of gains.*

*Note. It should be noted that percentile gains were not used for the analysis of LAB data because subtest percentiles were not available. In addition, the distribution of the norms is highly skewed and therefore subject to misinterpretation: large raw score gains at the low end of the score range result in little change in percentiles, while small raw score gains at the upper end result in misleadingly large percentile changes. Normal curve equivalent (N.C.E.) scores could have been calculated for the total raw scores, but would have been equally inaccurate, as their calculation is based on the assumption that the raw scores are normally distributed. These are not.

TABLE 9

English Language Achievement

Significance of Mean Total Raw Score Differences Between Initial and Final Test Scores of Students with Full Instructional Treatment on the Language Assessment Battery, Level 2 (Grades 3,4,5)

Subtest	N	Pre-Test Mean	Pre-Test Standard Deviation	Post-Test Mean	Post-Test Standard Deviation	Mean Difference	Corr. Pre/Post	T-Test	Level of Significance	E.S.
Listening	32	20.7	6.0	24.7	5.7	4.0	.67	4.7	.01	.84
Reading	28	19.5	8.8	26.2	8.4	6.7	.69	5.25	.01	.99
Writing	28	10.6	5.4	14.1	4.0	3.6	.65	4.55	.01	.87
TOTAL SCORE	32	47.0	21.7	62.5	17.9	15.5	.79	6.52	.01	1.15

TABLE 10

English Language Achievement

Significance of Mean Total Raw Score Differences Between Initial and Final Test Scores of Students with Full Instructional Treatment on the Language Assessment Battery, Level 3, (Grades 7,8)

Subtest	N	Pre-Test Mean	Pre-Test Standard Deviation	Post-Test Mean	Post-Test Standard Deviation	Mean Difference	Corr. Pre/Post	T-Test	Level of Significance	E.S.
Listening	142	24.3	7.2	25.8	7.4	1.5	.76	3.49	.01	.30
Reading	145	29.6	11.8	37.2	11.1	7.6	.71	10.62	.01	.88
Writing	144	12.8	5.0	14.2	4.1	1.5	.70	4.83	.01	.41
TOTAL SCORE	141	66.0	22.3	76.5	21.3	10.5	.81	9.30	.01	.79

TABLE 11

English Language Achievement

Results of the Language Assessment Battery

by Grade and Test Level

Grade 3

Subtest	N	Pre-Test Level 1 Mean	Pre-Test Level 1 Standard Deviation	Post-Test Level 2 Mean	Post-Test Level 2 Standard Deviation
Listening	14	23.3	8.1	22.8	5.1
Reading	14	18.5	6.9	15.5	8.4
Writing	4	3.8	1.3	7.3	4.6
TOTAL SCORE	14	42.9	12.2	49.3	17.0

Grade 6

		Pre-Test Level 2		Post-Test Level 3	
Listening	37	19.9	6.9	21.4	7.1
Reading	36	20.6	8.3	26.4	10.4
Writing	36	10.1	5.3	11.0	5.0
TOTAL SCORE	28	47.4	21.4	56.0	22.9

NATIVE LANGUAGE ACHIEVEMENT

As seen in Table 12, students from third to fifth grade tested with level 2 of the Spanish LAB made significant gains in all subtests, achieving the program objective. The largest gains were in reading (8.7). The gains in listening were smaller due to ceiling effects. Maximum scores on the tests are: listening (30), reading (36), writing (20). The students had a higher percentage of maximum score on the pre-test for listening (84 percent) than for writing (68 percent) or for reading (61 percent). The reason for the gain in writing being smaller than that for reading may be related to the curriculum sequence or the construction of the test itself.

Seventh- and eighth-grade students tested at level 3 also met the program objective by making significant gains (see Table 13). As with level 2, the gains were greater for reading than for listening and writing. The pre-test scores for listening were 82 percent of the maximum score and the writing pre-test scores were 80 percent of maximum, causing ceiling effects and lowering the possibility of gains. The reading subtest was 70 percent of maximum and showed the largest gain. However, the percentage of maximum possible score achieved at post-test were: listening (87 percent), reading (78 percent), writing (86 percent). These high percentages indicate that the Spanish LAB may be an inadequate instrument for measuring achievement in the native language because of severe ceiling effects: it tends to be too easy for students to demonstrate the full range of their academic growth.

