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AUTHOR	Middleton, James A.; And Others
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ABSTRACT

This technical report examines the results of a teacher background questionnaire administered to 430 frequent participants in 11 Urban Mathematics Collaboratives (UMCs). The goal of the UMC is to improve mathematics education in urban schools and to identify new models for meeting the professional needs of high school teachers by exposing them to new trends in the field, and by fostering a sense of collegiality with mathematicians in business and universities. The following findings are discussed: (1) the high proportion of female and minority group member participants reflected the local population; (2) participants had an average of 14 years of teaching experience; (3) participants appeared to be exceptionally well qualified to teach, but they may not have had as much exposure to mathematics as other mathematics teachers; (4) participants seemed to be exceptionally involved in professional enrichment and staff development; (5) involvement with other teachers was cited as the most important strategy for improving instruction; (6) participants cited absenteeism, low reading ability, and poor motivation as serious problems in their schools; (7) computers were not generally available for use by the majority of participants; and (8) participants placed heavy emphasis on developing students' knowledge of mathematical facts and principles and their approach to systematic problem-solving. Statistical data are presented in 34 tables. A list of 11 references and the survey questionnaire are appended. (FMW)

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October 1989

Characteristics and Attitudes of Frequent Participants in the Urban Mathematics Collaboratives: Results of the Secondary Mathematics Teacher Questionnaire

Report from the Urban Mathematics Collaborative Documentation Project

James A. Middleton, Norman L. Webb, Thomas A. Romberg, Susan D. Pittelman, Glen M. Richgels, Allan J. Pitman, and Elizabeth M. Fadell

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

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I. INTRODUCTION

This technical report examines the results of a teacher background questionnaire administered to frequent participants in eleven Urban Mathematics Collaboratives (UMC). This background questionnaire is one source of information among many that have contributed to the documentation of the UMC project. This study describes in some detail the group of mathematics teachers who are frequent participants in the collaboratives. It reports on their demographic backgrounds, as well as their educational experience, teaching longevity, certifications, in-service experience, professional involvement, kinds of courses teaching, and teaching methods.

Urban Mathematics Collaborative Project

The Urban Mathematics Collaborative (UMC) project was initiated in 1984 in order to improve mathematics education in urban schools and to identify new models for meeting the professional needs of high school teachers by exposing them to new trends in the field of mathematics, and by fostering a sense of collegiality and support with mathematicians in both business and universities, and with other mathematics teachers. Central to the purpose of the project is the assumption that teachers are the focus through which educational reform, advancement and quality can be effected. It was anticipated that through both financial and human support by the Ford Foundation, local organizations of mathematics teachers in eleven urban sites across the United States could reduce teacher feelings of isolation, engender a renewed sense of professionalism and enthusiasm. and ultimately encourage innovative teaching practices, such that mathematics education in these sites would be qualitatively improved.

In 1984, collaboratives were initiated in each of five pilot cities: Cleveland, Minneapolis/St. Paul, Los Angeles, Philadelphia and San Francisco. Within 18 months of the conception of the project, six more sites were added--Durham, Pittsburgh, San Diego, St. Louis, Memphis and New Orleans--making a total of eleven Urban Mathematics Collaboratives. Each site is locally governed, yet exists within the support structure of the entire UMC project. Each has the responsibility to gather resources (both financial and human) from local sources so that eventually each site will be self-supporting.

The initial goal of the Ford Foundation was to provide nondirective support to each of the collaborative sites in order that the unique needs and direction of each site were fulfilled. At the outset, the Ford Foundation established a Documentation Project to chronicle the progress of the individual collaboratives and to record the effectiveness of each collaborative in fulfilling the goals of the project (Webb, Pittelman, Romberg, Pitman, Fadell, & Middleton, 1989). The Documentation Project was designed to gather information from sites for a period of 6 years (1985 through 1990), until all of the sites had evolved into some permanent state. The Education Development Center, Inc. (EDC), a non-profit research and development organization located in Newton, Massachusetts, was engaged by the Ford Foundation to provide technical assistance to the collaboratives and to disseminate information about the project.

The Documentation Project and the Technical Assistance Project (TAP) link the eleven collaboratives by fostering a communication network through which the teachers at each of the sites can share ideas, successes and information.

Conditions of Teaching in Urban Schools

Urban teachers are beset with problems, both environmental and bureaucratic, that are very different from those experienced by teachers in other environments. School crowding, lack of funds for improvement of property, inadequate numbers of textbooks, vandalism and violence against teachers and students all negatively influence the teaching atmosphere in the inner city (Urbanski, 1987).

A report from the Carnegie Foundation (1988) illustrates differences in the problems that urban teachers face as compared to their counterparts in more suburban or rural schools. Urban teachers are confronted by greater vandalism (52% of urban teachers reported this as a problem compared to 26% in other schools), racial discord (19% vs. 5%, respectively), violence against students (32% vs. 9%), and violence against teachers (13% vs. 3%).

Similarly, 78% of urban teachers reported absenteeism as a problem in their schools, compared to 51% of other teachers. Even the students who do attend classes may not remain in school long enough to benefit from a course. Urban teachers were twice as likely as other teachers to define student turnover as a problem (58% vs. 25%, respectively). Eighty-one percent of urban teachers include student apathy as a problem in their schools compared to 67% in other schools. The other classroom concerns of urban teachers included disruptive behavior in class (53% vs. 30%, respectively), theft (48% vs. 23%, respectively) and drug use (53% vs. 48%, respectively).

As a result of these and other factors, the Carnegie Foundation reports that many urban teachers are forced to reteach material in order to help absent students "catch up," that they may have to obtain texts designed for younger children in order to better fit the reading level of their students, and that they may have to pass along incompetent students in order to avoid clogging the system.

