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ABSTRACT

The Comprehensive Instructional Management System (CIMS) Mathematics project is a teacher-developed mathematics curriculum for kindergarten through grade seven. The 1988-89 evaluation focused on (1) the operation and impact of the program in sample of five districts, chosen to provide diverse models of the computer management system, (2) the nature and effectiveness of the computer management system to change instructional and supervisory practice, and (3) identification of the arrangements of self-sufficiency on the part of district. Gains of mathematics achievement were educationally meaningful for all districts evaluated. There was a high correlation between mastery of objectives as measured by the CIMS tests and performance on the mathematics achievement test for each grade. Nine recommendations were made based on the evaluation results. (YP)

OREA Report

EVALUATION SECTION REPORT

Comprehensive Instructional Management System (CIMS)-Mathematics
1988-89

Office of Research, Evaluation, and Assessment
Robert Tobias, Director

EVALUATION SECTION
John Schoener, Chief Administrator
March 1990

EVALUATION SECTION REPORT

Comprehensive Instructional Management System (CIMS)-Mathematics 1988-89

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EVALUATION SUMMARY

The Comprehensive Instructional Management System (CIMS) Mathematics project is a teacher-developed mathematics curriculum for kindergarten through grade seven. It is administered through the Office of Program and Curriculum Development (O.P.C.D.) of the New York City Board of Education, and includes teacher manuals for each grade, corresponding criterion-referenced tests, and a computerized test scoring and reporting system. Piloted in five New York City community school districts (C.S.D.s) in 1982-83, the project operated in 1988-89 in 26 school districts, and in 15 of them it served as the main districtwide mathematics curriculum.

The original CIMS-Mathematics model included a district-based computer management system to score tests and generate management reports. In 1986-87, the project began a school-based version of the management system (PC-CIMS) in two districts. Because of the success of PC-CIMS, an improved version was initiated in three additional districts in 1988-89.

The objectives of the CIMS-Mathematics project in 1988-89 were to:

- effect growth in student mathematics achievement;
- continue to introduce and support the use of the CIMS-Mathematics curriculum in New York City districts and schools;
- expand the PC-CIMS model of project operation into additional districts and schools, and support the ongoing operation of existing centralized management systems;
- initiate, enhance, and expand staff development programs for teachers and supervisors in support of CIMS, especially staff development for principals, supervisors, and teachers in the instructional and supervisory uses of the PC management systems;
- promote district- and school-based management of project activities; and
- revise curriculum manuals, student workbooks, and tests for grade seven.

The 1988-89 evaluation focused on the operation and impact of the program in a sample of five districts, chosen to reflect varied lengths of participation in the project and different models of the computer management system: three of the five original pilot districts, of which two continued to use the original centralized systems, and two PC-CIMS districts, each using a different version of the PC system. A second part of the evaluation documented the operation and use of PC-CIMS in a sample of schools in the two PC districts. It aimed to examine in greater detail the nature and effectiveness of attempts to change instructional and supervisory practice through the use of the computer management system, and to identify the arrangements that promote the greatest degree of self-sufficiency on the part of district and school staff in managing project activities. In this effort, the evaluation drew on a number of data sources: interviews with district, school, and project staff; observation of project activities and review of project records; and student mathematics achievement data for spring 1988 and for 1989.

Among the major findings were the following:

- In all districts examined, CIMS was associated with continued growth in mathematics achievement from 1988 to 1989. For the five districts, there was an overall statistically significant mean gain of 21.0 scale score points (S.D.=27.5), which represents an educationally meaningful gain. Students' mean gains ranged from 25.2 scale score points (S.D.=28.6) in C.S.D. 30, to 17.0 scale score points (S.D.=27.2) in C.S.D. 32. All district mean gains were statistically significant, and in C.S.D.s 1, 18, and 30, they were educationally meaningful.

- All of the sampled PC schools reported mean gains ranging from 34.1 scale score points (S.D.=22.6) to 26.3 scale score points (S.D.=27.6). All of these gains were statistically significant and educationally meaningful; in all cases, mean gains in the sample schools outstripped those of the district as a whole.

- An analysis of the correlation between percent of CIMS objectives mastered and performance on the citywide mathematics achievement test (MAT) for 1,422 pupils in grades three through six in C.S.D. 30 revealed correlations ranging from 0.79 to 0.84. These were very high levels of correlation and indicated that mastery of objectives as measured by the CIMS tests was a very good predictor of performance on the mathematics achievement test for each grade. Moreover, since the MAT is customized to New York City and New York State curricula mastery of CIMS objectives is associated with mastery of these curricula

- Efforts to promote management of project activities by district staff were largely successful, as district mathematics coordinators began to take charge of the ongoing operation of project activities in their districts, assumed responsibility for continuing staff development in district schools, and were involved in selecting and preparing schools to join the project the following year.
- CIMS liaisons in the schools, and to a lesser extent principals and other supervisors, monitored the use of the

curriculum and tests, provided support to teachers in implementing the program, encouraged spiraling homework, and promoted coordination of remedial mathematics programs with CIMS. There was some variation in the extent to which supervisors other than the CIMS liaisons incorporated use of the management system into their supervisory activities.

- Nearly all teachers in sampled schools reported that their supervisors had spoken to them about pacing the curriculum or tests, but only a third had discussed specific test results or suggested instructional strategies for teaching mathematics. On the whole, three-quarters of teachers found their school-based staff development very helpful (38 percent) or moderately helpful (38 percent), although there were large differences among the schools in teachers' ratings of this assistance. Teachers were most satisfied with their school-based staff development where supervisors provided concrete forms of assistance, such as suggested strategies and practice items.

- Sixty percent of teachers reported that they regularly reviewed the item analysis, the objective summary report, or both; only 16 percent of teachers reported that they rarely or never reviewed the test reports. Two-thirds of teachers said they regularly consulted a copy of the test when interpreting the test results. On the whole, teachers were more likely to reteach objectives as a result of test findings (41 percent) than to spiral homework assignments (17 percent); the remainder did both equally.

- The highest percentages of teacher respondents reported using the test reports regularly for review or "Do Now" exercises in class (63 percent), to assist paraprofessionals' work with students (54 percent), and to inform parents (54 percent). Teachers were less likely to use the reports for grouping students for instruction or homework (24 percent), individualizing instruction or homework (21 percent), or peer tutoring (16 percent).

- A large majority of teachers reported that they always (32 percent) or often (47 percent) spiraled homework assignments, and nearly two-thirds of all teachers reported using the test reports for this purpose regularly.

- There was a consistent finding of greater use of test reports, apart from grouping, and higher ratings of the usefulness of the management system in the C.S.D. 30 schools using the older PC-CIMS model than in the C.S.D. 17 schools using the newer PC system. This was true for both the first- and second-year C.S.D. 30 schools.
- Commitment to continue the project was high on the part of the teachers interviewed: 45 percent were very committed

and 34 percent moderately committed to its continuation. Sixty-three percent of 30 respondents said that they were more committed to the program than the previous year.

On the basis of the evaluation, the following recommendations are made:

- Continue to expand the PC component of the project and staff development in support of it.

- Focus efforts on training supervisors, as well as CIMS liaisons, to provide assistance with the management system and its use for instructional purposes.

- Evaluate carefully the format and number of test reports and their usefulness for teachers and administrators; consider simplifying the newer PC reports.

- Continue efforts to promote the use of the management reports for grouping students and individualizing instruction.

- Help teachers to find alternate ways of teaching mathematical concepts through the use of the testing system.

- Consider carefully teacher and supervisor comments in reviewing and revising the first grade curriculum.
- Review test formats to check for unclarity and ambiguity in the questions, especially in grade two.

- Continue stressing use of the tests and test reports for diagnostic purposes.

- Assist teachers in finding ways to share the test reports effectively with parents, perhaps by linking them with other teachers in their schools who use them successfully for this purpose.

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This report is the result of a collaborative effort on the part of full-time staff and consultants. In addition to those whose names appear on the title page, the unit is grateful to the following people for their able assistance: Maria Cheung, Bernadette Russek, and Lois Wilcken.

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I. INTRODUCTION

PROGRAM BACKGROUND

The Comprehensive Instructional Management System (CIMS)-Mathematics project is a teacher-developed mathematics curriculum for kindergarten through grade seven, including criterion-referenced tests and a computerized test scoring and reporting system for managing mathematics instruction. The CIMS-Mathematics curriculum model was designed to incorporate all New York State and City mathematics instructional objectives and to be adaptable to individual districts' needs and resources. It was initiated in upstate New York in 1970, and prototype projects were introduced in several New York City community school districts (C.S.D.s) during the following decade.

The current CIMS-Mathematics project was begun by the New York City Board of Education's Division of Curriculum of Instruction. The project is currently administered by the Office of Program and Curriculum Development (O.P.C.D.). It was developed in 1982-83 with a grant from the New York State Department of Education, and piloted the following year in five community school districts. Since then, use of the project has continued to expand throughout the New York City public schools. In 1988-89, CIMS-Mathematics curriculum manuals were in use in 26 of the 32 New York City community school districts. Of these, 15 had adopted the manuals districtwide in all schools and grades.

The original CIMS-Mathematics model included the operation of a district-based computer management system to score tests and generate management reports. Because of the large commitment of resources and personnel needed to operate such systems, the project introduced a management system in 1986-87 using school-based microcomputers, called PC-CIMS. PC-CIMS was begun in nine schools in two districts in 1986-87 and expanded to an additional seven schools the following year. As a result of the success of PC-CIMS, in 1988-89 the PC model was further expanded in the two original districts, and a hard-disk version allowing for greater efficiency and expanded functions was initiated in three additional districts.

Staff development for teachers and supervisors in the use of the curriculum manuals, tests, and test reports has been an important part of the CIMS program in all phases of its implementation. Through the use of the computer management system, the project seeks not only to improve mathematics instruction, but to change and enhance the nature of mathematics supervision in the schools. When PC-CIMS was introduced, project staff assigned a CIMS staff developer to each of the participating districts on a permanent part-time basis. With the expansion of the PC model and the need to provide support to an increasing number of districts, the project modified this arrangement to lessen the direct dependence of schools on CIMS staff and to broaden the role of district and school staff in the management of project activities.

PROGRAM OBJECTIVES

The major objectives of the CIMS-Mathematics program for 1988-89 were the following:

- effect steady growth in student mathematics achievement;
- continue to introduce and support the use of the CIMS-Mathematics curriculum manuals in New York City districts and schools;
- expand the PC-CIMS model of project operation into additional districts and schools, and support the ongoing operation of existing centralized management systems;
- initiate, enhance, and expand staff development programs for teachers and supervisors in support of CIMS, especially staff development for principals, supervisors, and teachers in the instructional and supervisory uses of the PC management systems;
- promote district- and school-based management of project activities; and
- revise curriculum manuals, student workbooks, and tests for grade seven.

POPULATION SERVED

During 1988-89, the CIMS-Mathematics project operated in all schools from kindergarten through grade seven in 15 New York City community school districts. Of these, four were original pilot districts involved in the project since its inception six years ago (C.S.D.s 1, 18, 23, and 32), five had implemented the project for four years (C.S.D.s 5, 8, 15, 27, and 30), four had used the curriculum districtwide for three years (C.S.D.s 6, 10, 17, 21), and two were in their second year of districtwide implementation of the project (C.S.D.s 7 and 11). In addition, CIMS curriculum manuals were used in 1988-89 in selected schools and/or grades in 11 other school districts. Depending on district decision, both general and special education students were served.