TABLE 12

Native Language Achievement

Significance of Mean Total Raw Score Differences Between Initial and Final Test Scores of Students with Full Instructional Treatment on the Language Assessment Battery (Spanish) Level 2 (grades 3,4,5)

		Pre-Test		Post-Test						
Subtest	N	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	Corr. Pre/Post	T-Test	Level of Significance	E.S.
Listening	28	25.1	5.5	27.6	3.0	2.5	.34	2.53	.05	.47
Reading	28	22.0	10.4	30.7	5.5	8.7	.53	5.19	.01	.98
Writing	28	13.5	5.6	16.3	3.6	2.8	.32	2.60	.05	.50
TOTAL SCORE	28	60.7	18.4	74.8	10.8	14.1	.52	4.77	.01	.89

TABLE 13

Native Language Achievement

Significance of Mean Total Raw Score Differences Between Initial and Final Test Scores of Students with Full Instructional Treatment on the Language Assessment Battery (Spanish), Level 3 (Grade 7, 8)

Subtest	N	Pre-Test Mean	Pre-Test Standard Deviation	Post-Test Mean	Post-Test Standard Deviation	Mean Difference	Corr. Pre/Post	T-Test	Level of Significance	E.S.
Listening	139	31.0	4.7	32.9	4.3	1.9	.60	5.49	.01	.47
Reading	141	38.6	11.9	43.1	10.1	4.4	.69	5.92	.01	.50
Writing	140	15.9	3.7	17.1	3.1	1.1	.51	3.88	.01	.32
TOTAL SCORE	137	85.3	17.8	91.6	17.5	6.3	.57	4.47	.01	.38

TABLE 14

Native Language Achievement

Results of the Language Assessment Battery (Spanish)

By Grade, Subtest, and Test Level

Grade 3

Subtest	N	Pre-Test Level 1 Mean	Pre-Test Level 1 Standard Deviation	Post-Test Level 2 Mean	Post-Test Level 2 Standard Deviation
Listening	15	25.4	6.9	26.3	2.8
Reading	15	17.3	8.8	22.1	8.3
Writing	5	6.6	4.2	15.4	2.7
TOTAL SCORE	15	44.9	11.8	62.3	13.9

Grade 6

		Pre-Test Level 1		Post-Test Level 2	
Listening	37	27.6	4.9	29.3	4.3
Reading	37	28.1	7.4	32.1	10.0
Writing	37	14.7	5.0	15.7	2.8
TOTAL SCORE	26	69.8	16.3	77.3	14.4

ENGLISH READING ACHIEVEMENT (CAT)

Because students take a different level of the CAT each year, their raw score gains could not be analysed. However, because normal curve equivalents (N.C.E.)* and scale scores were available for this examination, two t-test analyses were performed. The calculation of scale scores enables us to articulate performance across different levels of the test on a single scale. The N.C.E.'s, like percentiles, indicate where a student stands relative to the population of the same grade. Therefore, the further below the mean, the more likely one is to show gain. The further above the mean, the more likely one is to show a loss. If one is close to the mean (40-60 N.C.E.), one may have a gain or a loss due to measurement error. The scale scores are not relative to a norm group, so that if one does not gain on N.C.E. level but changes grade, then one has been learning at a constant rate and must have a scale score gain. In summary, an N.C.E. gain of zero or greater will indicate a scale score gain, but a small N.C.E. loss does not necessarily indicate a scale score loss.

Pre- and post-test data (two consecutive years) were available for 143 students beginning with grade three. Students in grade two were not included in the analysis, because they were not tested as first graders.

