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ABSTRACT

Descriptions of major activities for each of the seven Urban Mathematics Collaborative Projects sponsored by the Ford Foundation are contained in this report. These include: (1) Cleveland Collaborative for Mathematics Education; (2) Los Angeles Collaborative: Professional Links with Urban Schools; (3) Philadelphia Urban Mathematics Collaborative; (4) San Francisco Urban Mathematics Collaborative; (5) Twin Cities Urban Mathematics Collaborative; (6) Durham Collaborative: The Durham Mathematics Council; (7) Pittsburgh Urban Mathematics Collaborative; and (8) Technical Assistance Project. These are followed by observations, reflections and final comments from the supervisory team. The appendix contains summary reports from each of the seven collaborative projects. (JM)

Program Report 86-1

ANNUAL REPORT TO THE FORD FOUNDATION: THE URBAN MATHEMATICS COLLABORATIVE PROJECTS

Thomas A. Romberg and Allan Pitman

A Report from
the Urban Mathematics Collaborative Documentation Project

Wisconsin Center for Education Research
School of Education
University of Wisconsin
Madison, Wisconsin

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WISCONSIN CENTER FOR EDUCATION RESEARCH

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Our approach is interdisciplinary because the problems of education in the United States go far beyond pedagogy. We therefore draw on the knowledge of scholars in psychology, sociology, history, economics, philosophy, and law as well as experts in teacher education, curriculum, and administration in order to arrive at a deeper understanding of schooling.

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I. INTRODUCTION

During the past year, the Ford Foundation established seven collaborative projects in urban centers across the United States, a documentation project to monitor the activities of the seven collaboratives, and a technical assistance project which will serve as a source of information for the collaborative projects. It was the intention of the Foundation that, as the collaborative projects develop, they will provide a framework for enhanced teacher professional activities. The initial objective of the Foundation was to provide nondirective support that would enable each network to develop its organizational framework and to choose its own focus of interest. As the effort continues, it will focus on the effects of the developing networks on the professional lives of the participating teachers and on the identification of issue-based outcomes. The Foundation's intention in this effort is consonant with the recommendations of the Conference Board of the Mathematical Sciences (1984):

> The Conference recommends the establishment of a nationwide collection of local teacher support networks to link teachers with their colleagues at every level, and to provide ready access to information about all aspects of school mathematics. (p. 5)

The broad sense in which the term colleague is used is exemplified by the objectives "strongly endorsed by the conference":

- to extend the sense of professionalism among teachers by building a support system that links them to colleagues in the mathematical sciences, inside and outside of the schools;

- to provide teachers at all levels with colleagues upon whom th y can call for information concerning any aspect of school mathematics; and

- to enable teachers to enlarge their views of mathematics, their sources of examples, and their repertoire of classroom skills in communicating mathematics. (CBMS, 1984, p. 15)

It has been the aim of the Foundation to assist in the establishment of networks in which mathematics teachers can participate as colleagues with mathematicians in business, government, higher education, and industry. In these networks, mathematics teachers will be participants rather than clients.

The purpose of the Documentation Project is to record the progress of each collaborative in defining, refining, and redefining its focal concerns. The efforts of each project, as well as those of the Ford Foundation itself, need to be studied for three reasons.

First, each project and the Ford Foundation need to be kept informed about what is happening. Ongoing activities, the strategies used, and the effects of those activities on the lives of the teachers and others who are participants in the project need to be documented. Second, it is important for the projects, the Ford Foundation, and the educational policymaking community to understand the characteristics and relationships inherent within each project. Because changes occur slowly over time, the activities which are carried out, the actual changes in behavior, the anticipated outcomes, the unanticipated outcomes, and the impediments encountered under different circumstances need to be identified and studied. Third, although we expect each site to be different, we are confident that from the data it will be possible to identify project activities and strategies which can be generalized to different settings.

On-site data about the activities of the collaboratives has been collected from a variety of sources including:

- the directors and coordinators of each project,
- the on-site participant observers from each project (reflecting the teachers' perspectives),
- on-site visits by the staff of the Documentation Project,
- meetings with Ford Foundation personnel and the two joint meetings of the project directors, and
- surveys administered to participating teachers.

II. PROJECT DESCRIPTIONS

A brief description of the major activities for each of the seven Urban Mathematics Collaborative Projects during 1985 is presented in this section. The project activities are of three types: out-of-school professional activities, in-school activities to apply the out-of-school work, and networking activities to facilitate communications among participants.

The five projects which began in February 1985 are described first, followed by descriptions of the two projects which began in October 1985. A description of the Technical Assistance Project then follows. (A more complete summary of each collaborative project is appended to this report.)

Cleveland Collaborative for Mathematics Education (C^2ME)

Director: Paula Anderson
Coordinator: Harriet Jakob
Funding Agent: Cleveland Education Fund

The out-of-school activities of C^2ME consisted of courses offered to teachers, teacher internships, and a small grants program. C^2ME held two week-long courses at Lorain County Community College's High Technology Center. Teacher response to the courses was excellent, with the number of applicants doubling from the first session to the second session. Cleveland has set a two-year goal for the Teacher Internship Project to produce ten new work placements in industry as well as eight university placements. Although eleven teacher internships in industry were achieved last summer, only one university placement was made. C^2ME feels that the goal for university intern placement was unrealistic. However, their efforts have produced four university scholarships for Cleveland mathematics teachers. The Cleveland Education Fund made grants to seven secondary mathematics teachers as a part of the Small Grants Program. In an effort to stimulate more proposals, C^2ME held a separate informational meeting for mathematics teachers to explain the application process and to answer questions.

The major in-school project was the creation of the Mathematics Teachers Resource Center at Cuyahoga Community College. Three Cleveland mathematics teachers were hired to establish and to staff the Center. The Center makes films and computer software available for previewing, catalogues mathematics materials and resources, and distributes free posters and materials. The Resource Center will serve as host to the Greater Cleveland Council of Teachers of Mathematics and will offer other mini-presentations.

To provide networking, a symposium series and a newsletter have been started. The first symposium was held at The SOHIO (Standard Oil of Ohio) Research Center on May 30. It included a tour of the facility, a dinner, and a speaker. Forty-seven mathematics teachers attended. Planning is underway for symposia to be held at the headquarters of Eaton Corporation in November and at NASA in January 1986. The C^2ME newsletter was first distributed in September 1985. A calendar of Resource Center activities appeared in the first issue of the newsletter.

Los Angeles Collaborative: Professional Links with Urban Schools (+PLUS+)

Director: Peggy Funkhouser
Coordinator: Toby Bornstein
Funding Agent: Los Angeles Educational Fund

The +PLUS+ effort is unique in the set of collaborative projects in that it is focusing its attention on a small group of teachers rather than on all teachers in the district.

+PLUS+ has established three collaborative teams, each team consisting of the mathematics department of a high school, two business associates, and two postsecondary associates. The teams are the networking component of the project. Two retreats were held for all +PLUS+ participants, one in May and one in September. At the retreats, the teachers shared their observations with their teammates and collaborated on their action plans. Each team will continue networking through exchange of information at departmental and faculty meetings, at school/community meetings held at each school, at a Practitioners' Night, in interchanges between schools, during summer internships in industry, and at summer institutes at universities.

The out-of-school activities for the Los Angeles Collaborative included a series of summer site visits. Members of the three collaborative teams visited each others' high school, postsecondary, and industry sites. During these visits, there were presentations, workshops, and tours as well as opportunities for team members to interact in professional environments. Future plans consist of four dinner planning meetings hosted by industry and university associates.

In-school activities will be supported via technical assistance grants. Guidelines for the $2500 team planning grants were discussed at the second retreat. Also, the development of team planning skills and use of staff development release time for execution of in-school activities are planned.

Collaboration with other initiatives is to be enhanced through a proposed computer networking system.

Philadelphia Urban Mathematics Collaborative

Director: Wayne Ransom
Coordinator: Herb Isakoff
Funding Agent: The Franklin Institute

The Philadelphia collaborative differs from the other projects in that it is concentrating its initial efforts on supporting, supplementing, and acting as a catalyst and bridge between other, existing teacher support initiatives.

The major out-of-school activity of the Philadelphia Mathematics Urban Collaborative was the Summer Institute held at Drexel University July 1-31, 1985. This was a successful undertaking. Eighteen participants, representing eleven senior high schools, were instructed in computers, introduction to analysis, and special topics in mathematics. Participants received six semester hours of post-baccalaureate college credit. The Summer Institute was sponsored jointly by the collaborative, Philadelphia Renaissance in Science and Mathematics (PRISM), the School District of Philadelphia, Philadelphia Regional Introduction for Minorities and Engineering (PRIME), and Drexel University.

Future plans for the out-of-school component consist of active participation in computer workshops planned with Community College of Philadelphia and other area institutions, and an extension of the 1985 Summer Institute to be held again at Drexel next summer.

As part of the network component of the Philadelphia collaborative, arrangements have been made with the Association of Teachers of Mathematics of Philadelphia and Vicinity (ATMOPAV) to use ATMOPAV's newsletter. Furthermore, the ATMOPAV membership fee for each of the approximately 450 senior high school mathematics teachers in the Philadelphia school system was paid by the collaborative. It is hoped that this will contribute to an increase in the number, interest, and involvement of teachers in ATMOPAV activities.

For in-school activities, the collaborative has established a working relationship with two other PRISM components: mini-grants and teachers in industry. This led to the awarding of mini-grants to three senior high mathematics teachers for the 1985-86 school year and the securing of three fellowships for 1985. The in-school component will be supplemented through monthly activities in the mathematics department meetings of the senior high schools and vocational technical high school. Speakers will be drawn from universities and industry as well as from the pool of teachers who have been participating in the collaborative's activities.

San Francisco Urban Mathematics Collaborative

Director: Gladys Thacher
Coordinator: Theresa Hernandez-Heinz
Funding Agent: Public Education Fund

The out-of-school activities of the San Francisco Urban Mathematics Collaborative Project began with a kick-off reception on March 19, 1985. The purpose of this reception was to celebrate and publicize the awarding of the Ford Foundation Grant. Seventy-five San Francisco Unified School District high school mathematics teachers were presented with information concerning the Teacher Institute. The reception also provided an opportunity for the teachers to meet and to socialize with one another. The Institute, which was co-sponsored with the Exploratorium, was held in the summer of 1985. A primary goal of the Institute was to emphasize the mathematics that underly the major concepts of physics in the exhibits of the Exploratorium. Workshops were conducted by the Exploratorium staff to present the physics concepts involved in visual and auditory perception, color and optics, and waves and sound. Mathematics from the areas of algebra, geometry, trigonometry, calculus, and probability and statistics was discussed in regard to these topics and exhibits.

The collaborative also established a Dinner Lecture Series to bridge the gap between the theory of mathematics and its applications in today's world. The series will also help to establish collegial relationships and networking between teachers and other mathematics professionals. Three weeks after each dinner, a follow-up session will be held to provide teachers with the opportunity to brainstorm and generate classroom activities. Teachers who attend the follow-up sessions become eligible for mini-grant awards. Ideas for mini-grant projects are presently being generated.

Twin Cities Urban Mathematics Collaborative

Co-Directors: William Miller and Harvey Keynes
Coordinator: Chris Ennis
Funding Agent: School of Mathematics, University of Minnesota

The out-of-school activities of this project began with the establishment of the Twin Cities Pre-College Mathematics Society. The Society has held three dinner meetings to bring secondary mathematics teachers together with other members of the mathematics community of the Twin Cities. Approximately 60 teachers as well as 15-25 representatives from corporations and colleges attended each of the meetings. The meetings were designed to include time for interacting and socializing, as well as for a speaker.

The major activity of the collaborative was the Urban Mathematics Collaborative Summer Institute. Nineteen teachers, representing eleven schools, participated in the three-week institute, which was a combination of Honeywell lectures (outside speakers), writing projects, and a problem-solving seminar. A series of monthly seminars for the participants in the Summer Institute have followed.

The in-school activities of the collaborative will evolve from the writing projects developed during the summer.

Durham Collaborative: The Durham Mathematics Council

Director: J. Keith Brown
Coordinator: Jo Ann Lutz
Funding Agent: Fund for the Advancement of Science and Mathematics in North Carolina

The immediate goal of this project is to ensure that all teachers know about the project and that they become involved in its activities.

The out-of-school activities will consist of a series of seminars on mathematics and its applications. The seminars will be given by professional mathematicians and computer scientists whose employers are also furnishing facilities and refreshments. Most seminars will be held after school.

The project is also funding three junior high teachers to attend a two-day Family Mathematics Inservice at Berkeley, California in January, 1986. Teachers are also being encouraged to apply for funds to go to the NCTM meeting in Washington, DC, in April. Teachers who attend these meetings will be expected to conduct sessions for other teachers in Durham to share what they learned.

For the in-school component, a Professional Development Plan is being solicited from each teacher. The plan is required from teachers who apply for funds. These plans should help both the Council and teachers themselves focus their activities on areas that are of most interest and need. A form has been developed to help teachers complete their Professional Development Plans.

A steering committee comprised of one teacher from each of the 15 schools participating in the collaborative has been formed. This committee will meet with the Council director to talk over plans for the Council. These teachers will help disseminate information to the other teachers at their schools.

Pittsburgh Urban Mathematics Collaborative

D'rector: Leslie Salmon-Cox
Coordinator: Martina Jacobs
Funding Agent: Allegheny Conference Education Fund

The initial attention of the Pittsburgh Urban Mathematics Collaborative focused on sharing information with relevant audiences that were previously unaware of the collaborative. These included members of the Pittsburgh Partnerships in Education Program, officers of the Pittsburgh Federation of Teachers, all secondary principals and chairpeople of mathematics departments in secondary schools, as well as district supervisors and administrators.

The Pittsburgh collaborative is directing its initial effort toward curriculum development. Westinghouse Electric Corporation sponsored the opening event for the collaborative, a dinner and workshop for mathematics chairpersons held on Nov. 1 and 2. A talk about discrete mathematics and other new topics in mathematics was given. At the workshop the group engaged in two kinds of needs assessment: an appraisal of individual needs related to their newly enhanced set of responsibilities as chairpersons and a discussion of the needs of the faculty in their respective buildings.

Technical Assistance Project

Coordinator: Mark Driscoll
Funding Agent: Educational Development Corporation (EDC)

In October 1985 the scope of the Urban Mathematics Collaborative Project expanded to include a technical assistance component. This role was given to EDC, the Education Development Corporation. The Technical Assistance Project was established to provide responsive assistance in five areas. First, EDC is to provide general information about mathematics and mathematics education. (This could involve provision of direct assistance or the identification of resources local to the individual UMC projects). Second, EDC is to provide assistance in planning and implementing the various types of training identified from time to time as necessary for teachers and others involved in the projects. Third, EDC will facilitate communication between the various projects in the UMC initiative. Fourth, EDC will provide assistance in materials development. Fifth, EDC will provide assistance in the planning, identification and implementation of systems of operation within the individual collaboratives.