PROGRAM EVALUATION

The 1988-89 evaluation of the CIMS-Mathematics project by the Office of Research, Evaluation, and Assessment/Instructional Support Evaluation Unit (OREA/I.S.E.U.) was in two parts. The first examined project activities in a sample of five districts, chosen to reflect varied lengths of participation in the project and the use of different computer management systems. Since the project had operated in these districts for a number of years, the evaluation focused on current issues in the ongoing implementation of project activities, and reported on the impact of the program on student achievement in mathematics for 1988-89. The second and main part of the evaluation sought to examine in greater detail the nature and effectiveness of attempts to change instructional and supervisory practice through the use of the computer management system, and to identify the arrangements that promote the greatest degree of self-sufficiency on the part of district and school staff in managing project activities. To this end, the evaluation documented the operation and use of PC-CIMS in four schools in two districts, one implementing PC-CIMS for the first time during the current year and one continuing the operation of existing systems. Project staff development support to the schools, follow-up support by district and school personnel, and use of the management reports by teachers, principals, and assistant principals were examined.

SCOPE OF THE REPORT

This report presents the results of the evaluation of the 1988-89 CIMS-Mathematics project. Background information and goals for the year are reviewed in Chapter I. Major project components are described in Chapter II, and the evaluation focus and methodology are discussed in Chapter III. Chapter IV reports findings from parts one and two of the evaluation: part one presents findings on the operation of the project and its effectiveness in a number of districts implementing the program for varying lengths of time; and part two documents the operation of PC-CIMS in a sample of schools in two districts. Conclusions and recommendations are presented in Chapter V. Appendices A, B, and C show 1988-89 analyses of CIMS mathematics scale scores by district, CIMS mathematics N.C.E. scores by district, and CIMS mathematics scale scores and N.C.E. scores for sample schools, respectively.

II. PROJECT COMPONENTS

STAFFING AND ADMINISTRATION

Two co-directors were responsible for the overall administration of the CIMS project. Their duties included: introducing the project to districts and schools new to CIMS; assisting mathematics coordinators in developing and implementing staff development activities in the districts; coordinating the PC-CIMS project; overseeing revision of curriculum manuals, student workbooks, and tests; and documenting project activities.

Four full-time CIMS staff developers, called "curriculum leaders," conducted districtwide and in-school training for principals, assistant principals (A.P.s), and teachers on the basis of staff development plans made with the districts at the request of individual schools. In order to lessen the dependence of the districts and schools on one CIMS staff member, pairs of curriculum leaders dealing with computer- and curriculum-related issues were assigned to work with districts on a flexible basis. Requests for staff assistance from the schools were expected to be handled through the district mathematics coordinator. Curriculum leaders were also involved in the curriculum revision process.

District mathematics coordinators functioned as the primary CIMS liaisons in the districts and were expected to take over management of project activities in their districts after an initial year of training and support by CIMS staff. In preparation for this role, CIMS requested that mathematics coordinators of districts joining the project attend all staff development sessions conducted by CIMS in their district. After the first year, the mathematics coordinator was responsible for staff development for schools continuing in the project, while CIMS provided orientation and support for new schools. Additional responsibilities of the mathematics coordinators included ordering and distributing CIMS materials in the districts and schools, and providing feedback from teachers regarding curriculum revision.

The central CIMS computer manager and Office of Data Processing Coordination (O.D.P.C.) staff were responsible for overseeing the operation of the district-based computer management systems and the in-school PC systems. Implementation of the PC systems involved training school-based personnel in the operation of the computers, overseeing their installation and ongoing operation, and designing and updating CIMS software and management reports. District computer managers were responsible for the day-to-day operation of the district-based systems: updating student rosters; overseeing test delivery, scoring, and reporting; and maintaining hardware and software. In the PC-CIMS schools, computer aides or administrative assistants were responsible for maintaining student class data, scoring test answer cards, generating test reports, and coordinating the delivery of tests and reports.

CURRICULUM

CIMS-Mathematics curriculum materials include a two-part teacher's manual for each grade and corresponding student workbooks. The teaching strategies suggested for each instructional objective make extensive use of manipulative materials and are intended to be supplemented by additional material and practice items from other resources. The CIMS material supports the cyclical organization of the New York City Scope and Sequence, which draws on research reportedly showing that students remember material more effectively when topics are reintroduced at various times rather than covered exhaustively once. To correlate with the cyclical nature of the Scope and Sequence, teachers are expected to "spiral" homework assignments. This means that each homework assignment should include review questions and preparation for future work, as well as cover material currently being taught. Ideally, a teacher should use the computerized test reports to prepare a spiraled homework assignment with four components: questions on the current lesson, questions on objectives missed during the past two weeks, questions on objectives missed earlier in the year, and review of a skill that will be needed for a future unit.

TESTS

Integral to the CIMS curriculum are criterion-referenced tests, each covering three instructional modules and consisting of 25 to 45 multiple-choice items. There are 12 cumulative tests and four quarterly tests in grades two through six, and 27 individual module tests in grade one. CIMS tests are not designed primarily for evaluation purposes, but are intended to be used along with the computerized test management system to diagnose student weaknesses and plan instruction and homework assignments.

COMPUTER MANAGEMENT SYSTEM

Linked to the CIMS testing component in the original CIMS model was a district-based computer management system, whose function was to provide teachers with computerized test results for instructional planning, and to give administrators and supervisors information for monitoring mathematics instruction and making long-range educational decisions. This system continues to be used in two of the original pilot districts. The newer PC model uses in-school computers to score tests and generate reports. The original PC system in use in two districts generates a number of reports for each test administered: an item analysis of the entire test; a report of objectives mastered and not mastered by each student; and a summary report of objectives mastered by the class. The newer hard-disk system in use in three other districts has increased capabilities and for each test generates two item matrices, two instructional objective matrices, and a class diagnostic report, which groups students according to objectives missed. An individual summary report, listing objectives missed by each student, accompanies the results of each quarterly test.

Teachers are expected to review the test results with a copy of the test in hand to determine whether student errors are due to the format of the question or to lack of mastery of the concept involved, and to decide what steps to take for remediation. CIMS staff recommend that teachers consider options other than reteaching the topic, such as spiraling homework assignments, peer tutoring, or "Do Now" exercises in class.

CIMS project staff also make available to school administrators periodic testing reports, summarizing the number of tests that had been administered and scored for each class in their school; and management reports, summarizing the percentage of objectives mastered on the tests by each grade. In addition, a computer operator's checklist, developed to keep track of the tests administered by each teacher, is generated weekly to help administrators monitor pacing of the tests. Supervisors (A.P.s or principals) are expected to review the test results, and to encourage and monitor teachers' use of the reports for planning instruction and for spiraling homework assignments.

STAFF DEVELOPMENT

Since implementation of the New York City Scope and Sequence requires a modification of the traditional topic-centered approach to teaching mathematics and a change in methods of administration and supervision, staff development has been an intrinsic part of the CIMS system from its inception. Staff training provided to schools implementing PC-CIMS includes an introduction for school staff to the operation and use of the system, and formal and informal follow-up sessions aimed at helping teachers understand and use the test reports in their instructional planning, lesson design, and homework assignments. Staff development for principals and A.P.s deals with analyzing and using test report data for administrative and supervisory purposes, as well as other issues related to mathematics instruction and supervision, and is provided informally through ongoing consultation about the program and formally at districtwide staff development meetings conducted by CIMS staff for school administrators. In these meetings, CIMS encourages experienced principals and A.P.s to serve as models and guides for their colleagues joining the project. CIMS project staff also work with district mathematics coordinators to prepare them to assume responsibility for providing staff development and managing project activities.

III. EVALUATION METHODOLOGY

OREA/I.S.E.U. has conducted evaluations of the CIMS-Mathematics project since 1982-83. These evaluations have documented the continued expansion of the project in New York City districts and schools, growth of the PC management component, ongoing revision of CIMS curriculum and testing materials, and overall growth in mathematics achievement. In 1987-88, interest in the PC management system and its potential for improving mathematics instruction and supervision led to a close examination of the operation of PC-CIMS in a sample of schools in one district. The success of the PC model and the increasing demand for it suggest that an examination of project efforts to prepare districts and schools to assume responsibility for managing project activities is now needed.

OREA designed the 1988-89 evaluation, therefore, to assess the effectiveness of project efforts to promote the ongoing local management of project activities and to identify the arrangements and mechanisms that provide for the greatest degree of self-sufficiency on the part of district and school staff. The evaluation was in two parts. The first reviewed briefly the continued operation of the project in a number of districts implementing CIMS-Mathematics for varying lengths of time, focusing on efforts of district staff to adapt the program to meet current needs. The second part of the evaluation examined the operation of the project in a sample of schools in two districts, one implementing PC-CIMS for the first time during the current year and one continuing operation of already existing systems. This part of the evaluation examined the roles of project, district, and school staff in carrying out project activities and preparing for the ongoing management of the project at the district and school levels.

EVALUATION QUESTIONS

The 1988-89 evaluation was therefore designed to answer a number of questions:

- How is CIMS-Mathematics currently being used in districts that have implemented it for three to six years? What are the current concerns of district and school staff and how have project activities been adapted to meet their needs and resources?

- What staff development was provided by CIMS project staff to support the PC-CIMS system and to train school staff in its use? What steps were taken to prepare district and school staff to take ongoing responsibility for the project, and to what extent did district and school staff assume this role? What arrangements and practices are most conducive to the successful operation of the project?

- To what extent and how did principals, supervisors, and teachers in the PC schools make use of the tests and test reports? What effect did the computer management system have on instructional and supervisory practices in the schools? How can the computerized management system best be used, and how can these uses be effectively promoted?

- What impact did participation in the CIMS-Mathematics project have on student achievement in mathematics?

- What is the level of correlation between performance on the CIMS tests and performance on the citywide test of mathematics achievement?

SAMPLING

To answer these questions, the 1988-89 evaluation of the CIMS-Mathematics project was divided into two parts. The first part of the evaluation examined the implementation of project activities and their impact on student achievement in a sample of five districts using CIMS for varying lengths of time. The districts were chosen to reflect the history of the project and to represent all models of the CIMS computer management component. They included three of the original districts involved in the project since 1982-83 (C.S.D.s 1, 18, and 32). These districts had implemented the original centralized computer systems; only C.S.D. 1 has since changed to a school-based PC system. Also included in the evaluation were two districts which had joined the project more recently and implemented PC versions of the management system (C.S.D.s 17 and 30). This segment of the evaluation examined the operation of the project and its effect on student achievement in all grades.

The second part of the evaluation consisted of a close examination of the project's activities in a sample of schools in the two PC districts examined in the first part of the evaluation. C.S.D. 30 had been chosen as one of the original sites for the PC project in 1986-87. As of 1988-89, the PC component was operational in 13 schools in the district. C.S.D. 17 became a PC site in 1988-89 and implemented the newer hard-disk system with expanded functions. Five schools in the district were involved in the PC component, with an additional five schools to be added each year in future years.

In order to examine the operation of the PC project closely in a number of settings, a sample of four schools was selected: two in C.S.D. 17 (hereafter called Schools 1 and 2) and two in C.S.D. 30 (Schools 3 and 4). All but School 4 were new to PC-CIMS in 1988-89. The schools were chosen in consultation with project staff to represent "best cases," places where commitment to the project was strong. In order to focus the investigation on a developmental sequence of grades that had not previously been the target of an evaluation, OREA examined the implementation of the PC project in grades one, two, and three.