In the CAT N.C.E. t-test analysis presented in Table 15, no consistent pattern emerges. Gains and losses were significant for only seventh- and

*Normal Curve Equivalents (N.C.E.'s) are equal interval normalized standard scores with a mean of 50 and a standard deviation of 21. Expressing scores in terms of N.C.E.'s allows for comparison to the norming population when a norm referenced test is used. N.C.E.'s have the same mean and range as percentiles, but unlike percentiles they are equal interval and therefore useful for statistical analysis purposes in a way that percentiles are not.

TABLE 15

English Reading Achievement

Significance of Mean Total N.C.E. Differences Between Initial and Final Test Scores of Students with Full Instructional Treatment on the California Achievement Test, By Grade

		Pre-Test		Post-Test						
Grade	N	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	Corr. Pre/Post	T-Test	Level of Significance	E.S.
3	10	40.7	14.5	38.9	5.0	-1.8	.63	-0.47	ns	-.15
4	14	31.8	9.8	38.7	11.1	6.9	.22	1.98	ns	.53
5	11	48.5	6.2	44.2	10.6	-4.3	.43	-1.46	ns	-.44
6	21	32.2	10.7	33.2	9.0	1.0	.18	0.36	ns	.08
7	43	27.7	12.4	35.8	9.9	8.1	.52	4.77	.01	.73
8	44	35.4	10.8	39.5	11.1	4.0	.63	2.84	.01	.42

eighth-grade students. This is partly due to the differences in sample size, since these two grades formed the largest group reported. The gains have a negative relationship with pre-test N.C.E.: the highest gain (8.1) was made at the lowest pre-test level (27.7), and the largest loss (-4.3) was made at the highest pretest level (48.5) with the other gains and pre-test scores falling between. Thus, N.C.E. gain analysis is too dependent on pre-test N.C.E. score distance from 50 to be very meaningful.

We also analyzed scale scores on the CAT, which enable us to look at performance between test levels. In the CAT scale score analysis presented in Table 16, students at all grade levels demonstrated significant growth except for grade five, which had a small scale score gain which was not significant.

Figure 2 presents the scale scores and scale score gains of the bilingual program students' performance on the CAT compared to a city-wide random sample of students. As can be seen, the random sample scores increase with grade level in almost a straight line. The scores of MAS students in grades three through five and six through eight parallel each other and the scores of the random sample. Third-, fourth-, and fifth-grade MAS students have scale scores closer to the random sample scores, while sixth-, seventh-, and eighth-grade MAS students performed at a lower level than the random sample. This appears to indicate that the latter group might differ somewhat from the rest of the Project MAS population. The seventh and eighth graders are in junior high school, and are probably new arrivals. The sixth graders are from two different elementary schools, and the reason

for their performance being different from fifth graders and similar to seventh graders is not clear.

A look at the gains shows that from the sixth grade on, both the MAS and random sample settle to a fairly constant amount of yearly gain after a somewhat erratic pattern for both groups. However, the gains for MAS seventh and eighth graders is greater than for the random sample.

The MAS students in the lower grades (three, four, five) are similar to the random sample monolinguals in their pattern of achievement. Although somewhat lower in scale scores, they are not very distant from the monolinguals. The upper grades are also similar to the monolingual group in overall pattern, but they are starting at a much lower point than the monolinguals and making slightly larger gains.