To date, the task of the Technical Assistance Project has been twofold: one, to sensitize the personnel at the various sites to the breadth of resources available from EDC, and two, to assist individual projects through "reactive listening" in the identification of concerns and the appropriate forms of support that they can use. Initial contacts with the local projects have been successful in both these areas.

III. OBSERVATIONS AND REFLECTIONS

After visiting the sites and examining the information about the activities, concerns, and problems faced by the teachers and administrators at each site, the most obvious conclusion was that each project is different. In each site, the teachers were overwhelmed by local problems including administrative requirements, curricular guidelines, mandated tests, and inadequate textbooks, as well as a myriad of social and political problems in the community.

OBSERVATIONS

If one looks beyond the local issues, however, it is clear that there were similarities across the sites in both the activities sponsored by the collaboratives and the problems faced by the teachers. Four of these similarities are discussed below.

First, the highest priority for each collaborative during the year was to intellectually challenge a group of secondary mathematics teachers. Since the job of teaching tends to become repetitive, many of the teachers had not been intellectually challenged since they had been in college many years before. The activities offered by the various collaboratives, such as the opportunity to solve mathematical problems, work on a computer, assist in an industry, and explore physics problems at the Exploratorium, were very exciting for the teachers and greatly appreciated. Equally as important as the activities themselves, was the opportunity for teachers to discuss their plans and follow-up activities with others. This intellectual refreshment was perhaps the most important outcome of every collaborative in this, the first year of the Urban Mathematics Collaborative Projects.

Second, an important feature of the activities in each collaborative was that the teachers were treated as professionals. Teachers were not given already developed materials or procedures that they were expected to implement. Instead, the expectation was that the teachers would become more familiar with the issues and the problems. Teachers were viewed as partners (concerned professionals) in the educational process, and their ideas were respected. Many teachers initially viewed this approach suspiciously, since in the past teachers have been treated as passive clients rather than as collegues. The corporate dinners and visits to universities, however, gave teachers an opportunity to interact with industry and university mathematical scientists. Teachers in all the collaborative sites appreciated both the opportunity to be with industry and university mathematics and the respect they were shown.

Third, the problems of curriculum organization and change were being debated in each project. In each site, personnel are attempting to work together to understand the changes happening in

mathematics and the impact that this may have on teaching, both in relation to new topics and in approaches to teaching.

Fourth, teachers in each site are beginning to become aware of the social and political problems related to curriculum and instructional reform. They recognize the need for time to reflect, the need for additional training, and the problems inherent in developing materials for implementation in a classroom. Traditionally, teachers have been treated as conduits in a system, with the assumption that the only responsibility of the teacher was to teach students in a classroom. However, if teachers are to become real partners in a reform effort (which would involve developing materials, trying them out, and discussing ideas with others), they will need time to plan, to develop, to reflect, and to evaluate. Furthermore, many teachers are now beginning to realize that their mathematics background is outdated, with their training often reflecting only the content of the NSF Institute programs of the 1960s. After seeking new topics from industry, teachers are asking for good examples they can use in their classrooms. All teachers realize that instructional materials (texts, software, tests, etc.) will need to be developed, although not every teacher or school district needs to develop these materials independently.

REFLECTIONS

Our reflections about what we have observed in the organization and activities of the collaborative projects during this past year are summarized under four topics: collaboration, professionalism, curriculum reform, and fundamental issues about schooling.

Collaboration

A central feature of each project is the collaboration between mathematicians from business and industry and universities with the secondary mathematics teachers in an urban core setting. Each project, however, was established based on local strengths and experiences. For example, in Minnesota, the support came from the strength of the School of Mathematics and its experience in dealing with teachers throughout the state. In Philadelphia strength comes from the Franklin Institute, its background and experience in dealing with teachers from the perspective of a Science Museum, and the strong leadership of the Mathematics Coordinator in the Philadelphia School District. In Cleveland and Los Angeles, the background and expertise of the Public Education Fund in soliciting and using corporate funds to support educational programs was their strength.

The strength of such organizations and the structural relationships to influential local groups and persons were critical in initiating each of the projects. However, it is possible that

these strengths may also contribute to an initial weakness in the evolution of the projects. The difficulties encountered by most of the projects have not been in capitalizing on their own strengths but rather in getting support from other elements. Los Angeles and Cleveland, for example, have been particularly successful in getting industrial support but have had difficulty in getting university help, while just the opposite is true in Minneapolis and San Francisco. And in Philadelphia, significant input from both universities and industry has been lacking.

All of the Ford projects operate within districts that have other mathematics and science activities. The development of the relationship between the activities sponsored by the collaborative project and the other on-going activities will be important to examine over time. Clearly, these activities should be complementary, but the degree of complementarity will depend upon the kind of activities each collaborative project pursues. Over the next three to four years we would expect to see changes in the organizational structure of each project as each attempts to build interdependent relationships and structures within its own district.

A final aspect of collaboration deals with school district administrative support for the projects' activities. Currently, there is nominal support at each site from school administration personnel. Administration welcomes the opportunity for teachers to have additional experiences and participate in a variety of activities. However, the collaborative projects are in a sense subversive. They are alerting teachers to a reform movement which challenges the traditional ways of organizing and of teaching mathematics in the schools. It is not clear that administrators will welcome the proposed changes in course structure, texts, tests, or methods of teaching which participants of these collaborative projects are likely to propose.

Increased Professionalism

A primary rationale underlying the establishment of collaborative projects is increased teacher professionalism. Teachers are isolated from each other in buildings, from others in a district, from ideas about mathematics and the teaching of mathematics, and from the process of change. Difficulties lie within each school system. Teachers are often not treated as professionals. Nor is it clear that they are accustomed to thinking and dealing with issues professionally. Training of department chairs and leaders in departments is needed. The teachers involved in these projects are excited about the opportunity to discuss problems and work with others to improve the teaching of mathematics. Although they are accustomed to working independently, most feel it is important to work with others.

Curriculum Instructional Reform

The opportunity for curriculum reform is viewed skeptically by most teachers. Dissonance has been created for many of the teachers in most of the projects. They are beginning to recognize the need to teach new mathematical ideas. This realization has been as a result of exploring mathematics in the world of work, or physics, or problem solving through the collaborative activities. However, the transition from these new ideas to classrooms and the structure in which mathematics is typically taught is not obvious. Curriculum reform implies a change in current status of the curriculum. Some teachers believe that we can make ameliorative and not radical change. Others feel that we must change texts and tests, etc., and not simply add things to the existing programs. Finally, in working toward change, teachers are unsure of how to use external resources. For too long, materials have simply been given to teachers without giving them an opportunity to reflect, think, or argue about what needs to be done. Now, the situation has changed, but most teachers are unaware of how to ask for and use external resources.

Fundamental Issues

The issues associated with the teaching and learning of mathematics today have not as yet been fully addressed in these projects. Four such issues need to be mentioned. First, teachers are becoming aware that there are new conceptions of what mathematics is important; they have examined new applications, the use of the computer, mathematics in the world of work, and problem solving. However, they have not shaken the belief that mathematics is a collection of concepts and skills mastered in some particular order. Today a fundamentally different world view about what is important in mathematics is emerging. Adopting this new view about mathematics would change notions about how schooling and school mathematics ought to be organized and developed.

Second, teachers seem even less aware of the revolution in psychology about how information is learned and stored. Learning is not simply absorption but creation. Students come to classes already having primitive notions about how to do much mathematics. Teaching is not simply pouring more ideas into students' heads. It is helping them to acquire and construct certain strategies or techniques for doing mathematics.

Third, the job of teaching traditionally has been characterized as being similar to guiding a tour (covering the pages of a book following a particular routine schedule). Teachers are now being challenged to change this tradition. It is not clear that they are in a position to make these changes without other administrative, social, and bureaucratic support. Such issues as yet have not been addressed in these projects.

Finally, there is a social/political dimension to teaching that is being brought to the attention of the teachers participating in the collaborative: mathematics is a commodity which is being differentially distributed to students. Different students have different opportunities to learn. Central to this are the issues associated with minority students and equity issues. These issues are only being touched upon in the projects.

In conclusion, only when the teachers in these projects begin to address some of these more fundamental issues will they begin to make the kind of progress toward educational reform which underlies this initiative.

IV. FINAL COMMENTS

This initial year of the seven Urban Mathematics Collaborative Projects has been exciting, enriching, and challenging for the participating teachers, for the staff of each project and also for us, the staff of the Documentation Project. In this regard, four comments about what we have learned are in order. First, the need for a documentation project has now been verified. Prior to starting this project it was easy to argue that such a monitoring effort was necessary for any reform effort (Romberg & Price, 1981). Now that we have been able to identify substantial educational problems as they are emerging, the need to document their evolution is imperative. For example, as teachers establish collegial relationships with other mathematicians, gain confidence, and increase in status, and therefore begin to demand self-control, it will be important to follow the potential for tension between those teachers and school administrators and how that tension is resolved. Successful project experiences should lead toward risk-taking opportunities for teachers consonant with the reform efforts. The degree to which risks are actually taken and how other teachers, union leaders, and administrators respond is going to be very interesting to observe and document.

A second example of an educational issue that merits documenting is the emerging premise that if one gets teachers to collaborate with others, then quality mathematics instruction will be developed. It is important to study whether the mechanics of collaboration will enhance or obscure the quality of mathematics instruction. Collaborating simply to make the current curriculum more efficient would be counter to the goals of the reform movement.

These are only two examples of educational issues related to the emerging school mathematics reform movement that have emerged. Other issues will be surfacing in the coming years. All warrant study.

Second, the wisdom of the Ford Foundations funding policy is becoming apparent. The long-term guidelines with short-term funding proposals is working to the benefit of all. The changes in strategies and focal problems that are already apparent in most of the projects reflect real progress. The evolution of collaborative networks within the complex social arrangements of urban cities is not linear. Providing the collaborative projects with the flexibility to change target populations, to start new activities, and to make other changes as needed is excellent.

Third, the importance of the collegial relationship that has evolved between the Documentation Project and each site was unanticipated. Being viewed as documentors who are vitally interested in making the projects successful has become both rewarding and demanding. Initially, we were viewed with some

suspicion, but we did not present ourselves as inspectors. Now we are being called upon to help in a variety of ways.

Fourth, it is also clear that our strategy for gathering information about the projects has been both fortuitous and in need of more structure. The complementary nature of the interests and insights of Allan Pitman and Tom Romberg has been fortunate. Allan brings external background to the problems of organizational structures and professionalism that have shed new light on the emerging problems. Similarly, the importance of the on-site observers at each site is clear. However, the voluminous and often redundant information about activities and the need to structure the information as the number of sites increases is apparent and is reflected in our proposal for renewal. Our reports for the later years of the Foundations efforts will be different in both quantity and quality based on what we have learned this year.

In all, this has been a good year.

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APPENDIX

SUMMARY REPORTS FOR THE SEVEN URBAN COLLABORATIVE PROJECTS

Cleveland Collaborative for Mathematics Education (C^2ME)
Los Angeles Collaborative: Professional Links with Urban Schools (+PLUS+)
Philadelphia Urban Mathematics Collaborative
San Francisco Urban Mathematics Collaborative
Twin Cities Urban Mathematics Collaborative
Durham Collaborative: The Durham Mathematics Council
Pittsburgh Urban Mathematics Collaborative

The following reports are brief summaries of each of the seven collaborative projects funded by the Ford Foundation in 1985. A draft of each report was written in October or November. The content of the final version was approved by each project.

SUMMARY REPORT:
CLEVELAND COLLABORATIVE FOR MATHEMATICS EDUCATION (C^2ME)

by

Thomas A. Romberg & Allan Pitman
Urban Mathematics Collaborative Documentation Project
University of Wisconsin-Madison

December 1985

PURPOSE OF THIS REPORT

The intent of this report is to summarize the initial activities of the Cleveland Collaborative for Mathematics Education (C^2ME). It should be understood that this report is intended to be factual and interpretive. It is not the intent of the Documentation Project to judge whether or not the organization of this collaborative or the activities it has carried out meet the objectives of the Ford Foundation.

The interpretations have been made in light of the intent of the Ford Foundation Foundation to establish projects which were:

- to extend the sense of professionalism among teachers by building a support system that links them to colleagues in the mathematical sciences, inside and outside the schools;

- to provide teachers at all levels with colleagues upon whom they can call for information concerning any aspect of school mathematics; and

- to enable teachers to enlarge their view of mathematics, their sources of examples, and their repertoire of classroom skills in communicating mathematics.

The information presented in this report comes from the following sources: the proposal submitted by the Cleveland Educational Fund (CEF) to the Ford Foundation, the meeting in New York City of project directors and coordinators in May 1985, a retrospective interview with Barbara Nelson of the Ford Foundation, documents provided by the CEF project staff, reports from the on-site observer, and two site visits by the staff of the Documentation Project.

CLEVELAND COLLABORATIVE FOR MATHEMATICS EDUCATION (C^2ME)

A. PURPOSE

The specific purposes of the Cleveland Collaborative for Mathematics Education as presented by William Madar, Senior Vice-President of Standard Oil of Ohio (SOHIO), in an address to teachers who were visiting the company's Research Laboratories are "to improve the perceptions of the public schools, to provide opportunities for teachers to become more cohesive as a group, to provide teachers with better resources, and to enhance the quality of mathematics education in the Cleveland Public Schools."

B. CONTEXT

The population of Cleveland is approximately 600,000. Cleveland has a large black population, a large Appalachian population, and an ethnic mix of Europeans who traditionally have been rather Balkanized. The Cleveland Public School District serves approximately 76,000 students; 35,000 students are in grades 7-12. The superintendent is Dr. Ronald A. Boyd. The mathematics coordinator is William Bauer, who has served in that position for five years.

Sixty-nine percent of the students in the district are black, 5 percent are other minorities and 26 percent are white. Local studies indicate a truancy rate of 20-30 percent per day, primarily in grades 7-12. The dropout rate is close to 50 percent. Almost 75 percent of the students come from households which fall below the U.S. Department of Labor's poverty line. However, the movement of pupils between schools within the district is considerably less than in many urban cities.