DATA SOURCES

Evaluation of the CIMS-Mathematics project in 1988-89 was based on a variety of data sources:

- In-depth phone interviews were conducted with the district mathematics coordinators of the districts chosen for examination. The interviews dealt with the continued implementation of project activities during the year, operation and use of the computer management systems and tests, and ongoing staff development support provided to project participants. Also covered were district staffs' perceptions of the effectiveness of project components and plans for future activities. Mathematics coordinators of the two districts selected for part two of the evaluation met with the OREA evaluator several times over the course of the year and were interviewed formally in person at the end of the year.

- Extensive in-person interviews were conducted at the end of the school year with principals, assistant principals, and teachers in grades one, two, and three in the four sample schools in C.S.D.s 17 and 30. The interviews focused on the operation of the computer management systems; the nature and extent of staff development provided to teachers, principals, and supervisors; participants' use of the test reports for instruction and supervision; and their assessment of project materials and activities.

- Interviews were conducted with the CIMS co-directors and the curriculum leaders assigned to C.S.D.s 17 and 30. The interviews dealt with participants' roles and responsibilities, the operation of project activities, the degree to which project goals were achieved, and future plans.

- Staff development sessions conducted by district and project staff were observed (principals' meetings in C.S.D.s 17 and 30 district offices; formal and informal staff development sessions for teachers in the four sample schools) and project records examined (curriculum developer's logs of visits to PC schools; checklists of CIMS tests administered and scored).

- Mathematics achievement data for general education students in the five districts were analyzed. Scale scores of students on the New York City Mathematics Test* in spring 1988 and 1989 were compared. Changes in student mean mathematics achievement levelsfrom year to year served as a measure of project impact. In addition, in order to determine the correlation between performance on the CIMS tests and the New York City Mathematics Test, the percentage of objectives mastered on the CIMS tests was compared with scores on the citywide test for all students in C.S.D. 30 for whom matched scores were available.

DESCRIPTION OF SITES AND RESPONDENTS

The five districts chosen for the evaluation differed from each other in a number of ways. C.S.D.s 18 and 30 were ninth and tenth, respectively, among the 32 New York City school districts in 1988 mathematics achievement; C.S.D. 1 was 22nd, C.S.D. 17 was 25th, and C.S.D. 32, which had made great strides over the previous two years, was 19th. Of the districts examined, C.S.D.s 1, 30, and 32 had the highest proportion of limited English

*This was the Metropolitan Achievement Test (M.A.T.). It has been "customized" to correlate with the city's required scope and sequence of topics, which is identical with the CIMS Scope and Sequence.

proficient (LEP) students, one-fifth of their student populations. Percentages of students qualifying for free lunch (this is considered a general indicator of low socioeconomic level) ranged from 52 percent in C.S.D. 18 to 86 percent in C.S.D. 1. Thus, C.S.D.s 17 and 30, the two sites of the 1988-89 examination of the PC-CIMS project, ranked 25th and tenth among the 32 community school districts in New York City in mathematics achievement in 1987-88, respectively.

The C.S.D. 17 schools examined in the evaluation were very large and overcrowded. School 1, with a 1988 register of 1,730 students, was operating at 195 percent of its capacity; School 2, with 1,176 students, was at 135 percent capacity. In comparison, School 3, in C.S.D. 30, had 487 students (100 percent capacity), and School 4 had 734 students (77 percent capacity). All schools averaged 10 percent LEP students, except School 3 (17 percent). The proportion of students eligible for free lunch varied from 63 percent in School 3 to 94 percent in School 1. All four schools reported mathematics achievement scores above the average for their districts in 1988. Nevertheless, there were large differences in percentage of students scoring at or above grade level in mathematics achievement: 59 percent in School 1, 48 percent in School 2, 70 percent in School 3, and 91 percent in School 4.

Interviews chosen to include approximately half of the teachers on each grade level at each school were completed with 38 of the 74 first, second, and third grade teachers in the four sample schools. On the whole, the respondents were experienced teachers. They had taught an average of ten years, with only slight variations among the schools. Only three were in their first year of teaching, and two in the second. However, of the 38 teachers, nine were teaching at their current grade levels for the first time. The sample included 13 first grade, 14 second grade, and 11 third grade teachers.

IV. FINDINGS

This chapter presents the findings of the 1988-89 CIMS-Mathematics project evaluation. The findings concerning project activities across five districts are reported first, followed by the results of a more detailed examination of the project in four schools in two districts. A summary of student mathematics achievement data in the districts and schools concludes the chapter.

ACROSS-DISTRICT EVALUATION

The five districts included in the evaluation had participated in the project for various lengths of time and implemented different models of the computer management system. C.S.D.s 1, 18, and 32 had been involved in the project since it was piloted in 1983-84; C.S.D.s 17 and 30 were in their third and fourth year of project implementation, respectively. C.S.D.s 18 and 32 continued to implement the original district-based model of the CIMS management system. C.S.D. 30 used the earlier version of the school-based PC-CIMS system and C.S.D. 17, the newer hard-disk system; C.S.D. 1 had switched from a district-based to a school-based system in 1987-88. In addition, the districts had divergent project histories and faced different issues in implementing project activities during the year. The evaluation focused only on those aspects of the project that had been of concern to the participants during the current year.

C.S.D. 1

C.S.D. 1 has had a history of strong district commitment to the project, but uneven support by school administrators and some teacher resistance to aspects of the curriculum and testing system. In 1987-88, the district had switched from a centralized management system, which had many problems, to in-school microcomputers. With a new mathematics coordinator in 1988-89, the district mounted an effort to revive commitment to the project. Five schools were chosen as sites for revitalization on the basis of need and willingness to re-commit themselves to the project. In conjunction with the mathematics coordinator, CIMS curriculum leaders trained computer operators in these schools, checked manuals for the latest revisions, and led workshops for teachers on the curriculum and interpretation of the test results. At the end of the year, the district mathematics coordinator and CIMS staff members agreed that the effort had been somewhat successful, and that the schools had varied considerably in the extent to which they supported the effort. For the following year, five additional schools were to be selected for revitalization, with the mathematics coordinator continuing to oversee the original five schools.

The mathematics coordinator also sought to overcome resistance by meeting with different groups in the district and attempting to change attitudes toward the project. She consulted with the Early Childhood unit over philosophical differences concerning the amount of testing in the early grades, and secured their agreement to test. She also met with seventh grade mathematics supervisors and sought their support for the revised curriculum coming the following year. In general, the mathematics coordinator stressed the fact that CIMS is a resource in support of the New York City Scope and Sequence and the customized citywide mathematics test. On the whole, she estimated that about half the teachers in the district used the curriculum manual as their main instructional resource during the current year. There had been some earlier resistance to the amount of testing the project involved, and the district had decided to use the unit tests without the quarterly tests. The mathematics coordinator monitored the progress reports showing the number of tests administered, and found that use was regular in some schools and sporadic in others. She contacted principals in order to encourage usage.

For the following year, the district planned to continue to re-emphasize the curriculum, with staff development on the themes of problem-solving, thinking skills, and reasons for using CIMS. The mathematics coordinator planned to conduct a staff development session in each school as a refresher and recommended that workshops be held for supervisors (principals and assistant principals) in the district. The experience in C.S.D. 1 clearly shows the importance of local support of the project.

C.S.D. 17

In 1988-89, C.S.D. 17 was in its third year of district-wide implementation of the CIMS curriculum. The newer PC hard-disk management system was introduced this year into five district schools, including one intermediate school. The project had the strong support of the district superintendent. A special effort was made in the district to coordinate funded remedial programs with project activities, which was facilitated by the fact that the mathematics coordinator was also the district coordinator of funded mathematics programs. Teachers from the funded remedial programs attended CIMS training along with the other teachers, and the mathematics coordinator hoped to encourage use of the test reports by funded teachers.

The mathematics coordinator was responsible for staff development in the district apart from the five PC schools. She conducted staff development at the request of principals and supervisors, especially for special education teachers. She also conducted 18 hours of staff development after school for grade six in conjunction with the O.P.C.D.'s summer training, as well as 14 hours of staff development for grades seven and eight. Both general and special education teachers attended this training, with especially good attendance by special education teachers. The focus of the training was problem exploration, using language skills in mathematics, and collaborative learning.

The C.S.D. 17 mathematics coordinator reported that teachers in the PC schools found the pacing of the curriculum and tests overwhelming at first. She planned to establish a suggested pacing chart for the following year. At that time, the PC management component was to be expanded into additional schools, with the mathematics coordinator taking primary responsibility for the first group of schools. As an additional means of providing for management of the project within the district, veteran computer operators were to be trained to act as troubleshooters in assisting new operators. A closer look at the operation of the project in selected C.S.D. 17 schools is provided in the following section of this report.

C.S.D. 18

As one of the original pilot districts, C.S.D. 18 has successfully implemented the CIMS-Mathematics project since 1983-84. The mathematics coordinator reported that the centralized management system continued to be used effectively by teachers, principals, and supervisors in the district. C.S.D. 18's plan for 1988-89, therefore, mainly involved providing continued staff development in support of the project. In addition to grade six staff development in conjunction with O.P.C.D.'s summer training, the district conducted ongoing staff development for each grade level, consisting of two to three half days on mathematics concentration and mathematics skills. The mathematics coordinator also conducted four staff development sessions for special education teachers and professionals in the district, and additional staff development for selected third, fourth, and fifth grade teachers on using manipulatives, problem exploration, and thinking skills. For the following year, the district planned to concentrate staff development on grade seven to complement the newly revised mathematics curriculum, and then to begin again with staff development for kindergarten and the primary grades.

The district also wrote a curriculum of enrichment lessons in thinking skills for grades five and six. The sixth grade curriculum began as a program for the gifted and talented and was then expanded to all sixth grade students. It was field tested in selected classes in each school during the current year. A fifth grade version was written during the current year, to be field tested during the coming year.

C.S.D. 30

In C.S.D. 30, PC-CIMS was in its third year of operation and had been expanded to 13 schools. A major effort in C.S.D. 30 was to encourage district self-sufficiency in managing project activities. At the beginning of the year, CIMS staff categorized project schools as A, B, or C schools based on their length of time in the project and readiness to be self-sufficient. Those identified as A schools were ready to manage project activities on their own; B schools were in their second year of implementation, but were not considered ready to be self-sufficient; C schools were those new to the project, and thus needing extensive support from the project. Eventually, CIMS eliminated the category of B schools, thus prompting schools to take over management of the project after one year. During 1988-89, the district mathematics coordinator took responsibility for those schools already using the PC system, as well as all non-PC schools in the district. She conducted one workshop in each veteran PC school to review use of the manual and test reports, and one workshop in each of the non-PC schools on use of the manual. Three days of staff development were also held twice during the year for sixth grade teachers.

Coordination of the CIMS management system with funded programs in this district was promoted through workshops led by CIMS staff for teachers in funded mathematics programs. These teachers received copies of the management reports, but the mathematics coordinator reported that principals varied in the extent to which they promoted coordination of remedial mathematics programs with CIMS.

PC-CIMS continued to be implemented successfully in C.S.D. 30, although the mathematics coordinator reported that teachers in the new PC schools sometimes complained that there was too much material to cover and too much pressure to keep up with the pacing. There were also some problems with teachers in the district not having updated pages of the manuals, and the mathematics coordinator checked manuals in the schools selected to join PC-CIMS the following year. At that time, 18 of the 25 district schools were expected to have the PC component. Additional information on C.S.D. 30 schools is reported in the following section on PC-CIMS.