TABLE 16

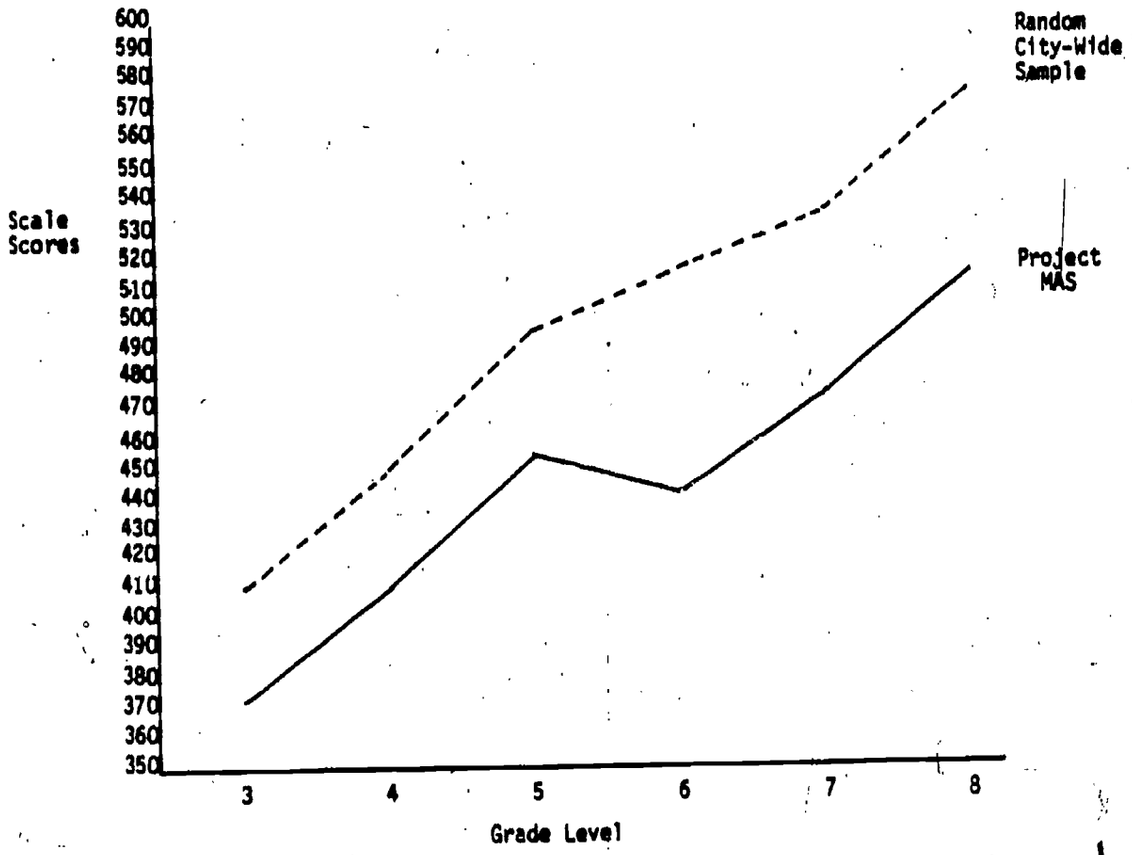
English Reading Achievement

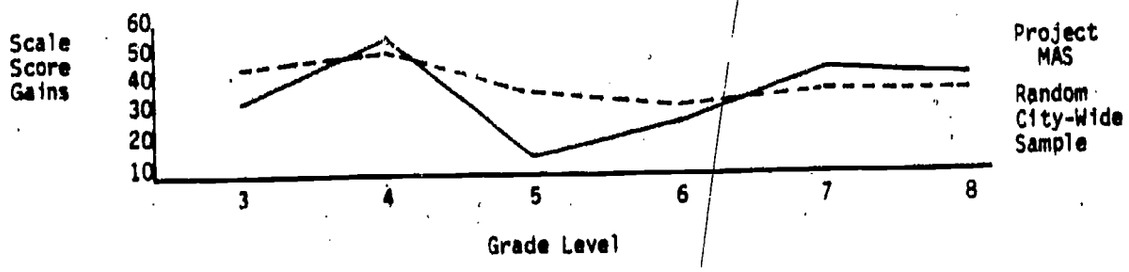
Significance of Mean Total Scale Score Differences Between Initial and Final Test Scores of Students with Full Instructional Treatment on the California Achievement Test, by Grade

		Pre-Test		Post-Test						
Grade	N	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	Corr. Pre/post	T-Test	Level of Significance	E.S.
3	10	338	36	371	14	33	.63	3.55	.01	1.13
4	14	354	34	410	34	56	.33	5.34	.01	1.42
5	11	438	20	454	34	16	.44	1.79	ns	.52
6	21	413	33	441	31	28	.17	3.15	.01	.68
7	43	431	43	474	35	43	.59	7.79	.01	1.19
8	44	472	39	513	43	41	.63	7.79	.01	1.16

FIGURE 2

Comparison of Scale Scores and Scale Score Gains on the CAT of Project MAS Students and a Random City-Wide Sample





MATHEMATICS ACHIEVEMENT (S.D.M.T.)