The teaching population is comprised of approximately 4,500 teachers, 229 of whom are secondary certified mathematics teachers. Average length of service in the system for all teachers is 15 years, but is slightly less than 19 years for mathematics teachers, based on a 72 percent response to a survey of the 88 mathematics teachers. Thirty-five percent of all the system's teachers are minorities, while 25 percent of the mathematics teachers for grades 10-12 are minorities. All three of the district's vocational high school mathematics teachers are members of a minority group.

The mathematics curriculum in the schools is the responsibility of a district committee made up of teachers. Names are submitted by the district to the teachers' union for membership to the committee, with final membership negotiated in the context of a harmonious relationship between union leaders and the curriculum section of the district. (Financial limitations have in the past forced after hours activities to be confined to only a few buildings).

Cleveland and its environs is served by two universities, and two community colleges. Historically it has been a center of industry and is the headquarters of several corporations, including Standard Oil of Ohio (SOHIO).

In 1973, a desegregation lawsuit was brought against the district. The Office of School Monitoring and Community Relations was established by the federal court to monitor the integration process because of resistance by the district to implement the desegregation activities. This office is still functional.

There are effectively three administrative groupings in the school system. There is the old guard and the court appointees, and some other administrators who do not fall into either of those two camps. Consequently, the district is not operating at the most satisfactory level of harmony. The School Board has also seen considerable conflict over the last year. The Board consists of seven people. Dr. Boyd assumed the superintendency September 23, 1985. He replaced Alfred D. Tutela, who served as interim superintendent after the death of Dr. Frederick D. Holliday. Superintendent Holliday committed suicide in January 26, 1984, leaving a note laying the blame for his frustration with the inability of the School Board to support him or to implement his policies. Holliday, as a black superintendent, was seen by sections of the black community as not being "black enough" and consequently, he had the support of only three of the seven School Board members. (Three of the four members voting consistently against him were black.) Efforts are being made to stabilize the district under Dr. Boyd's superintendency.

Understandably, the morale in the district among both teachers and administrators is low. This arises out of what is seen as irrational policies, teachers being moved from school to school, and lack of consultation, along with the other problems facing urban schools. Furthermore, there has been the problem of remuneration. Pay in the Cleveland school district has been very low with teachers earning an average $19,000 - $20,000 per annum. New awards raise these pay levels dramatically. For teachers with a master's degree, the pay scale changes from a range of $13,600-$27,721 to a range of $17,600-$36,000. Additionally, 7.5 percent of the employees of the District are to be offered a buy-out for earlier retirement in the first and third years of the contract, with the 1985 school year being the first year of the buy-out.

Overall, the problem of teacher isolation is seen as a critical issue in Cleveland. Lack of communication and lack of relations between teachers is exacerbated by what is seen as a low level of esteem of teaching in the public forum.

C. ESTABLISHMENT OF THE COLLABORATIVE PROJECT

In July 1984, Barbara Nelson of the Ford Foundation contacted Sondra Hardis of SOHIO's Corporate Contributions Department. The two had previously met on Foundation business. In August 1984, a letter of intent was written (with the cooperation of William Madar, a vice-president of SOHIO) to receive planning grant money. It should be noted that the initiative for this project came from businesses. For many years there has been interest in the schools within the business community of Cleveland. Some initiatives are particularly significant. SOHIO, for example, distributes approximately $18 million per year, with approximately $1 million directed to elementary/secondary education. The focus has been on mathematics, science, and the educational uses of computers. SOHIO has taken an interest in the Cleveland Public Schools for many years and has supported numerous projects.

One reason the letter of intent came from SOHIO was because of perceived problem in Cleveland of distrust and disinterest believed to exist between universities and the Cleveland Public Schools. In preparing a letter of intent, it was important that there be no "taint" from either of those two groups. Thus, the letter came from the rather neutral SOHIO.

The funding agent during the planning stage was the Cleveland Council for Higher Education (CCHE), which consists of high level business executives and university leaders. William Madar is a member of CCHE. He is also on the board of the just formed Cleveland Education Fund (CEF) which became the funding agent for this project. The Cleveland Educational Fund is an independent community-based organization that was established in November, 1983. According to its bylaws, CEF operates soley to support the Cleveland Public Schools. In its first year, it was funded by a grant from The Cleveland Foundation which covered the salary of the director and a half-time secretary. CEF now operates with grants from the Public Education Fund, the Ford Foundation, and some small local foundations. It also has corporate support.

The director of the C^2ME is Paula Anderson, who also serves as the director of the Cleveland Education Fund. Christopher Butler was hired as the project coordinator. He resigned on August 1 to accept a permanent position at Case Western Reserve University. Harriet Jakob was hired as his replacement. She began work September 3.

A key person in the collaborative project is William Bauer, the mathematics coordinator for the district. He was invited to the initial planning meeting and was asked to bring with him a teacher from the district, preferably one who had strong union support. The head of the local teachers' union was pleased with the idea of the project and supported the involvement of the teachers. There was, however, a conscious decision not to propose formal ties with the

union. Others invited to the planning sessions were people with influence who were prepared to show a commitment, had access to important persons or ideas, and also had time.

Institutions that were represented at that first meeting were SOHIO; Case Western Reserve University (by the Assistant to the President); John Carroll University (by a professor from the mathematics department and the chair of the education department); Cleveland State University (by the Dean of the College of Education and the chair of the mathematics department), Cleveland Electric Illuminating Company, and a teacher and two supervisors from the Cleveland Public Schools. It was decided that the Cleveland Council for Higher Education would act as the initial fiscal agent. William Madar had already identified the Cleveland Education Foundation as being suitable as being a continuing agent. (The Council for Higher Education never saw itself as fulfilling that role beyond the planning effort.) In order to get things organized, Barry McLaughlin (Alex Tobin's predecessor at PRIME in Philadelphia) was hired as a consultant. SOHIO funded this consultant because the consultant had to be paid before the planning grant was received from Ford. There was no mechanism for SOHIO to accept money from the Ford Foundation, so the money was returned to the Ford Foundation.

The Advisory Group worked well together. Attendance was very high and participation was good. The success of getting a proposal written stemmed from the high level of participation of all persons who were involved at that early stage.

D. RELATIONSHIP WITH OTHER LOCAL INITIATIVES

Although the Cleveland Education Fund was newly established in 1983, C²ME is only one of six activities that have already been organized by CEF for the improvement of mathematics instruction in the Cleveland schools. The other activities include:

- a small grants program,
- a seventh grade summer orientation program,
- a parent involvement project,
- the SAT/ACT Review Course, and
- the Primary Problem Solving Project.

E. PROJECT ACTIVITIES

Eight activities of C^2ME should be mentioned. First, 18 teachers, 10 in April and 8 in June, attended week-long courses at Lorain County Community College's High Technology Center. These courses focused on mathematics in high technology industries. All participants felt the courses were valuable.

Second, the Mathematics Teachers Resource Center was established at Cuyahoga Community College. Three teachers were hired to establish and to run it. The importance of hiring teachers for these positions was highly stressed. There was considerable interest in these positions and a number of applications were received. The teachers who staff the Center, do so in addition to their regular school commitments. One of the operators of the Teachers' Center is Les Moes. Les Moes grew up in Cleveland and actually teaches in the school to which he went as a child. He has a very strong commitment to the city and to the education system.

Third, a series of industry dinners and symposia have been planned. The first symposia was held at the SOHIO Research Center on May 30. Forty-seven mathematics teachers attended. There was a tour of the facility, a dinner and a speaker. A second symposium was held at the Eaton Corporation Manufacturing Services Center on November 12, 1985.

Fourth, small grant awards to teachers of approximately $500 have been initiated. There was $5,000 designated for secondary math projects. The regular application deadline was April 15, 1985. That date appeared to be a problem. To accommodate the mathematics teachers who participated in the program at the High Technology Center, special grant cycle limited to secondary mathematics proposals was offered. Grants were made to seven secondary mathematics teachers, totaling $3,146.25.

Fifth, in the summer, 11 teachers were placed in industry internships. It is expected that a further number of places will be available for the summer of 1986. This year, all who applied were placed. Each teacher is now preparing a classroom project for their students.

Sixth, Cleveland State University hired one summer intern. In lieu of hiring teachers for the summer, John Carroll University offered four scholarships to Cleveland mathematics teachers. These scholarships cover tuition for math courses taken in their mathematics department. One teacher took courses there in the summer.

Seventh, Bob Seitz (the project's on-site observer) is the editor of a newsletter just established. The first issue of the newsletter, Vol. 1, Issue 1, was printed in October 1985.

Eighth, William Bower, Harriet Jakob and four teachers were to participate in the regional NCTM conference in Columbus during early December. Mr. Bauer gave a report on the collaborative's activities and Ms. Jakob made available materials about the collaborative. Despite Mr. Bauer's intense efforts, the district was unable to release the four teachers to attend this professional meeting.

F. OBSERVATIONS

Five aspects of this collaborative project are of note. First, the one thing that stood out at the project director's meeting in New York was the emphasis that Cleveland placed on the importance of public relations and news management. Upon launching the Ford Foundation Project, there were three radio interviews, and several newspaper articles. This emphasis was deemed important in light of Cleveland's "educational inferiority complex." The public needs to be aware of positive actions in the schools.

Second, the commitment and involvement of industry in the collaborative is very strong. In particular, both the interships and the dinner-symposia demonstrate this.

Third, on the other hand, there has been little university involvement in the project. Cleveland State University had one internship over the summer. The other universities maintain that there is difficulty in finding money for work as well as money for teachers and internships.

Fourth, the relationship between the project's activities, what teachers are learning, and how this can be reflected in the school district's program has not been addressed.

Finally, the involvement of teachers in both the collaborative and the district's mathematics curriculum committees provides a real linkage between the project's activities and mathematical and curricular issues which may arise therein, and the administrative structures governing the teaching of mathematics in the schools.

G. NEXT STEPS: SUMMARY AND FUTURE

The audience has changed. The project now describes its audience as all 195-220 teachers, rather than the 85 initially specified in the grant application. This change has come about through the redefinition of the audience to cover all certified teachers of secondary mathematics, rather than only those teachers who currently teach mathematics in the high schools. Given the path by which teachers come to teach in high schools, a number of teachers who are likely to move from middle school into high school positions as they become available would be missed if only the 85 high school

teachers were included. With a high likelihood of staff changeover due to both an aging teaching population and the buy-out provision in the new contract, it was felt that there was an important long term gain to be made by broadening the scope of the project. Furthermore, it was felt that there was more enthusiasm for being involved among the junior high school teachers than among some of the older senior high school teachers. The district also felt strongly about involving the junior high schools in the program. It was, therefore, a combination of long-term employment, political issues, and a desire to get what is perceived to be a more enthusiastic and supportive group of teachers that led to expanding the initial project population.

SUMMARY REPORT:
LOS ANGELES COLLABORATIVE: PROFESSIONAL LINKS WITH URBAN SCHOOLS (+PLUS+)

by

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October 1985

PURPOSE OF THIS REPORT

The intent of this report is to summarize the initial activities of the Los Angeles Urban Mathematics Collaborative Project. It should be understood that this report is intended to be factual and interpretive. It is not the intent of the Documentation Project to judge whether or not the organization of this collaborative or the activities it has carried out meet the objectives of the Ford Foundation.

The interpretations have been made in light of the intent of the Ford Foundation to establish projects:

- to extend the sense of professionalism among teachers by building a support system that links them to colleagues in the mathematical sciences, inside and outside the schools;

- to provide teachers at all levels with colleagues upon whom they can call for information concerning any aspect of school mathematics; and

- to enable teachers to enlarge their view of mathematics, their sources of examples, and their repertoire of classroom skills in communicating mathematics.

The information presented in this report came from the following sources: the proposal submitted by the Los Angeles Educational Partnership (LAEP) to the Ford Foundation, the meetings of project directors and coordinators in New York City in May 1985 and in Cleveland in October 1985, a retrospective interview with Barbara Nelson of the Ford Foundation, documents and interview information provided by the project staff, reports from the on-site observer, and four site visits by the staff of the Documentation Project.

LOS ANGELES COLLABORATIVE PROJECT: PROFESSIONAL LINKS WITH URBAN SCHOOLS (+PLUS+)

A. PURPOSE

The proposal submitted in December 1984 outlined the objectives of the Los Angeles Urban Mathematics Collaborative Project, which came to be titled Professional Links with Urban Schools (+PLUS+), as being to:

- provide for ongoing networking and collaboration among teachers, mathematics departments, and the diverse mathematics resources within the community;
- broaden the scope of teachers' knowledge through association with mathematics-related industries and institutions;
- explore real-world relevance of mathematics for students in order to increase their interest in mathematics and mathematics-related careers; and
- promote team building and leadership skills for teachers;

in order to promote increased professionalism among mathematics teachers in urban high schools by creating a mathematics resource network through which teachers can identify and address their professional needs.

B. CONTEXT

The population of the County of Los Angeles is approximately 7,800,000. The Office of the County Superintendent of Schools serves 94 county school districts, with 1,585 schools serving approximately 1.5 million students. The +PLUS+ project works with teachers in two districts, the Los Angeles Unified School District and the El Monte Union High School District. The superintendent of the Los Angeles schools is Dr. Harry Handler, who has served in that position for 5 years. The Office of Secondary Instruction mathematics specialist is Donna Jorgensen, who is temporarily appointed, pending assignment of an accredited specialist. Additionally, the Senior High School division has its own mathematics advisor, as does each of the eight geographic regions. The superintendent of the El Monte Union School District is Dr. James J. Sheridan, who has served as superintendent for over 10 years. The district does not have a mathematics coordinator, but is served by the County mathematics consultant, Geri Clarke.

The Los Angeles Unified School District has an enrollment of approximately 570,000 students in all grade levels in 738 schools. The El Monte Union High School District serves approximately 7,000

students in five high schools (grades 9-12) and 16,500 adult education students. Students come to the El Monte district from four elementary school districts.

Los Angeles County is one of the most heterogeneous areas in the country. The diversity in all the county's schools reflects the differences in culture, socio-economic status, and housing segregation patterns. Since 1980 there has been a rapid increase in enrollment, particularly of immigrants from Latin America and Asian nations. A sample of nine county schools shows the total of minority students enrolled ranging from 48 percent to 87 percent. In the Los Angeles Unified School District (LAUSD), 78 percent of the students are minorities. Approximately 19 percent of the students enrolled in LAUSD and 18.3 percent in a nine county district sample are receiving assistance under the Aid to Families of Dependent Children program.

There are 1,631 secondary mathematics teachers, grades 6-12, in the Los Angeles district and 40 in the El Monte district. Because of the large population and number of schools, the +PLUS+ project has targeted its efforts on the mathematics faculty in three high schools: Manual Arts and Wilson High School in the Los Angeles Unified School District, and Mountain View High School in the El Monte Union High School District. Fifty-four high schools (18 schools from LAUSD and 36 schools from nine other county districts) were invited to apply to be participants. Three LAUSD and two county schools submitted applications, from which the three schools were chosen.