C.S.D. 32

In C.S.D. 32, there has been an ongoing effort to modify the CIMS curriculum and tests in line with perceived district needs. According to the mathematics coordinator, the district made small changes in the sequence of the fifth and sixth grade curricula after notifying teachers and supervisors of the proposed changes in order to achieve consensus. The district was in the process of w iting its own grade eight mathematics curriculum.

The district was also completing translation of the CIMS tests into Spanish (which it undertook at considerable expense), and sending them out for field approval. According to the mathematics coordinator, translation of the tests became critical two years ago, when for the first time there were bilingual versions of the citywide mathematics test. (The mathematics coordinator estimated that as many as 6,000 students were eligible for English as a second language or bilingual classes in the district.) There had also been a longstanding concern in the district that the CIMS tests were too long and too infrequent for district students. Therefore, the district divided the tests into approximately twice as many shorter tests: 32 unit tests in grade two, 23 unit tests and four quarterly tests in grades three through five, and 19 unit tests and four quarterly tests in grade six. (CIMS project staff did not sanction or encourage modifying the CIMS tests in this way.) The mathematics coordinator monitored a test utilization chart, which showed that tests were used by two-thirds of teachers, on the average. According to the mathematics coordinator, usage was never below 33 percent, and for a substantial number of tests there was 90 percent usage.

The district expanded staff development through the role of model mathematics lab teachers in the schools, who conducted two periods of staff development for every period of instruction, and through the responsibilities assumed by mathematics lab, lead teachers in junior high schools. The district replicated the summer grade six staff development in six different schools and conducted workshops on collaborative learning. A conference for junior high school assistant principals on the role of language in mathematics instruction dealt with lesson plans and instructional strategies for incorporating language skills in mathematics. This was to be the theme for staff development the following year.

EVALUATION OF PC-CIMS

The 1988-89 evaluation sought to investigate the implementation of PC-CIMS in four schools in order to identify the arrangements that lead to its successful operation. The sample schools were chosen as places where commitment to the project was strong. The evaluation focused on the activities of CIMS, district, and school staff that made the system work and the arrangements set in motion to keep it in operation. Because three of the schools were new to the project, there was an emphasis on using the system, pacing the curriculum, and administering the tests. In addition to this, however, the evaluation also sought to examine the effectiveness and potential of the project for improving mathematics instruction and supervision. The activities of the CIMS project staff are reported first, followed by the activities of district and school staff.

Role of CIMS Staff

A major objective for the year was to deepen the involvement of district and school staff in the operation of the program. As reported earlier, CIMS staff encouraged schools to become self-sufficient by eliminating direct support after one year on the project. Along with this went a redefinition of the role of the district mathematics coordinator, who was to assume responsibility for the overall operation of the project in the district and for staff development in schools after their first year of support from CIMS.

In line with their status as first-year schools, Schools 1, 2, and, 3 received an introduction to the project and follow-up from CIMS curriculum leaders. This included an introductory session at a centralized district site in September, followed by grade conferences and informal meetings in the schools after teachers had given tests and received test reports. The grade conferences showed teachers how to interpret the computerized reports and how to determine whether errors were due to the format of the question or to lack of mastery of the concept involved. Teachers were encouraged to use the test results for purposes other than reteaching, such as spiraling homework, peer tutoring, grouping for work with a paraprofessional, or "Do Now" exercises in class. While the grade conferences were devoted largely to interpretation of the test reports, the informal meetings were voluntary lunchtime sessions at which teachers raised questions and discussed problems they were having with mathematics instruction. At these sessicns, curriculum leaders often shared teaching strategies and ideas for incorporating manipulatives in the lessons.

This pattern was modified slightly at School 3. Because of its small size, the CIMS curriculum leader was able to meet individually with teachers several times over the course of the year. These meetings, suggested by the principal, were attended by all teachers and dealt with interpretation of the test reports, pacing the curriculum, and preparation for the citywide test. Although the curriculum leader offered to provide curriculum assistance and to teach a sample CIMS class, these forms of assistance were not requested by the school. In School 4, because of its second-year status, CIMS staff had no direct role in project activities, which were carried out by school and district staff.

In addition to staff development for teachers, CIMS staff also provided support and training for principals and assistant principals (A.P.s) of participating schools. This included informal meetings with school administrators throughout the year on the operation of the project, and several districtwide meetings for principals and A.P.s. In addition, supervisors (principals or A.P.s) were required to attend staff development sessions conducted for teachers. At the district meetings, administrators were encouraged to share ideas. problems, and experiences with each other. At the meeting discussing the midyear cumulative reports, CIMS staff asked administrators to consider the steps they were going to take as a result of the reports. School administrators were unanimous in their praise for the support they received from CIMS project staff.

Over 80 percent of the teachers interviewed rated CIMS staff development as the most useful source of assistance with interpreting the test reports, and 80 percent of these teachers found this help adequate to meet their needs. A majority of teachers also found CIMS staff development most helpful on the issue of spiraling homework, but found their school-based staff development more helpful with preparing for the citywide test. On the whole, teachers were most likely to find the CIMS staff development moderately helpful (55 percent) or minimally helpful (29 percent). Teachers in School 3, who had received the greatest amount of individual assistance from CIMS staff, were the most satisfied with this help. However, over a fifth of the respondents in the first-year schools complained that the CIMS sessions were repetitious or too general to be of use.

Role of District Staff

The two districts involved in the evaluation were led by superintendents who were strongly committed to the CIMS program. At the distr. meetings, they demonstrated familiarity with the project and their district test reports. In general, school administrators expressed satisfaction with district support of the project The only problematic issue mentioned by principals was the need for increased aide time for running the computer systems, and this seems to have been worked out to their satisfaction.

The planned role of the district mathematics coordinators, who were both new to their jobs, worked generally as intended. In the three first-year schools, the mathematics coordinators attended staff development sessions conducted by CIMS staff. At the school meetings observed, they interacted with teachers and offered comments and suggestions. In School 4, the mathematics coordinator conducted lunchtime meetings for teachers on pacing the curriculum and other issues, at the request of the school liaison. Toward the end of the year, the mathematics coordinators were encouraged to begin taking responsibility for the project and were involved in selecting and preparing new schools to join the project the following year.

Role of School Liaisons and Supervisors

All schools examined by the evaluation had principals committed to the project and exceptionally strong CIMS liaisons, although the situations in their schools differed somewhat. Schools 1 and 2 were very large, and an A.P. functioned as primary CIMS liaison in the school. In School 1, other A.P.s also supervised mathematics instruction on each grade, under the general direction of the liaison, who was himself the supervisor of one grade. In School 2, the CIMS liaison supervised the CIMS project for the entire school, although another A.P. was general supervisor of the lower grades that are the focus of this report. Schools 3 and 4 were much smaller schools where the principal supervised instruction in the lower grades. In School 3, the principal also acted as CIMS liaison. In School 4, a full-time teacher trainer (the former acting district mathematics coordinator) functioned as CIMS liaison. The effects of these different arrangements are reported in this and the following sections of this report.

A major focus of this year's evaluation was on supervisors' use of the computer management system. In this and the following sections, "supervisors" include both the CIMS liaisons and all other principals, and A.P.s who supervised mathematics instruction in the grades evaluated.

The three first-year schools reported using faculty conferences, grade conferences, and individual consultations with teachers to follow up on the training presented by CIMS. Only in School 4 were formal staff development sessions conducted by school staff members. These were led by the CIMS liaison/teacher trainer, and aimed at improving teachers' conceptual understanding of mathematics. They included workshops on manipulatives and on testing strategies, and demonstration lessons on bases, metrics, and place value.

Liaisons described their role as providing support and encouragement to teachers in using the curriculum. In all schools, liaisons reported that they reviewed the individual test results regularly and monitored the computer operators' checklists, which indicated when specific tests were given by each teacher; in Schools 2 and 4 principals also reviewed the checklists. There was some uncertainty as to whether supervisors other than the liaisons reviewed the management reports. In School 1, the A.P. who supervised grade one reported receiving copies of the results, whereas the supervisor of grade two did not.

Supervisory Uses of the Computer Management System. All supervisors said they regularly checked teachers' plan books for their pacing of the curriculum and tests, and spiraled homework assignments. In School 1, supervisors checked to see whether teachers included one skill lesson and one remediation or enrichment workshop per day, and if remediation activities were based on the management reports. Supervisors in the other schools reported that they could tell from observations, plan books, and discussions with teachers the extent to which teachers made use of the management reports in their instruction and homework assignments. In general, supervisors believed that the main supervisory use of the management reports was to provide information on what was going on in the classrooms and to indicate areas requiring remediation.

Nearly all supervisors reported that they spoke to teachers individually about the test results, and that teachers brought their reports to monthly grade conferences for discussion. The liaison in School 1 required teachers to bring their reports to their individual conferences with him after they were observed. He saw his role as linking teachers with others in the school who had the expertise to help them. In School 2, on the basis of the midyear cumulative reports, the liaison sent letters to individual teachers who were behind schedule in teaching the curriculum, offering to meet with and assist them. This liaison, who supervised the project for the entire school, spoke of the lack of time for following up on the reports as much as he would have liked.

Teachers' Reactions to Supervisors' Activities. For their part, teachers' responses provided additional documentation of the supervisors' activities and their effects. Nearly all teachers reported that their supervisors had spoken to them about keeping up with the pacing of the curriculum and tests. On the other hand, only about a third of the teachers said that their supervisor, had discussed specific test results with them or suggested instructional strategies for teaching mathematics. Very low findings for Schools 2 and 4 might be thought to be related to the fact that for teachers in some grades in these schools, the supervisor was a different person from the CIMS liaison who might also have followed up on the project. However, the same findings held across all grades examined in these schools.

The findings suggested that supervisors' actions were effective in encouraging teachers' use of the management reports. For all test reports, there was a tendency toward correlation between supervisors' practice of speaking to teachers about the test results and the frequency with which teachers reviewed the reports. For the class diagnostic report, the correlation between supervisors' actions and teachers' practice reached significance ($p \leq .05$): teachers whose supervisors spoke with them about specific test results were significantly more likely to review this report than those whose supervisors did not.

Sixty-eight percent of teachers reported that their supervisors encouraged use of test reports for grouping students for instruction or homework. Despite the fact that over half the teachers reported that they rarely or never used the reports for this purpose, use of the reports appeared to be linked to supervisors' practice. Teachers who reported that their supervisors encouraged the use of the management reports for grouping students were significantly more likely ($p \leq .05$) to use the reports for this purpose than those whose supervisors did not. Use of the reports for grouping was highest in School 1, where the liaison characterized this as the primary purpose of the test reports.

There were large differences among the schools regarding the extent to which supervisors provided concrete assistance to teachers in the form of suggested strategies or additional materials. Although nearly half of the teachers in School 1 reported that their supervisors had suggested strategies for teaching mathematics, one-fifth or fewer teachers said this was the case in Schools 2 and 3. In general, teachers in Schools 1 and 4 reported the highest levels of instructional assistance from their supervisors, and this appeared to be related to teachers' satisfaction with their school-based staff development.

For example, teachers in School 2, one of the large C.S.D. 17 schools, reported the lowest levels of follow-up by supervisors: only ten percent reported that their supervisors had discussed specific test results with them, and 20 percent said their supervisors had suggested instructional strategies. Although 45 percent of all teachers interviewed reported that their supervisors had provided manipulative materials and 40 percent had provided extra practice items, none of the ten teachers in School 2 reported receiving either of these. Further, teachers in School 2 were the least satisfied with their school-based staff development: 80 percent rated it minimally or not at all helpful, or said they had received no assistance. Since the CIMS liaison supervised the project for the whole school, these findings appear to support the importance of getting teachers' direct supervisors involved in project activities.