As scale scores were not available for both pre- and post-S.D.M.T. administrations, only N.C.E. scores were used for analysis. The results, presented in Table 17, show a mixed pattern of gains and losses, which is not correlated with pre-test scores.

Students appear to do extremely well in fourth grade, then drop in fifth grade, and stay about average for grades three and six. However, they remain very low, in fact drop slightly in comparison to the norm group, for grades seven and eight.

The reasons for this erratic pattern cannot be determined from the data. Possible explanations may include any or all of the following:

Selection effects. Some fourth graders may have been held over; these would have taken the same test twice. More able students are likely to be mainstreamed as grade level increases, to be replaced by new entrants some of whom may have weaker skills.

Testing issues. Questions of test scoring and the norming process may have contributed to the outcomes, as the test was "customized" for use in New York City.

Instruction. Differential emphases on mathematics at varying grade levels may account for some differences in growth.

Further comments on the testing program appear in the conclusions and recommendations.

TABLE 17

Mathematics Achievement

Significance of Mean Total N.C.E. Score Differences Between Initial and Final Test Scores of Students with Full Instructional Treatment on the Stanford Diagnostic Math Test, by Grade

		Pre-Test		Post-Test						
Grade	N	Mean	Standard Deviation	Mean	Standard Deviation	Mean Difference	Corr. Pre/post	T-test	Level of Significance	E.S.
3	19	45.3	15.1	46.9	16.6	1.6	.71	0.59	ns	.13
4	20	46.9	16.5	60.6	17.8	13.7	.62	4.06	.01	.91
5	18	52.8	11.2	42.7	12.4	-10.1	.33	-3.12	.01	-.71
6	13	43.5	10.6	51.9	19.1	6.4	.54	1.43	ns	.40
7	48	33.9	9.7	31.6	16.9	-2.3	.70	-1.29	ns	-.19
8	56	38.6	12.9	36.0	16.2	-2.7	.84	-2.28	.05	-.30

VII. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Based on the analysis of collected data, it is evident that Project MAS was largely successful in meeting its non-instructional objectives during its first year of funding. Through the efforts of the program, fifteen instructional science units were developed in Spanish. These included the following topics: magnetism, electricity, heat, energy, machines, needs of living things, the cell, digestion and absorption, circulation and respiration, nutrition, the atmosphere, weather, rocks and minerals, the changing earth, and the importance of fossils.

Instructional materials in mathematics, science, and language arts were acquired for use at the school sites. Manipulative audio and visual materials, particularly in the area of mathematics, were ordered for the resource centers at each site. Program paraprofessionals received intensive training at the central office and on-site from the resource teacher and the director. They also attended credit-bearing college courses that strengthened their skills for working with LEP students. Most program teachers participated in credit-bearing mini-courses on the teaching of language through science and mathematics. A few also attended a seminar on computers in education. Parents of program students were involved in advisory councils, and through their participation had input into program decisions. They received direct services at the school sites which included training workshops and classes. They also received individualized assistance, such as referrals to other service agencies and translations.

Review of the student outcomes indicates that participating students

were making significant raw score gains in English and Spanish proficiency, although the Spanish LAB proved relatively easy for Project MAS students. Patterns of achievement on the New York City Mathematics Test (N.Y.C.M.T.) were difficult to interpret, permitting few inferences about student progress to be made. Because interpretation of both the LAB and the N.Y.C.M.T. was problematic, although for different reasons, there appear to be testing issues which need to be considered. The distribution of scores on the LAB departs radically from normality, making interpretation of percentile gains difficult. As indicated, small raw score gains result in exaggerated percentile gains at the upper end of the test, while large raw score gains will result in small or no percentile gains at the lower end. Substantive interpretation of the LAB results is thus difficult.