The mathematics curriculum in both school districts is based on the State Model Curriculum Standards and the California Mathematics Framework.

In Los Angeles County, there are a large number of universities, colleges, junior colleges and trade schools. The University of Southern California, University of California-Los Angeles (UCLA), and California State University-Los Angeles (CSULA), are active participants in the +PLUS+ project. Through the California Mathematics Project, summer programs for high school mathematics teachers are held at both UCLA and CSULA. At UCLA, two Summer Institutes were offered: The High School Mathematics Project (HSMP), which is oriented to developing leadership skills, and the Secondary Update in Mathematics (SUM), which deals with basic mathematics content for teachers coming from other subject disciplines. Stipends and eight units of professional credit were offered. The Summer Institute held at CSULA, the Minority Schools Mathematics Project, addressed issues of curriculum and methods. A stipend and six units of credit were offered to participants of this institute.

In addition to support from universities, eleven companies in the county are participating in the collaborative: Atlantic Richfield Company, Bullock's, Ernst & Whinney, Fashion Institute of

Design and Merchandising, General Telephone Company of California, Hughes Aircraft Company, Koret of California, Los Angeles Police Department, National Medical Enterprises, Inc., Galaxy Sound Studio, Northrop, and TRW. Individual corporations have been supporting education outside of the collaborative's activities as well. For example, Northrop awards $1000 to mathematics departments seen as being excellent and several corporations participate in an adopt-a-school program and in student intership programs. Teachers in Residence programs (summer employment) have also been organized by individual companies.

C. ESTABLISHMENT OF THE COLLABORATIVE PROJECT

The funding agent for the +PLUS+ project is the Los Angeles Educational Partnership (LAEP). This private nonprofit corporation has been operating with corporate support since January 1984, and has been associated with the Ford Foundation by funding through the Public Education Fund. Contact was first made with regard to the Urban Mathematics Collaborative in August 1984, by the Executive Director of LAEP, Peggy Funkhouser.

The Ford Foundation made a planning grant of $2500 available in October 1984 for the preparation of a full proposal due December 1984. Funding of the project started on February 1, 1985.

The initial commitment of support to the establishment of an Urban Mathematics Collaborative came from the LAEP board, three university campuses, the L.A. County Office of Education, the Los Angeles Unified School District, seven major corporations represented in the Los Angeles area, the California Community Foundation, and the Museum of Science and Industry.

The advisory committee was large, with over 30 members representing the Unified School District, Office of County Superintendent of Schools, post-secondary institutions, community organizations, industry and the foundations. A characteristic of the university representation is that of the eight participants, five came from education faculties with the others being from interlevel or interinstitutional program offices. The steering committee of ten represented a cross-section of four interest groups: one member was from the county superintendent's office and three members each were from the school district, universities and industry. Toby Bornstein was hired as a consultant to prepare the proposal.

By the time of submission of the final proposal in December 1984, Toby Bornstein had been identified as the coordinator for the project. Toby Bornstein is a former elementary and junior high school mathematics/science teacher. Her more recent work has been in the development of mathematics curriculum materials, organizational applications in the computer industry, and in the organization of the

1984 Olympic Games in Los Angeles. Her appointment is full-time to LAEP, with a two-thirds commitment to +PLUS+. Dr. Warren Newman was appointed as an evaluator-consultant for the project. Dr. Newman is the superintendent of the South Pasadena School District. His role had been originally defined in the proposal as documentation, including profiles of all participants and reports of all activities, with the production of evaluation documents. In light of the establishment of the Documentation Project by the Ford Foundat. Dr. Newman's role was redefined to be the designer of an evaluatic tool that would assess how teachers' perceptions of themselves as professionals and their perceptions of other participants changed as a result of involvement in the project. It is intended that use of such an instrument will sensitize teachers to this thrust of this project.

The approach taken in the Los Angeles proposal differed from other collaboration proposals in two primary respects. First, it started with the emphasis on collaboration between teachers, university educators, and those in industry. Second, it elected to work with three schools intensively rather than spreading its resources over a school district that was huge, both in population and in area.

The mission as defined was to work with whole departments of teachers from which leadership could emerge in order to bring changes within the school. The departments could ultimately be used to disseminate that capability to other schools in the district. It was anticipated that this strategy might build cohesion within departments.

D. RELATIONSHIP WITH OTHER LOCAL INITIATIVES

The Los Angeles Educational Partnership is the sponsor and funding agent of numerous projects including a small grants program for innovative classroom projects, and Math/Science Teacher Fellowships for superior teachers. Both of these programs have a clear interrelation with the objectives of the Ford Foundation. A concern emerging from the Math/Science Fellowship was the inability of the program to sensitize fellows to the need to disseminate their new understandings. The +PLUS+ project addresses this need with strategies to change teachers' perceptions towards collegiality and networking.

The Mathematics/Science Fellowship of LAEP offered a collaborative workshop to which the 1984 Math/Science Fellows were invited to bring a counterpart from the other discipline to explore and see the benefits of collaboration. The MSF's organization developer, Peter Lewis, conducted the workshop. It included an analysis of teachers' own styles of working in groups and the application of a collaboration model to participants' schools. The

+PLUS+ high schools were invited to send a representative and a science teacher counterpart.

Teachers involved in +PLUS+ were also invited to attend the 1984 Summer Institutes at UCLA and CSULA. One teacher took part in the UCLA Institute, and four in the California State Institute. A luncheon at UCLA provided the opportunity for all teachers attending either program to meet each other as well as to meet other participants in the +PLUS+ program. This function was hosted by Dean Juan Lara, Dean of the Office of Academic Interinstitutional Programs. The Superintendent of Public Instruction for the State of California addressed the gathering and engaged in an informal question and answer session.

The +PLUS+ site visits to the universities served to make a number of teachers aware of the wide range of programs available to their students by many of the university departments. There is an interest in how such programs might motivate students to improve school performance.

The UC and CSU Mathematics Diagnostic Tests program provides a mechanism for communication between the universities and teachers of senior mathematics classes. Information on test performance by topic is provided, and consultation is available regarding curricular change. A meeting in November 1984 included the educator members of the Collaborative's Steering Committee. This was one of a series of meetings to develop the Model Curriculum Standards for the State. In October 1985 the UCLA Office of Interinstitutional Programs conducted a mathematics mini-conference for K-12 teachers, dealing with standards and with the state mathematics framework.

E. PROJECT ACTIVITIES

Before describing the activities of this collaborative, it should be noted that +PLUS+ has employed three facilitators recruited by Peter Lewis. The facilitators are professionally trained and were hired to assist in the planning processes and in team meetings. Teachers are not accustomed to having the resources of a facilitator available and are not yet able to take full advantage of this opportunity.

The first of the four activities of the collaborative was a Kickoff Retreat, at which the participants came together for the first time. Three teams were formed, each consisting of university and business associates and a high school mathematics department. A plan for the summer was formulated by each team and site visit objectives were stated. A facilitator was assigned to each team to keep things on track, maintain a visual record, and provide initial exposure to and direct experience with the skills needed for effective team planning.

The second activity was a series of site visits. The visits began with each math department hosting its team members at the high school site. At each site visit the team facilitator, the university and business associates that are part of the team, and the +PLUS+ coordinator were present. The high school site visits failed to provide sufficient information to enable the university and business associates to plan their own site visits. A meeting was therefore held to identify the needs common to all three mathematics departments and to focus on those areas which could be addressed through the resources of the associates. This meeting was followed by ten industry/university site visits. In looking for the application of mathematics to the world of work, teams repeatedly saw and heard evidence of the use of the computer as a collector, processor, and distributor of information. This trend in mathematics application requires students to acquire the ability to analyze information for patterns and irregularities, to develop formulae and mathematical models, to make predictions and to forecast results based on assumptions which minimize risk.

Organizationally, the teachers heard constant references to team work, team planning, and dependence and reliance on another group's efforts. However, most teachers ended with a feeling of "information overload," and they were left with the puzzling question of how to integrate this information into their mathematics program. Also, the teachers were clearly impressed by the professional treatment they received which to many was a stark contrast to the treatment they often receive.

The third activity of the collaborative was a one-day retreat (Retreat II) and a follow-up workshop. This retreat, which was planned by team leaders and facilitators, brought the teams back together in September to share experiences, and to review and redefine plans. As an outcome of this retreat a team building workshop is planned for December 7. This decision arose from the identification of the challenges of and obstacles to attaining team goals The workshop will focus on self-esteem, conflict resolution, problem solving and communication skills. Team building had been anticipated to occur at the indiviaual team level rather than as a project-wide activity. The workshop is an example of the project's capacity to respond to needs as they arise. The workshop now forms the basis for the planned team meeting foci during 1986.

Finally, each team is eligible to apply for a planning grant of $2500. Peter Lewis will use the December workshop to enable the members of the +PLUS+ high school teams to acquire skills necessary to execute their team plans.

F. OBSERVATIONS

The networks involving teachers and their industry/university associates are developing. This process has been accompanied by a shaking out period during which there has been a recognition that corporate or institutional support does not always translate into individual commitment. This has been even more of a concern with the associates from the colleges. Alternative processes of identifying individuals within colleges and industry who are interested in participation are currently being explored. In particular, it appears that one person from an organization is not enough, just as an isolated teacher in a school is not enough. On a positive note, two associates from corporations who initially had been identified by their employers, have maintained their involvement in the collaborative after changing corporations.

The building of teams generally has been a problem of mindset, with individual teachers tending to see their activities as not having a bearing on the group as a whole. Thus, for example, the initiative of a teacher in organizing 11 volunteers at USC to participate in activities with his school was seen by him as an individual act. Generally, the project has had strong business support from the start, as well as that of the county and school district. While the university support has been there, the nature of job specifications within universities and the lack of career reward for involvement appear to provide a barrier to achieving more consistent university faculty support. College associates who showed a personal involvement appear to be discouraged by lack of administrative support.

The site visits in the Los Angeles collaborative are interesting in that they involved both visits by teachers to industry and universities, and visits by business and university associates to schools. In the building of a collegial relationship between the teachers and the associates, this strategy fosters the belief that each group has something to learn about the reality of the others' work life. The planning of these visits was the responsibility of the hosts, and initial visits suggested that teachers were not used to the degree of planning necessary to maximize their value.

With regard to the site visits to university campuses and businesses, it was noted that teachers indicated that their needs were not satisfied. It appears that they were expecting materials to be given to them in readily usable form for the classroom.

G. NEXT STEPS

Networking beyond the +PLUS+ project will be initiated. The Computers in Schools Project of the National Commission on Industrial

Innovation (NCII) and LAEP intend to collaborate in the establishment of a computer information network to link six teacher projects in the Los Angeles area. The +PLUS+ group is one of these, and will identify a pair of teachers to act as key persons in this network. The NCII will provide terminals and modems for 1986. Within +PLUS+, networking will be expedited by a series of meetings of team leaders at the LAEP offices.

Site visits will continue. In addition to the team visits to schools, colleges, and industry, a joint visit of all teams is planned to Galaxy Sound Studios in January. A similar visit to LAPD Science Laboratory is to be scheduled for team representatives.

Each team is to present its development plan by January 15, and grants will be awarded by February 15. Following the decisions from Retreat II, each team's four meetings will focus in part on the problems and challenges of working as a team. Conflict resolution, problem solving, and communication skills directed toward developing cooperation with groups and from administrators are to be developed by the facilitators. Furthermore, each associate's organization will fund and host one of these meetings as a dinner meeting for members of the associate's +PLUS+ team.

A series of mini roundtables will provide task forces of teachers who attended summer site visits and who wish to further develop the available resources the opportunity to further accommodate their team plans.

The visits of the project coordinator to each school team will be on a regular monthly schedule. The foci will be on informing school administrators, building team profiles, and facilitating both the flow of information and the implementation of the initiatives of the project.

Teacher members of +PLUS+ are attending the November 1985 meeting of the California Mathematics Council and may give presentations at the 1986 convention.

SUMMARY REPORT
PHILADELPHIA URBAN MATHEMATICS COLLABORATIVE

by

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December 1985

PURPOSE OF THIS REPORT

The intent of this report is to summarize the initial activities of the Philadelphia Urban Mathematics Collaborative. The report is intended to be factual and interpretive. It is not the purpose of the Documentation Project to judge whether or not the organization of this collaborative or the activities it has carried out meet the objectives of the Ford Foundation.

The interpretations have been made in light of the intent of the Ford Foundation to establish projects which were:

- to extend the sense of professionalism among teachers by building a support system that links them to colleagues in the mathematical sciences, inside and outside the schools;
- to provide teachers at all levels with colleagues upon whom they can call for information concerning any aspect of school mathematics; and
- to enable teachers to enlarge their view of mathematics, their sources of examples, and their repertoire of classroom skills in communicating mathematics.

The information presented in this report came from the following sources: the proposal submitted by The Franklin Institute to the Ford Foundation, the meeting in New York City of project directors and coordinators in May 1985, a retrospective interview with Barbara Nelson of the Ford Foundation, documents provided by The Franklin Institute staff, reports from the on-site observer, and three site visits by the staff of the Documentation Project.

PHILADELPHIA URBAN MATHEMATICS COLLABORATIVE

A. PURPOSE

As indicated in the proposal, the collaborative project is being designed "to improve teachers' effectiveness in the classroom and thus improve the quality of mathematics education in this urban setting." Attributes of activities were to be:

- the promotion of collegiality among school teachers, and between them and college mathematics teachers and practicing mathematicians;
- the upgrading of teaching skills;
- the sharing of information;
- the promotion of a more professional feeling on the part of teachers; and
- the establishment of leadership nuclei in school mathematics departments.

The Philadelphia Urban Mathematics Collaborative aims to facilitate collaboration between projects directed toward mathematics teaching, and to move teachers to a more collegial involvement in the operation of these projects. Facilitation will include implementation of existing activities and the establishment of new interactions.

B. CONTEXT

Philadelphia has a population of approximately 1,700,000. The school district of Philadelphia serves 198,000 children. The superintendent of schools is Dr. Constance Clayton, who has served in that position for three years. The mathematics coordinator is David Williams who is in his first year. Alex Tobin had been the mathematics coordinator for 15 years before his retirement. David Williams was his assistant for the past four years.

Seventy-three percent of students in Philadelphia schools are from racial minority groups. Many of the students come from single parent and/or unemployed families. In the western, southern, and central sections of the city, minority enrollments range from 70-90 percent, while in the northeast section, the minority enrollment is 33 percent.