On the whole, three-quarters of the teachers found their school-based staff development very helpful (38 percent) or moderately helpful (38 percent). There were, however, large differences among the schools in this regard. Teachers in School 4 were the most satisfied with their school-based staff development, which is not surprising, given the presence of a full-time teacher trainer. Teachers in School 1, where A.P.s for each grade supervised mathematics instruction, also rated their school staff development highly. Only teachers in Schools 2 and

3 found the CIMS staff development more useful than their school-based staff development.

In summary, then, supervisors were most likely to use the computer management system to monitor the pacing of the curriculum and tests. Supervisors reported that they observed whether teachers made use of the management reports in their instruction and homework assignments, but only one-third of teachers said that their supervisors had discussed specific test results with them. One useful idea was to ask teachers to include remediation activities based on their management reports in their lesson plans. In order to improve supervisory practices as intended, it was important that all supervisors became involved in project activities.

Role of Teachers

Teachers' Use of Testing System and Tests. Although three-quarters of teachers reported that they were at the recommended point in the curriculum at the time of the interview, 47 reported problems in keeping up with the pacing of the curriculum and 63 percent had difficulty keeping up with the pacing of the tests. Problems with the tests were of three different kinds. First, five of the ten respondents in School 2 reported problems with the testing system itself--i.e., lags in getting the tests or in receiving the results. A majority of these teachers said at the time of the interview that the situation had not improved. Secondly, teachers in School 1 had difficulties with the school's policy of uniformly testing all classes at one time because of the size of the school. This was a policy instituted in previous years with a computerized mathematics testing system the school had developed itself. Four teachers in School 1 reported having to wait for tests after they had already completed the lessons, while two others reported that they were being pushed too quickly to keep up with the other classes. These difficulties were eased somewhat when the school loosened its policy on administering the tests, although at the time of the May interviews, teachers were still citing them as problems.

Thirdly, ten teachers across the schools reported that their students needed more time for instruction and were not ready for the tests at the recommended times. This included four of the six respondents in School 3. Teachers addressed this situation by adding extra lessons or double mathematics periods in some schools, or in some cases, by slowing down their schedules. In general, however, over half of the 24 teachers who had difficulty pacing the tests said that these problems had not been resolved. Unfamiliarity with the testing system and the cyclical approach in the first-year schools may account for some of these problems.

CIMS records of the computer operator's checklists showed different patterns of test use in the schools. On the whole, Schools 3 and 1 made the greatest use of the CIMS tests. First grade teachers in all schools administered, on the average, 13 of the 27 individual module tests. Second grade teachers administered seven of the 12 unit tests, and third grade teachers gave nine of them, on average. Use of the quarterly tests varied from school to school, but was consistent within schools: teachers averaged one quarterly test in School 2, two in Schools 1 and 4, and four in School 3.

Teachers in Schools 2 and 3 showed somewhat erratic patterns of test use. First grade teachers in School 2 averaged 12 of the 27 tests, ranging from five to 21. Often, teachers skipped tests and went back to give them later, sometimes for a second time. Several teachers stopped giving tests in March or April. In School 3, first grade teachers gave an average of 18 of the 27 tests. Two of these teachers gave seven tests in May and June; one teacher who gave 11 tests altogether gave seven in May, and several teachers went back and gave the first test at the end of the year. This suggests that, although teachers may have been using the tests for review or reinforcement, they were clearly not using the results for diagnostic purposes, as intended.

Teacher's Use of Management Reports. To what extent did teachers review and make use of the test reports? On the whole, half of the teachers reported that they reviewed the item analysis regularly, and half reviewed the objective summary report. Viewed together, 60 percent of teachers regularly reviewed one or other, or both, of these reports. Only 16 percent of teachers reported that they rarely or never reviewed either report. Two-thirds of teachers reported that they regularly consulted a copy of the test when interpreting the test results; only 6 percent said they rarely or never did this.

Teachers were evenly divided in reporting whether errors were more frequently the result of the format of the questions or lack of mastery of the concept involved. This seems to be a high percentage of errors due to the format of the questions. Fifteen of the 38 teachers interviewed reported that test questions were often worded differently, or used a different format or vocabulary than the corresponding lesson. At least one teacher noted this with approval and said that it was important the students learn different ways of using a concept. However, nine respondents reported that test items were sometimes unclear, ambiguous, or confusing. The majority of these were second grade teachers.

On the whole, teachers were more likely to reteach objectives (41 percent) as a result of the findings than to spiral homework assignments (17 percent); the remainder reported that they did both equally. Percentages of teachers reviewing the test reports were higher in Schools 3 and 4 in all cases.

Over sixty percent of teachers in Schools 1 and 2 reported that they reviewed the class diagnostic report regularly (38 percent) or sometimes (25 percent); 38 percent, however, said they rarely or never used it. The class diagnostic report is generated by the newer PC-CIMS program and groups students according to objectives missed. Use of the report was slightly higher at School 2 than at School 1.

How and to what extent did teachers use the management reports? The highest percentages of respondents reported using the test results regularly for review or "Do Now" exercises in class (63 percent), paraprofessionals' work with students (54 percent), and parent meetings (54 percent). The reports were least used for grouping students for instruction or homework (24 percent), individualizing instruction or homework (21 percent), and peer tutoring (16 percent). Thus, although over half of the 26 respondents who had paraprofessionals in their classrooms used the reports with them, these reports were not widely used for grouping students by the teachers themselves: 60 percent of all teachers reported that they rarely or never used the reports for this purpose. On the whole, administrators believed that teachers were using the reports for grouping to a much greater extent than teachers themselves reported, especially in Schools 2 and 4, where 70 and 86 percent of teachers, respectively, said they rarely or never used the reports for this purpose, and where use of the reports with paraprofessionals was limited.

In the two C.S.D. 17 schools where teachers received the class diagnostic report which grouped students by objectives missed, diametrically opposed findings emerged: two-thirds of the teachers in School 1 regularly used the test reports for work with paraprofessionals, while two-thirds of teachers in School 2 never used the reports for this purpose. A similar pattern was found with the use of the reports for grouping: half of the teachers in School 1 regularly used the reports for this purpose, while 70 percent of teachers in School 2 rarely or never did.

The greater use of the reports in School 1 appeared to be related to the liaison's emphasis on using the system for this purpose.

Teachers had mixed reactions to the use of the test reports for parent conferences. Of 19 respondents, 12 found the reports useful for this purpose. Teachers were most likely to appreciate the solid evidence of student performance that the reports provided. On the other hand, seven teachers reported that the formats of the reports were difficult for parents to understand. Teachers in Schools 3 and 4 reported greater use of the reports with parents than with teachers in School 1 and 2. In School 1, nearly two-thirds of teachers rarely or never used the test results for parent consultations. This may be related to teachers' preference for their earlier school-developed system, which, they reported, had a simpler parent report. Administrators in School 1 were planning to develop a letter for parents explaining the CIMS system for the following year.

A large majority of teachers reported that they always (32 percent) or often (47 percent) spiraled homework assignments, and nearly two-thirds of all teachers reported using the test reports for this purpose regularly (34 percent) or sometimes (29 percent). Of the 23 respondents in all grades who used the reports for spiraling homework assignments, three-quarters found them very useful (44 percent) or moderately useful (30 percent).

Across-District Differences in Use and Rating of Management System. In the C.S.D. 30 schools (Schools 3 and 4), where the older PC-CIMS model was in place, there were consistently higher rates of use of the test reports, apart from grouping, and higher ratings of the usefulness of the management system than in the C.S.D. 17 schools using the newer PC system. Teachers in the C.S.D. 30 schools reviewed the item analyses and objective summary reports more frequently (92 percent reviewed them regularly compared to 29 percent in C.S.D. 17), and used them more frequently for spiraling homework (62 percent regularly compared to 20 percent) and parent meetings (77 percent versus 40 percent). Teachers in C.S.D. 30 were also more likely to use the reports with their paraprofessionals, even though C.S.D. 17 reports grouped students by objectives needing remediation. C.S.D. 30 teachers also rated the usefulness of the reports for spiraling homework much higher (75 percent rated them very useful versus 9 percent in C.S.D. 17) and rated the computer management system in general higher than teachers using the PC model (62 percent found it very useful against 32 percent in C.S.D. 17).

These findings may be related to the size of the schools and the high level of assistance C.S.D. 30 teachers received from CIMS and school staff, although teachers in School 1 were also largely satisfied with the assistance they received from their school supervisors. The findings may also be related to the fact that School 4 had used the computer management system for a half year before the beginning of the 1988-89 school year, although similar results were found in both the first- and second-year C.S.D. 30 schools. The consistency of the findings suggests, however, that they may be due, at least in part, to differences in the two systems and the volume of reports teachers receive with the new system. Teachers in C.S.D. 30 characterized the reports as "useful and specific," "easy to consult," "giving good breakdown of information." Teachers in C.S.D. 17, on the other hand, found their reports "too complicated," providing "an overabundance of data," "giving too much information," or "more than I need to know." Four teachers in School 1 reported that they found most useful the "Scoring Summary Report" accompanying the quarterly test results, which lists the objectives missed by each student.

Coordination of CIMS with Remedial Programs. All schools had made some efforts at coordinating remedial mathematics programs with CIMS through use of the management reports. This was a special concern in C.S.D. 17, where the mathematics coordinator was also the coordinator of funded mathematics programs. In this district, teachers of remedial mathematics programs attended CIMS staff development sessions along with the other teachers. Coordination of remedial mathematics programs with CIMS was facilitated in School 1, where a mathematics lab team was responsible both for operating the computer management system and conducting remedial mathematics instruction. In the lower grades, remediation was provided by full-time paraprofessionals, who had access to test reports, according to the CIMS liaison. Through this system, few teachers coordinated directly with the providers of remedial instruction.

In School 2, teachers were encouraged to speak about test results with mathematics lab teachers (remedial mathematics teachers) who were asked to work with teachers, but the principal believed that the remedial programs had their own curriculum, which was somewhat rigid. In School 3, teachers were expected to share the test reports with the paraprofessionals who worked with groups of students. About half the respondents in these schools reported coordinating regularly with the providers of remedial instruction. The one remedial mathematics teacher in School 4, received copies of the test reports, according to the CIMS liaison.

Teachers' Ratings of the Computer Management System. On the whole, 89 percent of the teachers found the computer management system very useful (42 percent) or moderately useful (47 percent) for improving mathematics instruction. They liked the evidence it provided of student progress and deficiencies, and believed it was a good preparation for the citywide mathematics test. Of the total CIMS package, the management system was the most popular component. While teachers were most likely to rate the curriculum itself as good in addressing the instructional issues in mathematics for their grade (46 percent), 43 percent found it fair or poor (29 and 14 percent, respectively). Teachers liked the strategies provided, but 12 of the 38 interviewees said that they were still in need of additional materials in order use the curriculum successfully.

Satisfaction with the curriculum was lowest among first grade teachers: 63 percent of these teachers rated the curriculum fair or poor. Moreover, nearly 70 percent of the first grade respondents cited specific problems, most notably the sequence of topics. Problems noted by multiple respondents, including first grade supervisors, included too much time spent on concept development at the beginning of the year; introduction of addition, subtraction, fractions, and numeration delayed too long; and the introduction of the topic money before discussing 5s and 10s.

In general, commitment to continue the project was high on the part of the teachers interviewed: 45 percent were very committed and 34 percent moderately committed. Sixty-three percent of 30 respondents said that they were more committed to the program than they had been the previous year; only one teacher was less committed.