In its Spanish version, the LAB appears to be relatively easy for many students. Because their pre-test scores are close to the maximum attainable, many students make small gains which are not a true measure of their progress.

The results of the N.Y.C.M.T. are similarly puzzling, due to any or all of the following: selection effects, problems in test construction, norming, and/or scoring, and instructional differences.

RECOMMENDATIONS

On the basis of visits to the project sites, classroom observations, and interviews with program personnel, the evaluation team recommends that consideration be given to changes in the following areas:

1. Although program staff met with school staffs to explain the philosophy of the project, there continued to be differences among site

principals regarding the goals of the bilingual program in their schools. Although these differences appear not to conflict with the goals of Project MAS, it is recommended that the project continue its efforts to discuss the philosophy underlying the project with participating school administrators and staffs.

2. Several program teachers expressed discomfort in teaching science. Some consider that their background in this area is not sufficiently strong to enable them to present the instructional content in an effective manner. In light of this program need, it appears essential that the position of science resource teacher, which is presently vacant, be filled as soon as possible. This person may offer the instructional staff the kind of support needed to strengthen the science component of the program.

3. The instructional design of Project MAS calls for the integration of the students' language learning experience with mathematics and science instruction. Classroom observations, however, revealed that language teaching is frequently done in isolation from content-area instruction. It is therefore suggested that staff development activities focus on methods and techniques for the teaching of language through mathematics and science.

4. Project MAS has students from the elementary and intermediate school levels. However, training activities for paraprofessionals were geared, for the most part, toward those instructing at the elementary level. It is suggested that greater attention be placed on the intermediate level.

5. Given the problems with interpreting the outcomes of the New York City Mathematics Test, the program is urged to consider what alternative assessments are being given in the participating schools, with an eye to substituting a test already in use for the N.Y.C.M.T. If viable alternatives are not available in the schools, the use of the Comprehensive Test of Basic Skills, which has mathematics and reading subtests as well as a Spanish version, might be considered.

VII. APPENDICES

APPENDIX A

Staff Characteristics: Central Support Service Professional and Paraprofessional Staff

Function(s)	% Time in Function	Date Hired	Certification & Education	License	Yrs. Mono Exp.	Yrs. Bil. Exp.	Yrs. ESL Exp.
Program Director	100	9/82	B.S. Education M.A. Education/Admin.	DHS EA	7	10	1
Resource Teacher	100	2/83	B.S. Education M.S. Bilingual Education	Bilingual Common Branches	0	7	0
Parent Trainer	100	11/82	90 + credits in education	--	3	5	0
Educational Assistant	100	1/83	25 credits	--	3	6	0
Educational Assistant	100	2/83	48 credits	--	3 mos	4 mos	0
Educational Assistant	100	2/83	25 credits	--	3 mos	4 mos	0
Educational Assistant	100	2/83	18 credits	--	3 mos	4 mos	0
Educational Assistant	100	2/83	15 credits	--	1	4 mos	0

APPENDIX B

University Courses Attended by Professional and Paraprofessional Staff

Institution	Course Title	Credits	Attendance	
			Paras	Teachers
City College of New York	Language Learning through Science	1	5	16
City College of New York	Language Learning through Mathematics	1	5	14
City College of New York	Contrastive Linguistics	3	4	--
City College of New York	Sociocultural Foundations of Bilingual Education	3	4	--
City College of New York	Inquiry in Education	3	5	--
City College of New York	The Workshop Center Institute	3	5	--

APPENDIX C

Staff Development Activities Outside School

Strategy	Description	Sponsor(s)	No. and titles of staff attending
Workshops	Development of mathematics curriculum	OBE/Central	Director/Resource Teacher
	Development of science curriculum	OBE/Central	Director/Resource Teacher
Conferences, Institutes, and Symposia	Computer symposium	BESC-Hunter College	Resource Teacher/4 teachers
	Computer Institute	BESC-Hunter	Director/Resource Teacher/ 6 teachers
	Hispanic Colloquium	Teachers' College	Director/Resource Teacher