There are 9,069 teachers in the school district of whom 892 are mathematics teachers. Approximately 360 are high school mathematics teachers. Thirty-nine percent of the teachers are from racial minorities and 64 percent are women. While all public high school

mathematics teachers will be included in the overall scheme, the collaborative programs will be targeted to 12 high schools with a special emphasis on Chapter One schools.

The school district has a mandated mathematics curriculum, developed by a committee of administrators and teachers. The curriculum is sequenced and paced so that all students are approximately at the same point in the sequence at the same time. The program is tied to the administration of standard district-wide tests.

In Philadelphia, there are 25 institutions of higher learning including three involved in this project: Temple University, Drexel University, and the Community College of Philadelphia.

Also, as a major industrial city, Philadelphia is a home for many major industries including: ARA Services, Bell Atlantic, CIGNA Corporation, Crown Cork and Seal, Penn Mutual Life, Pennwalt Corporation, Rohm and Haas, Scott Paper Company, Smith Kline Beckman Corporation, and Westmoreland Coal.

C. ESTABLISHMENT OF THE COLLABORATIVE PROJECT

The original contact in Philadelphia for the Ford Foundation in 1984 was Alex Tobin, who was then the mathematics supervisor for the Philadelphia schools. It was on his suggestion that the Franklin Institute, one of the foremost science museums in the country, was approached to sponsor the project. Wayne Ransom, as Director of Education for that institution, became the executive officer for the collaborative.

Upon receipt of a planning grant of $2500 from the Ford Foundation in September 1984, a proposal was written. The proposal was written by Wayne Ransom and a member of his staff, Trina Vaux. This was done, however, with input from several subcommittees that had been organized to focus on various parts of the Ford Foundation guidelines. Three committees were formed: school professional activities, in-school components, and network components. Each committee consisted of five to seven people. In addition, an administrative coordinating committee was formed consisting of Joel Bloom, Richard DeLone, Wayne Ransom, and Alex Tobin. Trina Vaux attended and took notes at all of the committees meetings. She provided the continuity and direct input from the committees to the final drafting of the proposal.

D. RELATIONSHIP WITH OTHER LOCAL INITIATIVES

There are five very important organizations in Philadelphia whose activities have a direct bearing on the support of mathematics

teachers in Philadelphia and on the activities of this project. They are the Franklin Institute, the funding agency; the Committee to Support Philadelphia Public Schools, CSPPS; the Philadelphia Renaissance in Science and Mathematics Education, PRISM; the Philadelphia Regional Introduction for Minorities and Education, PRIME; and the Association of Teachers of Mathematics of Philadelphia and Vicinity, ATMOPAV.

The Franklin Institute has a 150-year history of promoting science and technology. As the region's only science and technology center, the Institute has valuable expertise to apply to the improvement of science and mathematics education. It has pioneered the area of experimental education, including hands-on exhibits, resource materials and kits, and has done seminal work in evaluating the effectiveness of exhibits and other informal teaching media. The Franklin Institute has a strong tradition of cooperative relationships with other organizations in the private and public sectors and has been deeply involved in new initiatives in mathematics and science teacher training.

The Committee to Support Philadelphia Public Schools, CSPPS, was started over two years ago. The CSPPS is an organization comprised of high level corporate, higher education, and foundation executives. It has established a humanities task force, and more recently, one in mathematics and science: the Philadelphia Renaissance in Science and Mathematics (PRISM). The CSPPS has approximately $2.5 million for support of teaching programs. Richard DeLone is the senior consultant to CSPPS and Joel Bloom, Alex Tobin, and Wayne Ransom are members of this task force. This task force has sponsored both a mini-grants program and teacher internships in industry through the Philadelphia Teachers in Industry Program (PTIP).

PRIME, the Philadelphia Regional Introduction for Minorities and Education, was established in 1972 at the initiative of General Electric. That company was concerned with both affirmative action and its difficulty in hiring minorities who were trained in engineering. Consequently, it convened a group to form the organization with a $50,000 grant. That organization has been active in supporting improvements in school mathematics and has spread its interest from engineering to other areas such as pharmacology and actuarial work.

PRIME consists of thirty-two businesses, seven colleges, nine environmental organizations and two school districts, Philadelphia and Camden. It has 2,000 children in its programs, with 450 in summer programs. There are several barriers to improving mathematics education in urban areas: the high absentee and dropout rate from the schools, students' reluctance to take higher level mathematics, and a reluctance by teachers to teach higher level mathematics. Members of PRIME felt that there was a feeling of pride in teaching, but that the feeling of pride was not institutionalized. They had two initial goals. The first was to get commitments from the

district regarding staff development for higher levels of mathematics. Second, they wanted to combine informal programs through the Franklin Institute and other agencies with formal programs and professional societies in order to improve what they saw as poor communications between the colleges and schools. It was felt that PRIME would be able to act as a catalyst because of its independence.

The Association of Teachers of Mathematics of Philadelphia and Vicinity, ATMOPAV, has an active membership of approximately 450 school and college mathematics teachers. It provides regular programs and a newsletter.

The presence of these five organizations is important because this collaborative project is being used to extend the many activities which are already being offered to the mathematics teachers in Philadelphia. Thus, it becomes very difficult to ascertain where the Ford initiative ends and the others' initiatives take over.

At the Planning Committee meeting of October 3, 1984, Ransom and Tobin outlined the purposes for the Ford Urban Mathematics Collaborative Project and argued for the necessity of building on what has already been in place. Their aim was to fit existing programs and proposals together and establish one loose but unified collaborative structure. The way in which they saw the interlocking relationship at work is exemplified by the 1985 Summer Institute activity held at Drexel University. Originally, Westinghouse had been approached to fund this activity but refused. It has now become a part of the Ford funded initiative in Philadelphia.

E. PROJECT ACTIVITIES

Six activities of this collaborative project should be mentioned. First, the Summer Institute which was an intensive four week summer mathematics program was held at Drexel University. The Institute was jointly sponsored by the Philadelphia Urban Mathematics Collaborative, Philadelphia Renaissance in Science and Mathematics (PRISM), the School District of Philadelphia, Philadelphia Regional Introduction for Minorities and Engineering (PRIME), and Drexel University. The program was modeled after the Phillips Andover program. Eighteen mathematics teachers from 11 senior high schools participated. Tuition was free, but teachers paid traveling expenses. Nine quarter-hours of Drexel University credits were granted for participating in the Institute and all materials were provided. Teachers were not paid an honorarium for attending for two reasons: first, it would be too expensive; and second, as the program did not involve the teachers being absent from work, it was considered appropriate not to pay them as the teachers were gaining professionally and getting university credit.

The second activity involved the collaborative paying for teachers' memberships in ATMOPAV. The idea behind the collaborative is to build on what already exists so that the present structures become stronger and more participative. As a result of the collaboratives' involvement, all the mathematics teachers in the Philadelphia School District have been made members of ATMOPAV. This additional support should result in an increase in the number of publications of ATMOPAV and a strengthening of its programs. The first issue of the ATMOPAV Newsletter for this school year was published in September 1985. The editor of the association's newsletter is Sue Stetzer, the on-site observer for this collaborative.

A third initiative, which is related to the PRISM organization, was the awarding of mini-grants to mathematics teachers. Mini-grants are awards made to support innovative or experimental projects designed to enrich classroom experiences. In the past, not as many applications as desired have been submitted, with very few in mathematics. The perceived reason for this is that mathematicians do not see themselves as competent in writing submissions. Consequently, funds were used to advertise and to help teachers write proposals. Three high school mathematics teachers from different schools were awarded mini-grants for the 1985-86 school year.

A fourth activity involved the recruitment of mathematics teachers as Teacher-Fellows for 1985 in the Philadelphia Teachers in Industry Program. This PRISM program offers opportunity for professional growth and development through four elements.

1) an 8-10 week summer placement for sponsored research and field study industry,

2) university supported academic study to assist the Teacher-Fellow to translate the summer experience into classroom instructional materials,

3) four mini-conferences to introduce Teacher-Fellows to developments in technology and to provide feedback on their work, and

4) dissemination of information and ideas.

The Teacher-Fellows receive a stipend of $2700 for the first year, academic credit, and a significant hands-on out-of-school experience. Three mathematics teachers have received Fellowships.

The fifth activity involves the heads of the high school mathematics departments. The first meeting of the department heads was held on September 19, 1985. The role of the collaborative, the summer institute, and the plan to provide ATMOPAV memberships for each high school mathematics teacher were discussed. Other items of

interest, including future speakers and trips for teachers, were also discussed.

The sixth activity was a retreat on October 15 for all mathematics department heads and principals. This was a leadership institute, during which attendees received training in management and leadership skills.

F. OBSERVATIONS

Three aspects of this collaborative project are of note. First, there was considerable delay in getting the activities started. Several reasons are apparent. At the time of funding, the project director, Wayne Ransom, was promoted to Director of Education for the Franklin Institute. Consequently, he had less time to spend on the collaborative. A second reason for the delay was the difficulty in hiring a project coordinator. It was seen as imperative that the coordinator be viewed as a teacher, yet with the salary for the project coordinator set at only $24,000 per annum, the project was unable to compete with the salaries being paid to teachers in the school district. Prior to the successful applicant, applicants were either not interested at the salary that was being offered, or were unacceptable as lacking the potential respect of teachers in the area. After much advertising and several interviews with candidates, the position was filled by Herb Isakoff. He is fifty-five years old and is taking early retirement. Most recently he was Assistant Director of Personnel for the Philadelphia School District. Previously, he was a mathematics teacher at South Philadelphia High School for nine years. He started this job on July 1, 1985.

The second area of note in regard to this collaborative project is that the primary support structure for the collaborative originates from the Philadelphia School District. Although there have been attempts to forge alliances with businesses and universities, it is the school district that has defined the problems to be addressed as well as the subsequent activities. A useful insight into the support structure is obtained by looking at the membership and affiliations of the Search Committee for the position of project coordinator for the project. The Search Committee consisted of: Alex Tobin; Dave Williams (Tobin's replacement as the director of mathematics education for the district); Corrine Caldwell, the chair of mathematics and science at the Community College of Philadelphia, and Wayne Ransom. Industry and major collaborating universities were not involved.

Another example of the dominant role taken by the school district involves the instructors of the courses offered at Drexel University in the Summer Institute. Although the courses were housed at Drexel and the teachers were getting university credit, the instructors were not Drexel faculty. In fact, they were teachers

from the Philadelphia schools. In all, there is little evidence of input into the planning or conducting of the activities from either university faculty or industry representatives.

The third area of note is that as a result of the planning effort, the nature of the Summer Institute changed from its initial target population and purpose. It was not for department heads, but for teachers. It was designed to enable some teachers to teach advanced mathematics classes. It was attended by 18 teachers from 12 senior high schools. Three areas of mathematical curricular interest were presented: special topics in computers, introduction to analysis, and special topics in mathematics. It was understood these teachers were to be given the opportunity to subsequently teach advanced classes. There is no question that those teachers who participated benefited from the program.

The path which the collaborative has chosen is an interesting one in that it is choosing to facilitate collaboration in two quite distinct ways: on the one hand, between existing and new projects in the Philadelphia area directed towards mathematics teachers, and on the other, toward involving teachers more collaboratively in the structure and operation of these programs. One point identified by the coordinator (in the other collaboratives, the title would be director) is that there is a need to establish a unique identity for the collaborative. Ways in which this might be done are being considered as part of the 1986 strategy.

G. NEXT STEPS

Several plans for the second year of the collaborative have been made. They include:

1 Contacting department heads at the 12 Chapter I high schools and surveying the mathematics teacher in order to plan future activities at those schools expressing interest. For example: a CAD/CAM workshop was requested by teachers in two schools.

2. Developing "Mathematics Colloquia" modeled after the Philadelphia Alliance for The Humanities "PATHS" Colloquia and "Academic Alliances." A colloquia on "The History of Mathematics" is being planned in conjunction with Dr. Robert McGee of Cabrini College.

3. Further developing the affiliation with teachers assigned to the High School Academies: Business, Electrical, Auto and Health Occupations. Meetings are arranged for November 12 and 13, 1985.

4. Cooperating with Lois Barson of Association of Teachers of Mathematics of Philadelphia Area and Vicinity (ATMOPAV) in the planning of AMROPAV's Winter 1986 meeting, which will be held on

February 22, 1986. This meeting will involve workshops, section meetings and a guest speaker.

5. Assisting, at the request of the School District Curriculum office, in forming a committee of mathematics teachers to rethink and rewrite the rationale and course of study for the "Mathematics in Application" course necessitated by new state graduation requirements. This committee will also identify applicable textual materials and software support.

6. Developing sponsors from the business/industrial community.

7. Arranging for the 1986 Summer Urban Teachers Institute, which will be similar to the 1985 Summer Institute. The Institute will probably be held at Drexel University.

8. Publicizing the activities of the collaborative in the PRISM and ATMOPAV newsletters.

SUMMARY REPORT:
SAN FRANCISCO URBAN MATHEMATICS COLLABORATIVE

by

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University of Wisconsin-Madison

December 1985

PURPOSE OF THIS REPORT

The intent of this report is to summarize the initial activities of the San Francisco Urban Mathematics Collaborative. The report is intended to be factual and interpretive. It is not the purpose of the Documentation Project to judge whether or not the organization of this collaborative or the activities it has carried out meet the objectives of the Ford Foundation.

The interpretations have been made in light of the intent of the Ford Foundation to establish projects:

- to extend the sense of professionalism among teachers by building a support system that links them to colleagues in the mathematical sciences, inside and outside the schools;
- to provide teachers at all levels with colleagues upon whom they can call for information concerning any aspect of school mathematics; and
- to enable teachers to enlarge their view of mathematics, their sources of examples, and their repertoire of classroom skills in communicating mathematics.

The information presented in this report comes from the following sources: the proposal submitted by the San Francisco Collaborative to the Ford Foundation through efforts of representatives from the San Francisco Unified School District, the San Francisco Education Fund, the Exploratorium, the San Francisco Consortium for Higher Education, and other mathematics educators; the meeting in New York City of project directors and coordinators in May 1985; a retrospective interview with Barbara Nelson of the Ford Foundation; documents provided by the San Francisco Education Fund staff; reports from the on-site observer, and three site visits by the staff of the Documentation Project.

SAN FRANCISCO URBAN MATHEMATICS COLLABORATIVE

A. PURPOSE

The purpose of this collaborative, as stated in the December 1984 proposal to the Ford Foundation, is to show teachers "how mathematics is embedded in the world around us while being sensitive to the needs and interests of the teachers involved in the program."