STUDENT ACHIEVEMENT

Analyses of mathematics achievement were performed on students' scores on the M.A.T. for spring 1988 and 1989. Achievement data are presented here in the form of both scale scores and normal curve equivalent (N.C.E.) scores. Scale scores represent student performance on a continuous scale, and thus indicate student growth in achievement from year to year in relation to the student's own previous performance. N.C.E. scores represent student achievement in relation to a national norming sample. They are, therefore, useful for comparing performance across districts and schools.

Correlated t-tests were used to determine whether the mathematics scores of CIMS-Mathematics students were significantly higher in 1989 than in 1988. Because statistical significance is affected by sample size and does not address the issue of whether the achievement changes are important to the students' educational development, an effect size (E.S.)* is reported for each comparison to indicate the educational meaningfulness of the gain or loss, independent of the sample size.

District Findings

Comparisons of mean gains in mathematics achievement scale scores between spring 1988 and spring 1989 of CIMS-Mathematics students in the five districts examined in the evaluation are summarized in Table 1. This table shows an overall mean gain of 21.0 scale score points, which represents an educationally meaningful gain. All districts show mean gains that are statistically significant, and those in C.S.D.s 1, 18, and 30 represent large effect sizes. This means that students in these

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*The effect size is the ratio of the mean gain to the standard deviation of the gain. This ratio provides an index of improvement in standard deviation units irrespective of the size of the sample. An E.S. of 0.2 is considered to be a small E.S., 0.5 a moderate E.S., and 0.8 a large E.S. Only effect sizes of 0.8 and above are considered to be educationally meaningful, reflecting the importance of the gains to the students' educational development.

TABLE 1

Analysis of CIMS Mathematics Scale Scores
for All Districts: 1988-89

District[a]	N	Spring 1988 Mean	Spring 1988 S.D.	Spring 1989 Mean	Spring 1989 S.D.	Difference Mean[b]	Difference S.D.	E.S.
01	3,980	601.3	48.9	624.1	43.1	22.8	27.5	0.8
17	11,622	601.4	45.8	621.0	41.8	19.6	26.2	0.7
18	7,381	622.3	51.7	643.4	47.9	21.1	27.8	0.8
30	8,554	615.3	50.9	640.5	47.6	25.2	28.6	0.9
32	7,022	605.8	48.4	622.8	41.0	17.0	27.2	0.6
Total	38,559	609.3	49.6	630.2	45.4	21.0	27.5	0.8

[a]Analysis of covariance showed that there were significant district differences on the spring 1989 scale scores using spring 1988 scores as a covariate [$F(1,4) = 266.0$, $p<.001$]. Scheffe post-hoc comparison tests revealed that both C.S.D. 18 and C.S.D. 30 had significantly higher 1989 adjusted mean scale scores than C.S.D.s 1, 17, and 32.

[b]These mean differences were significant at $p<.05$.

- There was an overall statistically significant mean gain of 21.0 scale score points which represents an educationally meaningful gain.

- Mean gains for each district represented moderate to large effect sizes.

districts made real gains in mathematics achievement that are educationally meaningful.

Tables 2 through 6 present grade-by-grade analyses for each district (Appendix A). As shown in these tables:

- C.S.D. 1 showed an overall statistically significant mean gain of 22.8 scale score points (S.D.=27.5). This mean gain was educationally meaningful. All grades showed positive mean gains from 1988 to 1989. The mean gains for grades 3 to 6 were educationally meaningful.

- In C.S.D. 17, there was an overall statistically significant mean gain of 19.6 scale score points (S.D.=26.2), which represented a moderate effect size. Grades 3 through 7 showed positive mean gains, and the gains for grades 3 through 5 were educationally meaningful.

- C.S.D. 18 showed an overall statistically significant mean gain of 21.1 scale score points (S.D.=27.8), an educationally significant gain. All grades showed positive mean gains from 1988 to 1989. The mean gains for grades 3 through 5 were educationally meaningful.

- In C.S.D. 30, there was an overall statistically significant mean gain of 25.2 scale score points (S.D.=28.6). This was an educationally meaningful gain. All grades showed statistically significant mean gains, which in grades 3 through 5 were educationally meaningful.

- C.S.D. 32 showed an overall statistically significant mean gain of 17.0 scale score points (S.D.=27.2), representing a moderate effect size. All grades showed positive mean gains from 1988 to 1989. The mean gains for grades 3 through 5 were educationally meaningful.

Table 7 presents the overall district findings in terms of student N.C.E. scores. As seen in this table, there was an overall statistically significant decrease of 0.5 N.C.E.s across the districts, but this was not educationally meaningful. C.S.D.s 1 and 30 showed positive mean gains in N.C.E. scores, but again these were not educationally meaningful. Tables 8 to 12

TABLE 7

Analysis of CIMS Mathematics N.C.E. Scores
for All Districts: 1988-89

District[a]	N	Spring 1988		Spring 1989		Difference		E.S.
		Mean	S.D.	Mean	S.D.	Mean[b]	S.D.	
01	3,980	52.4	21.0	53.2	20.1	0.8	14.7	0.1
17	11,622	52.2	21.2	51.2	21.1	-1.0	14.3	0.1
18	7,381	63.4	22.5	62.8	22.3	-0.4	13.3	0.0
30	8,554	61.4	21.7	62.6	22.1	1.2	14.0	0.1
32	7,022	54.3	21.1	52.1	20.6	-2.2	14.5	0.1
Total	38,559	56.8	22.1	56.3	22.1	-0.5	14.2	0.0

[a]Analysis of covariance showed that there were significant district differences on the spring 1989 N.C.E. scores using spring 1988 scores as a covariate [$F(1,4) = 193.8$, $p<.001$]. Scheffe post-hoc analysis revealed that the 1989 adjusted mean N.C.E. scores for C.S.D. 18 and C.S.D. 30 were significantly higher than those obtained for C.S.D.s 1, 17, and 32.

[b]These mean differences were significant at $p<.05$.

- There was an overall statistically significant decrease of 0.5 in N.C.E. scores throughout the five districts, but the decrease was not educationally meaningful.

- Of the five districts, C.S.D.s 1 and 30 were the only two districts with positive mean N.C.E. gains.

(Appendix B) present grade-by-grade analyses for each district. As seen in these tables:

- C.S.D. 1 showed an overall statistically significant gain of 0.8 N.C.E.s. Grades 3, 5, 6 and 7 made positive mean gains which were statistically significant.

- C.S.D. 17 showed an overall statistically significant mean decrease of 1.1 N.C.E.s, but this was not educationally meaningful. Grades 3, 6, and 7 showed statistically significant mean decreases and grades 4 and 5 made statistically significant mean gains.

- In C.S.D. 18, there was an overall statistically significant mean decrease of 0.5 N.C.E.s, but this was not educationally meaningful. Grades 3, 4, and 5 showed statistically significant positive mean gains, and grades 6 and 7 statistically significant mean decreases.

- C.S.D. 30 showed an overall statistically significant mean gain of 1.2 N.C.E.s. All grades but grade 6 showed statistically significant mean gains. The mean gain for grade 5 represented a moderate effect size. Only in C.S.D. 30 did grade 7 show positive mean gains, an unusual finding.

- In C.S.D. 32, there was an overall statistically significant mean decrease of 2.1 N.C.E.s, which was not educationally meaningful. Grades 6 and 7 showed mean decreases which were statistically significant. Grade 5 showed a positive mean gain which was statistically significant.

On the whole, these findings show that CIMS-Mathematics students in the five districts made real gains in mathematics achievement from 1988 to 1989. However, on the whole they maintained their ground in relation to their peers.

PC-CIMS Sample Schools

Tables 13 through 16 (Appendix C) present scale score and N.C.E. findings in mathematics achievement for the four sample schools in C.S.D.s 17 and 30 that were the subject of the evaluation. These tables show that students in all schools and grades made positive statistically significant mean gains in scale scores from 1988 to 1989, which were educationally meaningful in all cases except grade 3 in School 4. Overall school mean gains ranged from 26.3 scale score points (S.D.=27.6) in School 4 (Table 16) to 34.1 scale score points (S.D.=22.6) in School 2 (Table 14). All overall school gains were greater than those made by the districts as a whole. The greatest mean gains were made by third graders in School 2 (41.1 scale score points, S.D.= 22.4) and fifth graders in School 4 (44.2 scale score points, S.D.= 23.1). Effect sizes were very large in nearly all cases.

Comparisons of N.C.E. scores for the four schools showed positive mean gains in all schools, with statistically significant mean gains of 3.8 N.C.E.s in School 2 and 3.6 N.C.E.s in School 3. In School 1, there was a small 2.6 N.C.E. mean loss in grade 3, which was not educationally meaningful, and an overall small gain of 0.7 N.C.E.s (Table 13). School 2 showed mean gains in all grades (Table 14). In third grade, there was a 1.9 N.C.E. mean gain which was not statistically significant, but represented a very large effect size of 1.7. Overall mean N.C.E. gains for both Schools 1 and 2 outstripped those of C.S.D. 17 as a whole.

In C.S.D. 30, School 3 showed statistically significant mean gains in grades 4 and 5 (Table 15). The 6.0 N.C.E. mean gain in grade 4 represented a moderate effect size. The 3.6 N.C.E. overall mean gain in School 3 was greater than the mean gain of 1.2 N.C.E.s in C.S.D. 30 as a whole. In School 4, third graders showed a loss of 10.6 N.C.E.s, which represented a moderate effect size (Table 16). On the other hand, fifth graders in School 4 made mean gains of 10.3 N.C.E.s, which was statistically significant and educationally meaningful.

Correlation of CIMS Tests with Mathematics Achievement Test

In 1987-88, O.R.E.A. conducted a pilot study of the correlation between student mastery of objectives on the CIMS tests and performance on the citywide mathematics test for 494 second graders in C.S.D. 30. In this analysis, the percent of CIMS objectives mastered during 1987-88 was correlated with student scale scores on the spring 1988 mathematics achievement test. This analysis revealed a correlation of 0.73 between percent of CIMS objectives mastered and performance on the citywide mathematics test, a very high and statistically significant correlation.

In 1988-89, similar analyses were performed on the scores of 1,422 pupils in grades three through six in C.S.D. 30 for whom matching data were available. The percent of objectives mastered on the CIMS tests during 1988-89 was correlated with student scale scores on the spring 1989 mathematics achievement test for each pupil. Table 17 presents the results of this analysis. As seen in this table, very high and statistically significant correlations were found, ranging from 0.79 in grade six to 0.88 in grade five. This meant that performance on the CIMS tests explained from 62 to 77 percent of the variation in student achievement scores. As a result, mastery of objectives on the CIMS tests was shown to be an extremely good predictor of success on the citywide test of mathematics achievement.

TABLE 17

Correlation Coefficients: Assessment of the Relationship between Performance on the CIMS-Mathematics Test and Citywide Mathematics Achievement Test for Grades Three through Six, C.S.D. 30.

Grade	n	Pearson's r[a]
3	262	0.80
4	430	0.84
5	262	0.88
6	468	0.79

[a]Coefficients were significant at the $p<.05$ level.

- Correlations between performance on the CIMS-Mathematics tests and the citywide mathematics achievement test ranged from .79 in grade 6 to .88 in grade 5. These very high correlations were statistically significant in all cases.

V. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

In 1988-89, the CIMS-Mathematics project continued its successful operation in the New York City public schools. The PC-CIMS management component was expanded into 69 schools in five districts, with three new districts making use of a new hard-disk computer system with added functions.