Underlying this general purpose, the aim is both to make the teaching of mathematics more attractive and to encourage present teachers to remain in the field through:

1. professional development of the teacher as a mathematician and educational teacher;

2. collegiality and network building with other mathematics professionals, and;

3. opportunities for the teacher to infuse the embeddedness of mathematics in the real world into his/her instruction.

B. CONTEXT

San Francisco, which comprises all of San Francisco County, has a population of approximately 700,000. The area is served by the San Francisco Unified School District. The interim superintendent of schools is Carlos Cornejo who has been selected by the Board of Education to serve for a period of one year, while a national search for a superintendent is conducted. The mathematics coordinator is Tania Madfes.

The district has 114 schools with approximately 64,000 students enrolled in grades K through 12, of which 83.4 percent are minorities. English is the second language for 47.6 percent of the students; 29.6 percent are either Limited English Proficient (LEP) or Non-English Proficient (NEP). In more than one-third of the schools, over 20 percent of the students receive Aid to Families of Dependent Children (AFDC). Of all the students, 61.8 percent are classified as Educationally Disadvantaged Youth (EDY). Therefore, more than one-third of the students in the San Francisco Unified School District are in at least one of the categories: LEP, NEP, AFDC, or EDY. This has impacted on the schools in a variety of ways.

One hundred seventy-two teachers are responsible for mathematics instruction at the high school level; 105 (61%) of these teachers have either a college minor or major or advanced degree in the subject. The group of 105 mathematics-relat teachers comprises the

target audience for this collaborative project. Thirty-eight percent of these individuals are minorities; 45 percent are over 50 years old. While about 80 percent of the students take two or more years of mathematics, recent legislation mandates that all students take two years of mathematics for graduation.

Large classes (some over 40), teacher shortages, "retraining programs" for teachers coming from other disciplines to mathematics, and classes composed of students with special needs have increased the burden on the group of professional mathematics teachers who have been given little recent opportunity for involvement in mathematics or exposure to new research and developments.

Most teachers of mathematics in the San Francisco Unified School District have been teaching for over 20 years. They, therefore, need to be brought up to date on current trends in and uses of mathematics. This need is exacerbated by the district's design of a new curriculum which requires significant shifts in content and pedagogy. The new curriculum is consistent with the newly adopted State Framework for Mathematics.

San Francisco is the home for a number of major universities. These institutions are linked in a high-level organization, the San Francisco Consortium for Higher Education, which has, for almost 20 years, brought the universities and colleges of the city together to assist the community in seeking solutions to its urban problems. This consortium is directly involved in the collaborative project.

As a major industrial city, San Francisco is the site of many prominent industries including McNesson Corporation, Levi Strauss, Chevron U.S.A., Wells Fargo Bank, Crocker Bank, and Bank of America. In San Francisco there is a history of corporate funding of public school activities. The Corporate Action Committee, for example, has been operating for three years.

San Francisco is also the home of the Exploratorium, a world reknown science museum which contains over 500 participatory exhibits. Since 1975, the Exploratorium has offered opportunities for "hands on" learning in the sciences through organized workshops as well as through casual visits by individuals. An NSF project is already operating within the museum to improve the instruction of science at middle and high schools.

C. ESTABLISHMENT OF THE COLLABORATIVE PROJECT

The initial approach by the Ford Foundation was to Dr. Frank Oppenheimer as a result of his role in organizing the Exploratorium for active learning and problem solving. Underlying the Exploratorium's activities is the assumption that its users learn by thinking through problems and relating intuitions to experience. He

strongly supported starting a Mathematics Collaborative, but felt that the Exploratorium was not the most appropriate funding agency. The Exploratorium staff felt they could better actively support and participate in such a project, rather than administer it. The museum directed the Ford Foundation to the San Francisco Education Fund and the SFEF became the funding agent.

Established in 1979, the San Francisco Education Fund is a community organization dedicated to improving the quality of education in the city's public schools. The SFEF raises funds for prioritized programs for which no federal or state funding is available, and provides a channel for corporate funding of public school activities. It also collaborates with other organizations to increase community support for the schools and provides a bridge between the public schools and the educational, cultural, scientific, and business resources in the community.

In 1984, a planning grant was made to SFEF to prepare a proposal to establish an Urban Mathematics Collaborative. This proposal was prepared by representatives of the San Francisco Unified School District, the San Francisco Education Fund, and the San Francisco Consortium for Higher Education. There was no direct representation from business on the steering committee.

The proposal was submitted in December 1984 and funded in February 1985. A project director was identified: Theresa Hernandez-Heinz, head of the mathematics department of Mission High School and vice president of the San Francisco Mathematics Teachers Association. Ms. Hernandez-Heinz's appointment is part-time, with organizational duties being shared with Gladys Thacher, executive director of the SFEF.

D. RELATIONSHIP WITH OTHER LOCAL INITIATIVES

It is the intention of the collaborative to utilize and expand a number of existing initiatives. In particular, the work of the Exploratorium in offering Summer Institutes in the sciences provided an opportunity to develop similar activities for mathematics teachers. This, in fact, constituted the first major activity of the collaborative.

E. PROJECT ACTIVITIES

The intent of the collaborative was to organize activities which targeted the experienced high school mathematics teachers in the whole district. To date, there have been four primary activities: a start-up reception, a Summer Institute for 23 teachers at the Exploratorium with a series of follow-up seminars, an initial dinner lecture, and a seminar and reception held at the Wells Fargo Bank.

Seventy-five high school mathematics teachers attended the kick-off reception on March 9, 1985. The reception provided the teachers an opportunity to gather in a social setting to be honored for their dedication and positive contribution to education, to socialize with their colleagues, and to become informed about the San Francisco Urban Mathematics Collaborative Project. Specific information and application forms concerning the Teacher Institute were presented as well as an opportunity for questions regarding the Institute.

Twenty-five mathematics teachers were selected from 31 applicants to participate in the Teacher Institute at the Exploratorium. Twenty-three teachers attended the four-week summer workshop. The lessons were designed to further teachers' understanding of some important concepts of physics through the language of mathematics, with about 50 percent of the time devoted to concepts in each field. The teachers found the sessions to be very stimulating and enlightening. All were positive in their evaluation of the workshop. Three follow-up sessions, two dealing with concrete examples related to trigonometry and one on empirical data and power functions, have been held. A discussion group on exhibits for the Exploratorium on mathematics was planned. The Saturday morning follow-up sessions have proven to be very successful, and have maintained a high attendance rate. These sessions are considered an integral part of the summer seminar program.

A Dinner Lecture Series designed to draw upon the rich community resources of San Francisco is planned for the 1985-86 academic year. Speakers in the series will include two Nobel laureates and two mathematicians in industry. The first of the four meetings in the series was held in October with Dr. Robert Langridge speaking on the topic "Molecular Graphics: Computer Assisted Insight and Reasoning in Three Dimensions." Teachers who had participated in the Summer Institute were encouraged to bring another teacher with them to the first dinner meeting: 40 attended. A follow-up workshop on computer usage was attended by nine teachers. Minigrants were available to workshop participants, but none were used. The problem seemed to be that teachers brought too many diverse expectations to the workshop. The issue suggests the need to better communicate the intent of the Fellowship, which is to move beyond questions of "what software?" to analysis of types of teaching.

Approximately 40 teachers participated in a seminar at the Wells Fargo Bank where they were addressed by four management personnel, who stressed the importance of basic mathematics. A reception followed the presentation.

F. OBSERVATIONS

The Summer Institute at the Exploratorium was very successful. Teachers were stimulated by the conceptual bridges that linked mathematics with the physical world. Through the follow-up program, this enthusiasm has the potential of being carried back to those teachers' classrooms. A concern identified by the director of the collaborative project is that this core group of teachers needs to be convinced that they can be educational leaders. They may need to be provided with some form of management training. Otherwise, there could be a possible barrier to the networking of ideas within schools. In particular, mathematics department heads could benefit from leadership training to better effect curriculum change in schools.

Organizationally, it has been necessary to share the responsibility for running the collaborative between the SFEF Executive Director and the collaborative's part-time director. This initially created some problems while the division of labor was sorted out.

The participation of Exploratorium staff and of representatives of colleges has been at a high level in the planning and running of the collaborative. There has, however, been some difficulty in actively involving mathematicians from industry. This problem reflects the varying degree of involvement of the various sectors in support of the collaborative. There is now, however, an indication that direct approaches to individuals and the enlistment of active support of the Chamber of Commerce are generating more industrial support.

G. NEXT STEPS

A key concern of the collaborative is to consider ways of developing its infrastructure. In particular, to find ways for teachers to identify needs beyond those which are day-to-day, and to develop within schools the capacity to take advantage of outside resources. A teacher center specifically for mathematics (and possibly science) is likely to be established. It will be a Center for Professional Exchange, with access to out ide resource people, as well as to school personnel. Also, attention will be focused on the development of leadership skills in a core of matrematics teachers.

With regard to governance, a five-member Teacher Advisory Committee has been identified to facilitate feedback and provide information from the teachers' viewpoints directly to the director and coordinator of the collaborative. This is part of the formalization of the governing structure of the collaborative.

SUMMARY REPORT:
TWIN CITIES URBAN MATHEMATICS COLLABORATIVE

by

Thomas A. Romberg and Allan Pitman
Urban Mathematics Collaborative Documentation Project
University of Wisconsin-Madison

December 1985

PURPOSE OF THE REPORT

The intent of this report is to summarize the initial activities of the Twin Cities Urban Mathematics Collaborative. The report is intended to be factual and interpretive. It is not the purpose of the Documentation Project to judge whether or not the organization of this collaborative or the activities it has carried out meet the objectives of the Ford Foundation.

The interpretations have been made in light of the intent of the Ford Foundation to establish projects:

- to extend the sense of professionalism among teachers by building a support system that links them to colleagues in the mathematical sciences, inside and outside the schools;

- to provide teachers at all levels with colleagues upon whom they can call for information concerning any aspect of school mathematics; and

- to enable teachers to enlarge their view of mathematics, their sources of examples, and their repertoire of classroom skills in communicating mathematics.

The information presented in this report came from the following sources: the proposal submitted by the School of Mathematics at the University of Minnesota to the Ford Foundation, the meeting in New York City of project directors and coordinators in May 1985, a retrospective interview with Barbara Nelson of the Ford Foundation, documents provided by project staff at the University of Minnesota School of Mathematics, reports from the on-site observer, and two site visits by the staff of the Documentation Project.

TWIN CITIES URBAN MATHEMATICS COLLABORATIVE

A. PURPOSE

The purpose of the collaborative as stated in its proposal is "to extend the sense of professionalism among secondary school mathematics teachers, provide for their future intellectual stimulation and renewal, and establish collegial and professional relationships among teachers and the wider mathematical community of the Twin Cities."

B. CONTEXT

The population of the Minneapolis-St. Paul area is approximately 650,000. Two urban public schools districts serve Minneapolis and St. Paul. The superintendent of schools in Minneapolis is Richard Green, who has served in this position for five years. The mathematics coordinator is Ross Taylor. David Bennett has been the superintendent in St. Paul for one year. Charles Lund is the mathematics coordinator.

Minneapolis has 37,500 students, and St. Paul, 30,650 students in grades K-12. In the Minneapolis district, approximately 40 percent of the children live with a single parent. Between Minneapolis and St. Paul, the districts serve a racial mix of children of whom two-thirds are white, one fifth black, over seven percent Asian, and about three percent Hispanic. Of notable presence is the Native American population which accounts for over four percent of the children.

The teacher population in both districts is mature and highly qualified. Over 50 percent of St. Paul teachers have at least 12 years experience and hold the equivalent of a master's degree or higher. In Minneapolis, 70 percent have taught in the district for 11 years or more; 73 percent of junior high teachers and 89 percent of senior high teachers hold master's or equivalent degrees. Only 30 percent of the teachers have taught in the district for less than four years. There are 113 teachers in Minneapolis and 94 teachers in St. Paul who devote at least 50 percent of their time teaching secondary mathematics.

The two districts have similar mathematics curriculums. Both are somewhat traditional, yet teachers have considerable autonomy in terms of the content and pacing of lessons.

Two of the universities in the Twin Cities are involved in this project: the University of Minnesota and Macalester College. The School of Mathematics at the University of Minnesota has a long history and interest in the continuing education of mathematics teachers. This is due to the commitment and enthusiasm of a number

of senior members of the School of Mathematics to secondary school mathematics in Minnesota.

As a major industrial center, Minneapolis is a home for many major industries including: Honeywell, Control Data, Cray Research, Sperry Corporation, Medtronics, Pillsbury, General Mills, St. Paul Companies, Minnesota Mutual, First Bank Corporation, and Northwest Corporation.

C. ESTABLISHMENT OF THE COLLABORATIVE PROJECT

Contact was first made by the Ford Foundation with Willard Miller, Chair of the School of Mathematics at the University of Minnesota. The approach was based on both the school's known interest and record of activity with teachers and gifted students.

The Twin Cities Urban Mathematics Collaborative was established with Professors Harvey Keynes and Willard Miller as joint directors. Chris Ennis, coordinator of the collaborative, is also a member of the School of Mathematics with experience in the University of Minnesota's Talented Youth Program. The steering committee consists of representatives of the University of Minnesota, the Minneapolis and the St. Paul School Districts, the Science Museum, Macalester College, and two corporations: Honeywell and St. Paul Fire and Marine.

D. RELATIONSHIP WITH OTHER LOCAL INITIATIVES

The previous involvement of the University's School of Mathematics in the Talented Youth Mathematics Program has provided a basis for this cooperative effort with mathematics teachers. In fact, the Twin Cities Urban Mathematics Collaborative is itself providing a means of piloting strategies for a statewide, NSF funded project for mathematicians to impact precollegiate mathematics.

E. PROJECT ACTIVITIES

The teaching force in the Twin Cities is seen to be both experienced and generally knowledgeable mathematically. The view is that teachers require renewal rather than retraining. A major issue is, How can teachers be freed from the dominance of textbooks? Thus, the primary focus is not one of changing the curriculum, but of pedagogy. In particular, the concern is how to transform the teaching of mathematics from the presentation of facts and processes to one of problem solving. This perspective involves two elements: first, there is a needed pedagogical change involving lesson structure and teacher-pupil relationships; and second, the view of mathematics is to be changed from a functionalist or formalist

approach to a more intuitivist or constructivist one. Given this orientation, three activities of the Twin Cities Urban Mathematics Collaborative Project should be mentioned.

The initial activity of the collaborative was the establishment of the Twin Cities Pre-College Mathematics Society. This organization will organize functions which bring about professional and social contact between mathematics teachers and both university and industrial mathematicians.

The first activity of the Society involved a series of dinner meetings to which teachers, university faculty, and mathematicians from some corporations were invited. These meetings were addressed by keynote speakers who spoke on mathematical topics. Teachers were treated as mathematical colleagues, competent to understand and be interested in mathematical issues. To date, three dinner meetings have been held. The first was held on March 25, 1985, the second on May 15, 1985, and the third on October 10, 1985. Each had approximately 60 teachers in attendance as well as 15-25 representatives from corporations and colleges.

The second activity was the Urban Mathematics Collaborative Summer Institute (UMCSI). The Institute was held for three weeks for five hours daily. There were 19 participants, 8 from Minneapolis and 11 from St. Paul, representing 11 schools. The participants were awarded a $600 stipend and University of Minnesota graduate mathematics credit.

The 1985 Summer Institute focused on problem solving. It stressed content while addressing methodology. The problem-solving sessions were directed by Professor Bert Fristedt. These sessions were held each day. There were also nine lectures by Honeywell Corporation personnel describing the mathematics used in particular fields, four lectures given by University professors, and one panel discussion on "Women in Mathematics." A computer lab was made available to participants.

During the summer work, three projects were completed by the participants. First, writing groups mapped out instructional units integrating content with specific problem-solving skills for four areas: Discovery Math, Algebra-Trigonometry, Enriched 7th Grade Pre-Algebra, and Geometry. Second, a problem-solver's handbook was compiled with annotated listings of problems from the summer work. And third, the exercise book Going to the Workforce was revised.

A follow-up to the Institute has been planned. The participants will meet monthly to continue the work begun in the summer. Gerry Sell, the on-site observer for the collaborative, will observe each teacher's class and talk with each teacher about the impact of the summer workshop. Also, a teacher advisory committee of five

participants will meet regularly with Chris Ennis and Harvey Keynes to advise the collaborative.

F. OBSERVATIONS

The Summer Institute was a resounding success. It is evident that the activities provided needed intellectual stimulation for teachers. The lecture series provided teachers with new information and perspectives. In particular, the problem-solving component provided an opportunity for collegial interaction, while dealing with substantial mathematical issues. One of the reasons for the Institute's success was that it was not a "course" in the usual sense. The teachers were active participants, and the ultimate outcomes are to be a set of classroom materials produced by and for teachers.

One fundamental problem being addressed in this project is the stereotypic role of universities in any collaborative effort. Universities usually are seen as experts providing knowledge to clients. Thus, university staff members have often treated school teachers in a paternalistic rather than collaborative fashion, and both teachers and administration have come to expect this kind of relationship. If the participating teachers have an equal and active role in the planning, implementation, and evaluation of the collaborative project, the very historical success of the School of Mathematics as a provider could be a source of concern. In this situation, we would have an example of the type of barrier which arises from a "healthy" environment. The history of the department in successfully providing for teachers may give rise to a provider-client relation with its mutual expectations. This could be an obstacle to the development of a timely collaborative enterprise.

In particular, it will be important to document the reactions of school administrators to the teachers' projects and their implementation, and to teachers' reliance on the School of Mathematics and Twin Cities Pre-College Mathematics Society for support.

This problem is being addressed by the establishment of an advisory committee of teachers to help guide the development of the collaborative project. Further thought is now being given to the problem of developing teacher leadership skills. In fact, the Twin Cities Urban Mathematics Collaborative Project is tackling this problem head-on in advance of the other collaborative projects.

A second problem to be noted is the lack of involvement of the university mathematics education community and of educators generally in the activities and planning of the project. After unsuccessful overtures to the mathematics education faculty at the University of Minnesota, Uri Treisman (University of California-Berkeley) was hired

and provided excellent assistance to the participants of the Summer Institute. However, long-term or regional local involvement is still a problem.

A third concern relates to the involvement of mathematicians from the corporate sector. Honeywell has actively participated in the project to date; their lecture series during the summer was well planned and received. This project, however, needs to broaden its industrial support.

G. NEXT STEPS

In addition to continuing the successful activities of the collaborative (Precollege Mathematics Society Dinner Meetings and Summer Institute with its follow-up activities), several steps are being taken to strengthen the collaborative nature of the project and to instill a sense of ownership in the participating teachers.

First, a Teacher Advisory Council consisting of five teachers from the Summer Institute has begun meeting on a regular basis. A major goal of the council is to strongly encourage leadership sharing and collaboration. It should provide a powerful vehicle for the advocacy of ideas generated by teachers from both within and outside the council, as well as provide the collaborative's Steering Committee with a valuable sounding board for new ideas and modification of older ones. For example, the council has already been instrumental both in recommending the inclusion of junior high specific activities for collaborative participants and in modifying the application form for upcoming NSF/UMC Summer Institutes. The original application form for last summer's UMC Institute was found to be somewhat intimidating by several teachers.

Second, the number of teacher and industrial/business members of the collaborative Steering Committee has been significantly increased to two teachers (previously one) who are also members of the Advisory Council, and four industrial/business representatives (previously two). This will allow for greater interchange of ideas and development of programs involving these groups. In particular, a subcommittee of the Steering Committee on industrial/school collaboration has been established to explore further possibilities in this direction, and all four industrial/business representatives to the Steering Committee have enthusiastically agreed to serve on this subcommittee. Furthermore, greater involvement of both teachers and industrial mathematicians as speakers at the dinner meetings of the Twin Cities Precollege Mathematics Society has been planned. Third, a separate subcommittee of the Steering Committee has been established to address the issue of teacher professionalization. This committee will deal with the difficult issue of how to better involve teachers in the decision making process, not only within the

collaborative but also within their own school systems, as advocates for the type of changes they as professionals desire.

In addition to the continued involvement of the mathematics consultants from the St. Paul and Minneapolis public schools and the possible future involvement of consultant Uri Treisman, the collaborative is seeking the involvement of one additional member from the mathematics education community of the greater Twin Cities area. Certain individuals have been considered and inquiries are being made as to their interest and commitment to the project. It is hoped that such an individual will be appointed to the Steering Committee in the very near future.

Finally, a regularly published newsletter for the collaborative is being prepared. The first issue will be mailed to all participants in late December or early January. All mathematics teachers will receive this newsletter at their home address. The newsletter is being co-edited by one of the junior high teacher participants in the Summer Institute. The newsletter is designed to encourage teachers to learn about and discuss issues related to their professional lives.

SUMMARY REPORT:
DURHAM COLLABORATIVE: THE DURHAM MATHEMATICS COUNCIL

by

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December 1985

PURPOSE OF THIS REPORT

The intent of this report is to summarize the initial activities of the Durham Urban Mathematics Collaborative. The report is intended to be factual and interpretive. It is not the purpose of the Documentation Project to judge whether or not the organization of this collaborative or the activities it has carried out meet the objectives of the Ford Foundation.

The interpretations have been made in light of the intent of the Ford Foundation to establish projects:

- to extend the sense of professionalism among teachers by building a support system that links them to colleagues in the mathematical sciences, inside and outside the schools;
- to provide teachers at all levels with colleagues upon whom they can call for information concerning any aspect of school mathematics; and
- to enable teachers to enlarge their view of mathematics, their sources of examples, and their repertoire of classroom skills in communicating mathematics.

The information presented in this report came from the following sources: the proposal submitted by the Planning Committee to the Ford Foundation, the meeting in Cleveland of project directors and coordinators in October 1985, a retrospective interview with Barbara Nelson of the Ford Foundation, documents provided by the project staff, and three site visits by the staff of the Documentation Project.

DURHAM COLLABORATIVE: THE DURHAM MATHEMATICS COUNCIL

A. PURPOSE

The Durham Mathematics Council is a collaborative program designed to provide mathematics teachers with opportunities for professional growth and for colleagueship with other teachers and local mathematicians.

The Planning Committee identified five major areas for involvement regarding professional growth for secondary school mathematics teachers. They are:

- enhancement of knowledge about local mathematics applications,
- expansion of the limited opportunities for teachers to travel,
- support for more opportunities for teachers' growth as mathematicians,
- provision of opportunities for professional colleagueship, and
- combating loss of professional self-esteem and "burnout."

B. CONTEXT

The population of Durham is approximately 160,000. Durham forms a segment of an economic and educational zone known as the Triangle, which comprises Durham, Raleigh, Research Triangle Park and Chapel Hill. The collaborative project involves both the Durham City and the Durham County school districts.

The Durham City Public School District serves approximately 8,400 students with 13 elementary, 5 junior high and 2 high schools. The superintendent of the school district is Dr. Cleveland Hammonds, who has served in the position for a long time. Dr. Cleopatra Hargett Lawton has been the Director of Instruction for more than 10 years. She has taken a direct interest in the mathematics curriculum and has an officer specifically responsible for mathematics in her department.

Of the students in grades 7-12, 85 percent are black and 15 percent are white. Forty-six percent of the students receive federal lunch program assistance. About 63 percent of the graduating students enter some form of postsecondary education. Slightly more than half of the 2,333 high school students (grades 10-12) were

enrolled in a mathematics course in 1984. In the two high schools, 93 percent of the students are black, six percent are white and one percent are from other racial groups.

Of the system's sixteen high school mathematics teachers, fifteen majored in mathematics and one in mathematics education, with four holding masters degrees in mathematics. They average eleven years experience in teaching high school mathematics. There are also twenty teachers of mathematics at the middle school level; of these, five majored in mathematics or mathematics education. All are certified to teach mathematics and have an average of fourteen years of teaching experience. The racial composition of the faculty in all the secondary schools (grades 7-12) is 65 percent black and 35 percent white.

The Durham County School system enrolled 16,268 students in 1984. The system serves a mix of urban, suburban and rural students. Nearly 8 percent of the students receive assistance under the federal lunch program. The racial composition of the student population in this system is 69.2 percent white, 29.4 percent black, and 1.4 percent other racial groups. Of students graduating from the system, 68 percent pursue postsecondary education. About 80 percent of the 3,914 high school students in the three high schools were enrolled in mathematics courses last year. Students take an average of 3.47 high school mathematics courses.

The Durham County school system employs 495 secondary teachers, of whom 79 percent are white and 20 percent are black. There are 35 high school mathematics teachers (grades 9-12) as well as 25 mathematics teachers for grades 7-8. All are certified to teach mathematics, and all except one have a major in mathematics or mathematics education. Twelve have higher degrees in mathematics. These teachers average nearly ten years of teaching experience.

The mathematics curriculum is, to a degree, the responsibility of the schools. A list of approved texts is issued by the State Department of Public Instruction. Local school districts then choose a single book for each mathematics course to be used throughout the district. In these two districts, the selection committees are largely made up of teachers. Schools may provide supplementary materials and texts, however, these are not paid for by the DPI. The salary scale for teachers is determined at the state level and ranges from $15,500 to $24,000.

There is a diverse set of resources available in the region around Durham, known as the Triangle. Major industries established in the region include Liggett & Myers Tobacco Company, Central Carolina Bank and Trust Company and a number of high technology companies including the IBM Corporation. The National Institute of Environmental Health Sciences is located in the Triangle Research

Park. North Carolina Mutual Life, one of the nation's largest black owned financial institutions, is headquartered in Durham.

The city hosts two universities and a technical institute. A special residential school for gifted children, the North Carolina School of Science and Mathematics, is part of the University of North Carolina system. Nearby Research Triangle Park is the site of the Southeastern Regional Council for Educational Improvement.

C. ESTABLISHMENT OF THE COLLABORATIVE PROJECT

The initial contact between the Ford Foundation and Durham occurred in late January 1985 when Barbara Nelson contacted the Director of NCSSM, Mr. Charles Eilber. On February 21 there was a meeting at the School of Science and Mathematics of Barbara Nelson, the Director and some faculty of the school, and representatives of the Durham City and Durham County school districts. Business leaders were invited to the luncheon and to the second part of the meeting. Those in attendance were strongly supportive of pursuing the project. From the date of this meeting it took only ten weeks of intense effort for a final proposal to be presented to the Ford Foundation. Responsibility for establishing the project was given to J. Keith Brown, Head of Outreach and Research at NCSSM and Director of the Mathematics and Science Education Center of the North Carolina Mathematics and Science Education Network.

Immediately following the meeting, Mark Leuchtenberger, who at the time was the Development Officer of NCSSM, wrote a proposal for a planning grant. Funding of $2500 was quickly granted. An executive planning committee of 16 people was established. Generally the strategy was to identify specific individuals within corporations and institutions rather than approach the organizations themselves. This committee met weekly and had a first draft of a proposal ready by the end of April. In late April the Chamber of Commerce's education committee hosted a breakfast so that business leaders could hear a presentation about the project. At the breakfast a "business package" was distributed. The packet provided background information about the collaborative and listed means of assistance in cash and kind that corporations and institutions could offer. A pledge card was included. Responses yielded considerable "in kind" support, and a relatively small cash commitment.

There were two meetings with teachers during April. On April 2, a luncheon meeting was held for 12 city and county secondary mathematics teachers who had been identified by the district mathematics supervisors. The activities to be included in the proposal were formulated at this meeting. Three weeks later a slightly expanded group met to review the proposal. Feedback from this meeting was used to check the targeting of teacher concerns, to

modify the content of the proposal, and to provide these teachers with a sense of ownership in the project.

A final meeting of the planning committee with Barbara Nelson led to the fine tuning of the proposal, which was then submitted on May 7, 1985. Notification was received on August 12, 1985 that funding for the collaborative, the Durham Mathematics Council, would commence on August 1. The fiscal agent was identified as the Fund for the Advancement of Science and Mathematics in North Carolina. This foundation is the receiving agent for the NCSSM, in whose buildings the directorate of the project is located. Dr. Brown was appointed Project Director of the Council. His position is supported by the North Carolina Mathematics and Science Education Network.

An issue of intense debate arose at the May 7 meeting of the planning committee, centering on the definition of the skills to be required of the Executive Director, who was yet to be identified. It was resolved that primarily this person should have credibility among teachers, and have teaching, mathematical, and organizational skills. The capacity to tap local sources for financial and material support would be in the province of the chairman of the Council's Board of Directors. The position of Executive Director was filled in August 1985 by the half-time appointment of Dr. Jo Ann Lutz, a mathematics teacher at NCSSM.

D. RELATIONSHIP WITH OTHER LOCAL INITIATIVES

The establishment of the Durham Mathematics Council occurred at a time of statewide expansion of the North Carolina Mathematics and Science Education Network (NCMSEN). The involvement of the North Carolina School of Science and Mathematics in the network has included summer seminar work and a pilot telecommunication project for teachers and pupils of science and mathematics. The school offers activities for endorsement to teach academically gifted children. Other sites in the network offer activities for college credit.