A major objective of the year was to strengthen the role of district and school staff in the management of project activities. In the districts and schools examined, this objective was largely achieved, as district math coordinators took on responsibility for the ongoing operation of the project and school administrators were involved in overseeing its local implementation.

In the districts examined in the evaluation, CIMS was associated with continued growth in mathematics achievement from 1988 to 1989. In the five districts, there was an overall statistically significant mean gain of 21.0 scale score points (S.D.=27.5), an educationally meaningful gain as determined by effect size. Students' mean gains ranged from 25.2 scale score points in C.S.D. 30 (S.D.=28.6) to 17.0 scale score points in C.S.D. 32 (S.D.=27.2). Mean gains for C.S.D.s 1, 18, and 30 were statistically significant and educationally meaningful. When compared with a national norming sample, there was a slight decrease of 0.5 N.C.E.s across the districts, but this was not educationally significant. C.S.D.s 1 and 30 showed mean gains of 0.8 N.C.E s (S.D.=14.7) and 1.2 N.C.E.s (S.D.=14.0), respectively. These findings together mean that CIMS-Mathematics students in the five districts made real and educationally significant gains in mathematics achievement from 1988 to 1989. On the whole, however, they maintained their ground in relation to their peers in the national norm group. Greatest N.C.E. gains were made in two of the three districts implementing PC-CIMS.

All sample schools examined in the evaluation showed greater growth in mathematics achievement than their districts as a whole. Overall school mean gains ranged from 26.3 scale score points in School 4 (S.D.=27.6) to 34.1 scale score points in School 2 (S.D.=22.6). Mean scale score gains for all schools were statistically significant and educationally meaningful. Comparison of N.C.E. scores for the four schools showed positive mean gains in all schools, with statistically significant mean gains of 3.8 N.C.E.s in School 2 (S.D.=13.0) and 3.6 N.C.E.s in School 3 (S.D.=11.5).

Although the four sample schools were chosen as sites where the project was being implemented successfully, it is not possible to associate the student achievement results in detail with the findings gathered by the evaluation. Apart from grade three, the student achievement data are for grades higher than those covered by the evaluation. The greatest gains in student achievement were made in Schools 2 and 3, but it is difficult to link this to aspects of project implementation. The evaluation revealed the lowest levels of follow-up by school personnel in School 2; however, students in this school were at the lowest level of achievement of the four schools at the beginning of the project and may have benefitted most from the introduction of a new program. Teachers in School 3 received the most intensive and individualized assistance from the CIMS curriculum leader, which may have contributed to the success of their efforts. On the whole, however, the evaluation offers little basis for generalizing about the factors that are associated with project effectiveness across contexts.

Supervisors used the management reports primarily to monitor the pacing of the curriculum and tests, perhaps in line with first-year status of the majority of the schools, and less to pinpoint specific test results and suggest instructional remediation. Teacher responses suggest that supervisors' actions had an effect: teachers whose supervisors spoke to them about the reports were more likely to review them, and teachers whose supervisors encouraged the use of the reports for grouping were more likely to use them for this purpose. Mixed findings on the use of the class diagnostic report in the two C.S.D. 17 schools showed that additional staff development on utilizing the resources that the system offers is needed. However, consistent differences found in the use and ratings of the older and newer PC systems also suggests that a rethinking of the format and usefulness of the newer reports may be in order.

Previous evaluations have called for staff development for supervisors; it is now possible to make this more precise. The present evaluation reveals the importance of getting teachers' direct supervisors, in addition to the CIMS liaison, involved in project activities, especially in large schools. There was, in general, a moderate response to the CIMS staff development, and slightly higher ratings were given to teachers' school-based staff development, which is an encouraging finding given the aim of promoting management of project activities at the local level. However, after providing a general introduction to the management system for all participants, it might be a better use of time, and lead to more permanent change, for the CIMS curriculum leaders to focus staff development on training supervisors to work individually with teachers, rather than conducting general presentations for teachers on test interpretation. In this regard, it would have been more beneficial if the principal in School 3 had attended the teachers' individual sessions with the CIMS curriculum leader so that individualized assistance could be provided to teachers after direct support by CIMS was withdrawn.

Test reports were used most regularly by teachers for review or "Do Now" exercises in class, paraprofessionals' work with students, and parent meetings; they were less frequently used for grouping students or individualizing instruction. Nearly two-thirds of the teachers reported using the management reports for spiraling homework assignments, although teachers were still more likely to reteach than to spiral homework on the basis of the test reports. Teachers estimated that errors on the tests were as likely due to the question formats as to lack of mastery of the concept involved. The management system might prove useful in helping teachers find ways of teaching concepts in different formats. There was also an unusually high percentage of critical comments on the sequence of the first grade curriculum, which should be considered when the manuals are updated or revised. Teachers still express a need for additional materials to use CIMS successfully. One useful strategy is for teachers to pool items on a grade. If the manuals are revised, CIMS may want to consider an A.P.'s suggestion to make the exercises in the manual different from those in the student workbook.

RECOMMENDATIONS

On the basis of the evaluation, the following recommendations are made:

- Continue to expand the PC component of the project and staff development in support of it.
- Focus efforts on training supervisors, as well as CIMS liaisons, to provide assistance with the management system and its use for instructional purposes.
- Evaluate carefully the format and number of test reports and their usefulness for teachers and administrators; consider simplifying the newer PC reports.
- Continue efforts to promote the use of the management reports for grouping students and individualizing instruction.
- Help teachers to find alternate ways of teaching mathematical concepts through the use of the testing system.
- Consider carefully teacher and supervisor comments in reviewing and revising the first grade curriculum.

- Review test formats to check for unclarity and ambiguity in the questions, especially in grade two.

- Continue stressing use of the tests and test reports for diagnostic purposes.

- Assist teachers in finding ways to share the test reports effectively with parents, perhaps by linking them with other teachers in their schools who use them successfully for this purpose.

APPENDIX A:

Analysis of CIMS Mathematics Scale Scores
by District, 1988-89

TABLE 2

Analysis of CIMS Mathematics Scale Scores
for C.S.D. 1: 1988-89

Grade	N	Spring 1988 Mean	Spring 1988 S.D.	Spring 1989 Mean	Spring 1989 S.D.	Difference Mean[a]	Difference S.D.	E.S.
3	834	544.7	37.9	585.1	38.9	40.4	31.6	1.3
4	775	589.2	38.7	611.7	36.1	22.5	27.3	0.8
5	839	607.4	35.4	634.4	38.8	27.0	20.8	1.3
6	759	633.7	33.0	652.5	36.5	18.8	21.8	0.9
7	773	636.0	28.8	639.3	27.8	3.3	19.6	0.2
Total	3,980	601.3	48.9	624.1	43.1	22.8	27.5	0.8

[a]These mean differences were significant at $p<.05$.

- There was an overall statistically significant mean gain of 22.8 scale score points. This mean gain was educationally meaningful.
- Grades 3 to 7 showed positive mean gains that were statistically significant.
- Mean gains for grades 3 to 6 represented a large effect size.

TABLE 3

Analysis of CIMS Mathematics Scale Scores
for C.S.D. 17: 1988-89

Grade	N	Spring 1988		Spring 1989		Difference		E.S.
		Mean	S.D.	Mean	S.D.	Mean[a]	S.D.	
3	2,403	556.6	44.8	585.9	41.1	29.3	32.4	0.9
4	2,234	586.0	36.9	612.1	36.9	26.1	23.6	1.1
5	2,468	608.7	35.9	636.0	38.5	27.3	22.6	1.2
6	2,215	628.3	33.0	635.6	33.8	7.3	20.9	0.3
7	2,302	629.2	29.9	636.0	32.0	6.8	18.3	0.4
Total	11,622	601.4	45.8	621.0	41.8	19.6	26.2	0.7

[a]These mean differences were significant at $p<.05$.

- There was an overall mean gain in of 19.6 scale score points, which represented a moderate effect size.
- Grades 3 to 7 showed positive mean gains that were statistically significant.
- Mean gains for grades 3, 4, and 5 represented large effect sizes. Mean gains for grades 6 and 7 represented small effect sizes.

TABLE 4

Analysis of CIMS Mathematics Scale Scores
for C.S.D. 18: 1988-89

Grade	N	Spring 1988 Mean	Spring 1988 S.D.	Spring 1989 Mean	Spring 1989 S.D.	Difference Mean[a]	Difference S.D.	E.S.
3	1,481	575.8	47.8	608.3	48.0	32.5	32.4	1.0
4	1,484	603.0	45.2	629.9	43.7	27.0	25.4	1.1
5	1,489	628.0	41.8	656.3	43.5	28.4	24.8	1.1
6	1,419	650.3	40.3	665.0	40.0	14.8	23.4	0.6
7	1,508	654.9	35.4	657.8	38.7	2.8	20.0	0.1
Total	7,381	622.3	51.7	643.4	47.9	21.1	27.8	0.8

[a]These mean differences were significant at $p<.05$.

- There was an overall statistically significant mean gain of 21.1 scale score points. This mean gain was educationally meaningful.
- Grades 3 to 7 showed positive mean gains that were statistically significant.
- Mean gain for grades 3, 4, and 5 represented large effect sizes. Mean gain for grade 6 represented a moderate size.

TABLE 5

Analysis of CIMS Mathematics Scale Scores for C.S.D. 30: 1988-89

Grade	N	Spring 1988		Spring 1989		Difference		E.S.
		Mean	S.D.	Mean	S.D.	Mean[a]	S.D.	
3	1,745	563.7	43.9	604.0	45.7	40.3	35.0	1.2
4	1,984	601.0	39.3	628.4	40.6	27.4	24.3	1.1
5	1,774	622.6	40.7	655.9	44.4	33.4	23.5	1.4
6	1,662	648.7	37.2	664.6	40.5	15.8	22.6	0.7
7	1,389	651.4	35.0	655.3	37.5	3.9	20.0	0.2
Total	8,554	615.3	50.9	640.5	47.6	25.2	28.6	0.9

[a]These mean differences were significant at $p<.05$.

- There was an overall statistically significant mean gain of 25.2 scale score points. This mean gain was educationally meaningful.
- Grades 3 to 7 showed positive mean gains that were statistically significant.
- Mean gains for grades 3, 4, and 5 represented large effect sizes. Mean gain for grade 6 represented a moderate effect size and mean gain for grade 7 represented a small effect size.

TABLE 6

Analysis of CIMS Mathematics Scale Scores for C.S.D. 32: 1988-89

Grade	N	Spring 1988 Mean	Spring 1988 S.D.	Spring 1989 Mean	Spring 1989 S.D.	Difference Mean	Difference S.D.	E.S.
3	1,404	553.5	40.8	587.0	38.2	33.5[a]	31.9	1.1
4	1,336	589.2	37.1	611.4	35.7	22.2[a]	24.2	0.9
5	1,444	612.5	37.2	635.5	37.2	23.1[a]	22.2	1.0
6	1,460	632.2	35.3	638.1	33.4	5.9[a]	22.4	0.3
7	1,378	640.4	33.1	640.8	31.9	0.4	19.2	0.0
Total	7,022	605.8	48.4	622.8	41.0	17.0[a]	27.2	0.6

[a]These mean differences were significant at $p<.05$.

- There was an overall statistically significant mean gain of 17.0 scale score points, which represented a moderate effect size.
- Grades 3 to 6 showed positive mean gains that were statistically significant.
- Mean gains for grades 3, 4, and 5 represented large effect sizes. Mean gain for grade 6 represented a small effect size.

APPENDIX B:

Analysis of CIMS Mathematics N.C.E.
Scores by District, 1988-89

TABLE 8

Analysis of CIMS Mathematics N.C.E. Scores for C.S.D. 1: 1988-89

Grade	N	Spring 1988 Mean	Spring 1988 S.D.	Spring 1989 Mean	Spring 1989 S.D.	Difference Mean	Difference S.D.	E.S.
3	834	50.0	23.3	53.2	23.4	3.2[a]	19.3	0.2
4	775	54.9	23.6	55.9	19.2	0.9	15.9	0.1
5	839	53.4	19.4	55.6	21.7	2.2[a]	11.9	0.2
6	759	55.7	20.2	57.4	19.7	1.7[a]	12.3	0.1
7	773	47.9	16.8	43.8	15.6	-4.1[a]	11.4	0.4
Total	3,980	52.4	21.0	53.2	20.1	0.8[a]	14.7	0.1

[a]These mean differences were significant at $p<.05$.

- There was an overall statistically significant mean gain of 0.8 in N.C.E. scores.
- Grades 3, 5, 6 and 7 showed positive mean gains that were statistically significant.

TABLE 9

Analysis of CIMS Mathematics N.C.E. Scores
for C.S.D. 17: 1988-89

Grade	N	Spring 1988 Mean	Spring 1988 S.D.	Spring 1989 Mean	Spring 1989 S.D.	Difference Mean[a]	Difference S.D.	E.S.
3	2,403	56.4	25.6	53.4	23.8	-3.0	19.1	0.2
4	2,234	53.6	22.6	56.0	20.0	2.4	14.1	0.2
5	2,468	54.1	19.3	56.7	21.1	2.6	12.4	0.2
6	2,215	52.2	19.3	47.8	18.7	-4.5	12.1	0.4
7	2,302	44.5	17.1	41.5	17.4	-3.0	10.4	0.3
Total	11,622	52.2	21.2	51.2	21.1	-1.1	14.3	0.1

[a]These mean differences were significant at $p<.05$.

- There was an overall statistically significant decrease of 1.1 in N.C.E. scores, but this decrease was not educationally meaningful.
- Grades 3, 6 and 7 showed mean decreases that were statistically significant.
- Grades 4 and 5 showed positive mean gains that were statistically significant.

TABLE 10

Analysis of CIMS Mathematics N.C.E. Scores
for C.S.D. 18: 1988-89

Grade	N	Spring 1988		Spring 1989		Difference		E.S.
		Mean	S.D.	Mean	S.D.	Mean[a]	S.D.	
3	1,481	67.0	24.2	64.8	24.6	2.2	16.1	0.1
4	1,484	62.7	25.1	65.0	22.0	2.3	13.6	0.2
5	1,489	63.8	21.0	67.2	22.0	3.5	11.8	0.3
6	1,419	64.7	21.3	63.8	19.7	-0.8	12.2	0.1
7	1,508	58.7	19.4	53.5	20.3	-5.2	10.0	0.5
Total	7,381	63.4	22.5	62.8	22.3	-0.5	13.3	0.0

[a]These mean differences were significant at $p<.05$.

- There was an overall decrease of 0.5 in N.C.E. scores that was statistically significant, but the decrease was not educationally meaningful.
- Grades 3, 4, and 5 showed positive mean gains that were statistically significant. Grades 6 and 7 showed mean decreases which were statistically significant.

TABLE 11

Analysis of CIMS Mathematics N.C.E. Scores for C.S.D. 30: 1988-89

Grade	N	Spring 1988 Mean	Spring 1988 S.D.	Spring 1989 Mean	Spring 1989 S.D.	Difference Mean	Difference S.D.	E.S.
3	1,745	61.7	23.6	63.5	24.6	1.8[a]	19.1	0.1
4	1,934	62.4	22.4	64.5	20.3	2.1[a]	13.2	0.2
5	1,774	61.2	20.5	66.8	22.0	5.6[a]	11.6	0.5
6	1,662	64.0	20.8	63.5	20.7	0.6	11.7	0.1
7	1,389	56.7	19.6	52.5	20.1	4.1[a]	10.6	0.4
Total	8,554	61.4	21.7	62.6	22.1	1.2[a]	14.0	0.1

[a]These mean differences were significant at $p<.05$.

- There was an overall statistically significant mean gain of 1.2 in N.C.E. scores.

- Grades 3, 4, 5 and 7 showed positive mean gains that were statistically significant. Mean gain for grade 5 represented a moderate effect size.

TABLE 12

Analysis of CIMS Mathematics N.C.E. Scores
for C.S.D. 32: 1988-89

Grade	N	Spring 1988 Mean	Spring 1988 S.D.	Spring 1989 Mean	Spring 1989 S.D.	Difference Mean	Difference S.D.	E.S.
3	1,404	55.1	23.7	54.4	23.0	-0.7	19.4	0.0
4	1,336	55.4	22.4	55.6	19.4	-0.3	14.4	0.0
5	1,444	55.8	19.5	56.6	20.8	0.9[a]	12.0	0.1
6	1,460	54.3	20.5	49.5	18.8	-4.8[a]	12.9	0.4
7	1,378	50.8	19.0	44.6	18.0	-6.1[a]	10.7	0.6
Total	7,022	54.3	21.1	52.1	20.6	-2.1[a]	14.5	0.1

[a]These mean differences were significant at $p<.05$.

- There was an overall statistically significant decrease of 2.1 N.C.E.s.
- Grades 6 and 7 showed mean decreases that were statistically significant. Grade 5 was the only grade that showed a positive mean gain which was statistically significant.

APPENDIX C:

Analysis of CIMS Mathematics Scale Scores
and N.C.E. Scores for Sample Schools, 1988-89

TABLE 13

Analysis of CIMS Mathematics Scale Scores and N.C.E. Scores for School 1, C.S.D. 17: 1988-89

Grade	N	Spring 1988 Mean	S.D.	Spring 1989 Mean	S.D.	Difference Mean	S.D.	E.S.
Scale Scores:								
3	222	562.4	44.8	594.2	37.8	31.8[a]	28.3	1.1
4	226	587.6	33.7	614.5	35.8	26.9[a]	20.2	1.3
5	236	613.0	35.5	639.2	38.1	26.2[a]	19.9	1.3
Total	686	588.3	43.5	616.6	41.8	28.3[a]	23.2	1.2
N.C.E. Scores:								
3	222	61.3	25.8	58.6	23.0	-2.6[a]	16.1	-0.2
4	226	55.3	21.6	58.0	20.0	2.7[a]	12.2	0.2
5	236	57.0	19.1	58.8	21.5	1.9[a]	10.9	0.2
Total	686	57.8	22.3	58.5	21.5	0.7	13.5	0.1

[a]These mean differences were significant at $p<.05$.

- All grades in School 1 showed statistically significant mean gains in scale scores with very large effect sizes.

- Grades 4 and 5 showed mean gains of 2.7 N.C.E.s and 1.9 N.C.E.s, respectively. There was an overall mean gain of 0.7 N.C.E.s.

TABLE 14

Analysis of CIMS Mathematics Scale Scores and N.C.E. Scores for School 2, CSD 17: 1988-89

Grade	N	Spring 1988 Mean	Spring 1988 S.D.	Spring 1989 Mean	Spring 1989 S.D.	Difference Mean	Difference S.D.	E.S.
Scale Scores:								
3	148	528.4	34.9	569.5	36.3	41.1[a]	22.4	1.8
4	131	575.3	32.7	603.1	34.7	27.8[a]	23.1	1.2
5	151	607.6	32.1	640.3	40.2	32.8[a]	20.6	1.6
Total	431	570.5	46.9	604.6	47.5	34.1[a]	22.6	1.5
N.C.E. Scores:								
3	148	42.1	21.3	44.0	22.4	1.9	1.1	1.7
4	131	47.3	20.0	51.4	18.8	4.1[a]	13.9	0.3
5	151	55.4	17.3	60.8	22.1	5.4[a]	11.9	0.5
Total	431	48.3	20.3	52.1	22.4	3.8[a]	13.0	0.3

[a]These mean differences were significant at $p<.05$.

- All grades in School 2 showed statistically significant and educationally meaningful mean gains, with an overall mean gain of 34.1 scale score points.

- All grades showed mean N.C.E. gains. Those in grade 3 represented a very large effect size. There was an overall mean gain of 3.8 N.C.E.s.

TABLE 15

Analysis of CIMS Mathematics Scale Scores and N.C.E. Scores for School 3, CSD 30: 1988-89

Grade	N	Spring 1988 Mean	Spring 1988 S.D.	Spring 1989 Mean	Spring 1989 S.D.	Difference Mean	Difference S.D.	E.S.
Scale Scores:								
3	38	579.6	27.9	624.7	38.0	45.1[a]	26.4	1.7
4	48	599.0	35.0	636.3	47.3	37.4[a]	23.5	1.6
5	59	607.1	21.6	635.7	26.1	28.7[a]	18.9	1.5
6	34	638.8	25.6	656.9	38.6	18.1[a]	20.0	0.9
Total	179	605.1	33.5	637.5	38.7	32.5[a]	23.7	1.4
N.C.E. Scores:								
3	38	73.7	16.4	76.7	19.8	3.1	13.7	0.2
4	48	62.1	21.3	68.1	23.0	6.0[a]	11.0	0.5
5	59	53.5	12.2	57.0	15.6	3.5[a]	10.7	0.3
6	34	59.0	15.4	59.8	21.2	0.8	10.7	0.1
Total	179	61.1	18.0	64.7	21.0	3.6[a]	11.5	0.3

[a]These mean differences were significant at $p<.05$.

- All grades in School 3 showed mean gains in scale scores with very large effect sizes. There was an overall mean gain of 32.5 scale score points, which was statistically significant and educationally meaningful.

- Overall, students in School 3 made mean gains of 3.6 N.C.E.s. Grades 4 and 5 showed statistically significant mean gains that represented small to moderate effect sizes.

TABLE 16

Analysis of CIMS Mathematics Scale Scores and N.C.E. Scores for School 4, CSD 30: 1988-89

Grade	N	Spring 1988 Mean	Spring 1988 S.D.	Spring 1989 Mean	Spring 1989 S.D.	Difference Mean	Difference S.D.	E.S.
Scale Scores:								
3	91	608.6	44.3	620.5	44.5	11.9[a]	32.0	0.4
4	88	619.0	37.1	646.6	38.9	27.6[a]	21.5	1.3
5	72	637.1	35.2	681.3	46.2	44.2[a]	23.1	1.9
6	67	661.7	38.3	686.5	46.3	24.7[a]	20.9	1.2
Total	318	629.1	43.7	655.4	51.3	26.3[a]	27.6	1.0
N.C.E. Scores:								
3	91	83.1	16.5	72.5	21.0	-10.6[b]	16.9	0.6
4	88	73.2	19.6	73.6	17.3	0.3	11.8	0.0
5	72	69.0	17.9	79.3	20.4	10.3[a]	11.9	0.9
6	67	71.4	20.3	73.5	20.3	2.1	8.8	0.2
Total	318	74.7	19.2	74.5	19.8	0.2	14.9	0.0

[a]These mean differences were significant at $p<.05$.

- There was an overall mean gain of 26.3 scale scores points in School 4, which was statistically significant and educationally meaningful. All grades showed mean scale scores gains that represented very large effect sizes.
- Grade 3 showed mean losses of 10.6 N.C.E.s and grade 5 showed mean gains of 10.3 N.C.E.s. The mean gain in grade 5 was statistically significant and educationally meaningful.