The primary thrust of the network was toward out-of-field teachers and those mathematics-endorsed teachers needing further mathematical knowledge. The Ford collaborative effort complements this initiative by providing activities for the fully certified teachers in the two districts. It has been previously mentioned that the project director of the Council is also Director of the Mathematics and Science Education Center of the North Carolina Mathematics and Science Education Network.

The Ford initiative, the Durham Mathematics Council, provides a pilot for similar future initiatives of the statewide network in other North Carolina cities.

E. PROJECT ACTIVITIES

The Durham Mathematics Council was introduced to teachers at a reception held at the Sheraton University Center in September 1985. About 45 teachers, two principals, and half of the Council's Board of Directors attended. Howard Clement, as Chairman, spoke on behalf of the Board, and Jo Ann Lutz outlined the intentions and currently planned activities of the collaborative project. Teachers were invited to attend through personal letters sent to their homes. At the reception, a background information sheet was circulated which requested both personal data regarding qualifications and teaching, and information about the degree of interest in a range of Mathematics Council activities. All teachers were invited to indicate a willingness to serve as a school representative on a teachers' steering committee. While teachers appeared pleased with the idea of the steering committee, at the time of writing not all schools were represented. About two thirds of 110 questionnaires distributed either at the meeting or through the mail have been returned.

Three periodical bulletins have been produced. The first, published in early October, was largely introductory and focused on the mission of the Council. In response to information in the first bulletin, two junior high school teachers successfully approached the Council for funding to attend the NCCTM Meeting in Charlotte, NC on October 27-28. The second bulletin, dated November 4, advertised both coming activities and the involvement of teachers earlier in the year. In response to information in the second bulletin, three teachers, two from the same school, applied for a grant to attend the Family Math programs in Berkeley in January. Although only two places were advertised, all three teachers received funding. Release time is available as a result of the County District's commitment to the Council. No inquiries have as yet been received in response to an offer to support attendance at the NCTM meeting in April 1986.

Three of five planned seminars have been held. Dr. Chris Portier, of the National Institute of Environmental Health Science, spoke to 17 teachers on November 20 on the topic "Quantitative Risk Estimation." That was followed by a second seminar on December 10 at which Rich Moore of the tobacco company Liggett & Myers discussed "The Importance of Mathematics" with 35 teachers at the company's headquarters. In his address, Mr. Moore stressed the importance of fundamental mathematical concepts, problem solving skills, and attitude.

F. OBSERVATIONS

Given the relatively short startup period from the first contact with the Ford Foundation, this collaborative has made significant

strides. A completely new organization exists which brings together representatives of Durham's business, college and school district communities.

The two school districts being served by the Council provide a series of contrasts. The City school district serves a predominantly black student population and has a supervisor of long standing. The County school district, which serves a predominately white student population, has a new superintendent who is actively working to improve the system. The degree to which these differences influence the short term success of the Council in involving teachers is a matter of speculation. To date, only County teachers have applied for funding to attend the NCCTM and Family Math activities. Furthermore, they have been the overwhelming majority at the two seminars. This is an issue that Jo Ann Lutz addressed in a meeting with City school district principals in December. At the same time, she appealed to the principals to encourage teachers to use the resources of the collaborative and also asked them to facilitate teachers' participation when release time from school was involved.

There has been some disappointment that more teachers have not asked the Council for funding. This may, however, be associated with two elements. The first is the sense of some teachers that they are "locked in" and powerless. The second is that in order to be considered for support, a Professional Development Plan is required. Preparing a plan may be intimidating to a number of teachers; however, the significant proportion of teachers who have completed them have had little difficulty once they made the attempt. In fact, more teachers have provided Professional Development Plans than have sought funds.

G. NEXT STEPS

It is expected that the current range of activities will expand as teachers become accustomed to using the Council. At this time one teacher is preparing to seek support to undertake graduate study.

SUMMARY REPORT:
PITTSBURGH URBAN MATHEMATICS COLLABORATIVE

by

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University of Wisconsin-Madison

December 1985

PURPOSE OF THIS REPORT

The intent of this report is to summarize the initial activities of the Pittsburgh Urban Mathematics Collaborative Project. The report is intended to be factual and interpretive. It is not the purpose of the Documentation Project to judge whether or not the organization of this collaborative or the activities it has carried out meet the objectives of the Ford Foundation.

The interpretations have been made in light of the intent of the Ford Foundation to establish projects:

- to extend the sense of professionalism among teachers by building a support system that links them to colleagues in the mathematical sciences, inside and outside the schools;
- to provide teachers at all levels with colleagues upon whom they can call for information concerning any aspect of school mathematics; and
- to enable teachers to enlarge their view of mathematics, their sources of examples, and their repertoire of classroom skills in communicating mathematics.

The information presented in this report comes from the following sources: the proposal submitted by the Steering Committee of the collaborative to the Ford Foundation, the meeting in Cleveland of project directors and coordinators in October 1985, a retrospective interview with Barbara Nelson of the Ford Foundation, documents provided by the project staff, and three site visits by the staff of the Documentation Project.

PITTSBURGH URBAN MATHEMATICS COLLABORATIVE

A. PURPOSE

As stated in the proposal submitted to the Ford Foundation in June 1985, the primary purpose of the Pittsburgh Urban Mathematics Collaborative is to increase the professional status of the high school teachers of mathematics in Pittsburgh. Status is defined in terms of both self-concepts and the values outsiders assign to high school mathematics teachers.

This two-fold goal is to be approached by providing opportunities for professional self-enhancement and for expanding teachers' knowledge-base of mathematics' applications. These activities will facilitate teacher interaction, thereby helping to overcome teachers' isolation. A key component in achieving these goals is the provision of time; for interaction, for work and for professional development. Additional efforts will be directed toward providing opportunities for teacher recognition and for educating the community about the professional nature of high school mathematics teachers.

B. CONTEXT

The Pittsburgh metropolitan area has a population of 2.5 million people. The city itself has a population in excess of 400,000. The area is served by the Pittsburgh Public Schools District. The superintendent is Dr. Richard Wallace, who has held the position since the 1980-81 academic year. The central office support for curriculum areas was reorganized at the start of the 1985-86 academic year. Four positions as subject area directors are as yet unfilled; one of which is for mathematics. There is an instructional supervisory staff of four who are assigned responsibilities based on geographic region. This regionalization, instituted in July 1, 1985, replaces the earlier elementary/middle/ junior high/senior high school division of responsibility. The district is now organized into 49 elementary (K-5), 15 middle (6-8) and 12 high schools (9-12). Good relations exist between the superintendent's office and the local teachers' union.

A school closure program is nearing completion. The district serves approximately 41,000 kindergarten through twelfth-grade students in 76 schools. Of the student population, 52 percent are black and 48 percent are white, with other groups not being significantly represented.

There are 126 high school mathematics teachers. Of these, ten are black. All 126 teachers are fully certified to teach mathematics and average nearly 20 years experience in the classroom. There has been no recruiting for some years, as the district's population has

declined. Teaching positions will soon open as teachers on this maturing teaching force retire. For example, two of the twelve department chairs are within five years of retirement.

The state legislature has recently mandated that all students take three years of mathematics in grades 9-12. This requirement demands a differentiated curriculum to cater to the "weaker students", and has created a focus on the provision of general mathematics courses at eleventh grade.

Although there is a district mathematics curriculum, schools differ considerably both in the structure of their course offerings and in academic achievement. There have been great gains in academic achievement in the last five years, but at this time baseline data exists only at the elementary and middle school levels.

There are a number of initiatives operating within the Pittsburgh Public Schools District, including the Schenley High School Teacher Center which has obtained national recognition for its work in teacher renewal. The Center for Advanced Studies (CAS) programs in selected high schools provide very rigorous curriculum for students having an IQ in excess of 130. CAS classes have 15-18 students; teachers of these classes are given extra preparation time. A Scholar's program is offered, which is less rigorous than CAS. The district's 24 magnet programs, which are not all academic, are directed at desegregation.

In the community at large, Pittsburgh is endowed with a number of valuable resources including non-profit organizations, such as the Carnegie Institute, the system of Carnegie libraries, and the Buhl Science Center, which houses a number of exhibits and projects relevant to mathematics education. There are also several universities, among them the University of Pittsburgh and Carnegie-Mellon University. The Pittsburgh Council of Higher Education represents the senior administrators of local universities.

Industrially and commercially, Pittsburgh has been through a painful economic restructuring, with the transition from a heavy industrial base founded on steel to one tied more to "high technology" industries, regional service industries and finance. A number of businesses and industries are headquartered in the city.

Finally, the Allegheny Conference on Community Development (ACCD) is based in Pittsburgh. Within ACCD is the Allegheny Conference Education Fund which is already involved in a range of activities relevant to the collaborative.

C. ESTABLISHMENT F THE COLLABORATIVE

The initial contact between the Ford Foundation and Pittsburgh was made in late 1984 between Barbara Nelson of the Ford Foundation and Jane Burger of the Allegheny Conference Education Fund. The Steering Committee first met with Barbara Nelson on March 30, 1985. The committee was chaired by Robert Wilburn, former Secretary of Education in Pennsylvania, and currently the director of the Carnegie Institute. Also present were the superintendent of the Pittsburgh school district, the president of the local teacher's union, and the director of the Learning Research Development Center at the University of Pittsburgh. The Allegheny Conference and Buhl Foundation were also represented, as was the local Public Broadcasting station. It was felt that the collaborative should have a strong base both inside and outside of the Allegheny Conference. On March 11, 1985 Dr. Leslie Salmon-Cox of the Learning Development Research Center (LRDC) of the University of Pittsburgh was approached through the Director of the IRDC, Dr. Lauren Resnick, with the request that she become involved in the establishment of the collaborative project. From then on, the development of the proposal became primarily the responsibility of Dr. Salmon-Cox, who is a sociologist by training. In the following week, Dr. Salmon-Cox interviewed each of the eight members of the Executive Committee of the Steering Committee individually in order to establish their understandings of what the Ford Foundation was offering, and what Pittsburgh needed. These interviews were supplemented by discussions with public school teachers and with Superintendent Wallace. On April 9, a summary paper was presented for discussion at a full meeting of the Steering Committee.

At a meeting of the Steering Committee with Barbara Nelson on April 30, a one-month extension to the proposal deadline was negotiated. The proposal was to be written by Dr. Salmon-Cox, circulated to members for feedback and submitted by the new deadline of July 5. In late July, funding for the collaborative project was confirmed with a start-up date of September 1. The collaborative began operation on October 1, with the filling of both leadership positions. The titles adopted for these positions is important in understanding the orientation of the project.

The post of director, to which Dr. Salmon-Cox was appointed, is titled Coordinator in the belief that a key to the collaborative is the local definition of local needs, and that this is best done by teachers themselves. The mission of the collaborative is to initiate activity while balancing multiple interest groups. In time, the coordinating role may diminish as participants move to the foreground. The half-time assistant coordinator is Dr. Martina Jacobs, a specialist in instructional psychology, who was a writer and editor for the Carnegie Institute and High Technology Council.

The lack of secondary mathematics teaching experience in the directorate of the project is not seen as a problem. For several years the coordinator has been working with teachers in the Pittsburgh Public Schools in formative evaluations and other colleagial activities, and is well known to them.

On October 1, Superintendent Wallace sent a letter to all the chairs of the high school mathematics departments announcing the "new resource program," the Pittsburgh Mathematics Collaborative. This was followed by a letter from Dr. Salmon-Cox to the principals. On November 1, the department chairs were invited to a dinner followed by a half-day workshop. At the dinner the participants were treated to an informal talk on discrete mathematics. On the following day, after a brief description of the collaborative project, the department chairs discussed problems, projections, and concerns and developed plans to reach their teachers.

D. RELATIONSHIP WITH OTHER LOCAL INITIATIVES

The collaborative will draw upon and supplement existing initiatives as well as draw support from a number of them. For example, the mini-grants program sponsored by the Allegheny Conference Education Fund will be supplemented by an allocation from the collaborative of $6,000 for mathematics teachers. The Pittsburgh Council on Higher Education has a summer internship program which enables teachers to work in industry, and the Schenley Teachers' Center provides internships for teachers on its faculty. The High Technology Council has designated the collaborative as one of its three special projects for the next year.

E. PROJECT ACTIVITIES

The first major initiative of the collaborative has been directed toward mathematics curriculum reform. Given the requirement of the state legislature for a third year of general mathematics, and the district policy decision to give more responsibility to subject chairs, Superintendent Wallace has endorsed the collaborative as the context for discussion of the issue. Consequently, the chairs of the high school mathematics department are to meet six times under the auspices of the collaborative to formulate recommendations for the new course and its content. The district is funding three of these meetings.

The concentration of the initial efforts on the department chairs is part of a strategy which is believed will facilitate a long term atmosphere that is supportive of teacher involvement in the collaborative's activities. The major focus of the collaborative's program is discussion of new curriculum.

Preliminary work is underway to establish a series of industrial site visits. The foci of these will be on the nature of vocational training and on jobs available now and in the future. A summer internship program is also being prepared. It is believed that the first impact of these efforts might be on those students who are not college-bound.

F. OBSERVATIONS

The collaborative was established at a time of reorganization in the Pittsburgh Public Schools. On July 1, 1985, directorates were created for subject areas. Presently three of these, including the position in mathematics, are unfilled. The instructional supervisory staff duties in mathematics have been redefined, with geographic regional responsibility replacing the elementary/middle/junior high/senior high school division between the four officers. The hiatus associated with these changes has provided the context for the new project to step into a meaningful facilitating role.

G. NEXT STEPS

The collaborative is now setting up its program of activities. Mathematics teachers will be introduced to present and future growth areas in the Pittsburgh workplace (e.g., manufacturing, high technology, health care, financial services) and jobs in these areas which have implications for mathematics education. Opportunities to tour specific companies that are representative of these growth areas and to speak with individuals in various job categories at the companies are being planned.

At the present time, a new pilot program is being developed in Pittsburgh. The notion is to link job training to economic development through a centralized, customized job training program. Mathematics teachers will be put in touch with the individuals who are providing trained employees for new and expanding companies in the Pittsburgh region.

In identifying jobs requiring mathematics skills, the major focus will be upon students entering the workforce with either a high school diploma, or limited vocational training. This group not only appears to be of major concern to high school mathematics teachers, but is also the group on whom a high school mathematics teacher/employer collaboration can have the greatest direct impact.

Several forms of communication, within and about the collaborative are planned. A project newsletter will be developed, primarily for internal communication. Information about the project will also be included in the school district's regular publication and in the newsletter produced by the Allegheny Conference

Partnerships program, which is distributed to business and foundation communities.

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