Just as urban teachers are plagued with problems presented by students and the urban environment, these teachers also are entangled within a bureaucracy that strips them of power and autonomy within their own classes and creates mounds of busywork which may be only peripherally related to teaching. Further, teachers feel isolated from one another and from the collegial support that their colleagues can provide (Lieberman, 1988).

The urban schools are influenced by national trends that affect the hiring of mathematics teachers. Frymier (1987) states that population shifts, changes in city and county governance, centralization of decision-making from teachers to administrators, court-ordered desegregation, and increased unionization all contribute to a deterioration of education in our urban systems. Problematic factors include: 1) greater centralization of power within districts; 2) more students with learning problems; 3) power struggles between teachers and administration, and between different factions of teachers; and, ultimately, 4) disenchantment and diminished enthusiasm for teaching as a profession.

The economics of urbanization also impact negatively upon urban teachers. When affluent citizens move away from inner-city neighborhoods, the resulting drain in the tax base leaves the community with no alternatives but to locate other funding, or to save money in whatever way it can. Often teaching staffs are reduced, and newly hired teachers are released in order to increase revenues. Unions, functioning to protect jobs, resort to strikes or other drastic measures to negotiate with school governing boards. Often bad feelings persist even after these disputes are settled.

Frymier suggests that the urban teachers in his study had developed an externalized locus of control when it came to feelings about the reinforcement value of their work. They tended to lack enthusiasm, to feel isolated and helpless, to feel disinclined to work hard at their jobs when so many factors were working against them, and to put educational reform issues out of their mind because of more immediate problems that needed to be solved. In other words, teachers tended to feel like the reward value of their occupation was controlled by external factors rather than by their own ability and effort (e.g., DeCharms, 1968).

Nationwide, there appears to be a shortage of qualified mathematics educators. Of the approximately 200,000 secondary school mathematics teachers in the United States, it is estimated that over half do not meet current professional standards for teaching mathematics (National

Research Council, 1989). One in thirteen American teachers is not certified to teach, and one in six has taught a course for which he or she was not qualified (Urbanski, 1987).

At a report to the annual meeting of the American Educational Research Association Weiss (1987) presented results of a national survey of science and mathematics educators that indicated considerable variation in teacher preparation, including course background and certification status, self-perceptions of adequacy, degree of emphasis placed on various course objectives, and the availability and adequacy of classroom materials. However, despite wide variation, several patterns in the conditions of mathematics teachers in the United States emerged from the data. For example, although 67% of mathematics teachers surveyed felt they were very well qualified to teach mathematics, 33% did not feel this way. Moreover, the amount of time spent by a teacher in in-service education, which is viewed as a remedy to inadequate teacher preparation, was typically less than 6 hours per year.

These studies paint a harsh picture of teaching in an urban setting as well as some conditions that affect mathematics teachers in general. From these works, some general conclusions can be made about those teachers who participate in the Urban Mathematics Collaboratives. At present, however, there is little detail about these teachers' education, teaching experience, and classroom practices, and how, if at all, they differ from other teachers. The intent of this study is to provide such a detailed view of those teachers who are the most involved in the collaboratives.

II. METHOD

The Documentation Project is charged with assessing the impact of the UMC collaboratives as it pertains to the empowerment of mathematics teachers, and with identifying changes in the educational practice of urban schools that may have resulted from collaborative involvement. This study, which describes the teachers in the UMC project has targeted those actively involved in the collaborative for two reasons. First, it is reasonable to expect that the greatest impact of the collaboratives will be experienced by those teachers who have been most committed to the project and who have participated in the activities that it offers. Sites have approached collaborative development in different ways, with some sites targeting teachers in particular schools, some requiring departments to apply to join, and some including all secondary mathematics teachers (Webb, Pittelman, Romberg, Pitman, Fadell & Middleton, 1989). Common among sites, however, has been the development of a core group of teachers who are the most frequent participants. Thus, in considering and analyzing the impact of the UMC project, some detailed information is needed about those teachers who are most likely to be influenced by the collaborative.

Second, because collaboration is a dynamic process, it does not lend itself to be studied readily with a classical research design using independent and dependent variables and an imposed treatment that causes an effect. The teachers who participate in the collaborative affect what it is and what it does. As a result, this investigation of active collaborative participants offers insights regarding the teachers who have the potential of influencing what the collaborative is, and what direction it will take.

This study is one of three designed to provide information about the teachers who participate in the urban mathematics collaboratives. In addition to the present study which describes the active collaborative participants, a questionnaire to determine teachers' views about teaching as a profession and another to understand their conception of mathematics and mathematics teaching are being administered. The three questionnaires, along with other information collected, will help form a composite of collaborative teachers.

Sample and Procedure

The Secondary Mathematics Teacher Questionnaire (SMTQ), a survey designed to gather background information on collaborative teachers, was distributed to the five original collaboratives in the fall of 1986. Over the next 18 months, questionnaires also were sent to the other six collaboratives. These lapses in time resulted from the fact that, in order to ensure the clear identification of a group of core teachers, questionnaires were not sent until a collaborative had been in operation for at least one year. At each collaborative, the coordinator or a designated representative was responsible for the administration of the questionnaire to those teachers they felt had expressed the greatest sense of commitment to the collaborative's goals and had participated frequently in collaborative activities. Included in this core were those teachers who had designated themselves as frequent participants on the professionalism questionnaire, as well as others the project coordinator felt met the criteria. After filling out the SMTQ forms, teachers returned them in sealed envelopes to a project representative, who in turn forwarded them to the Documentation Project.

Responses to the questionnaire were received from 430 mathematics teachers from the 11 collaboratives. The number of respondents ranged from 16 in New Orleans to 69 in Los Angeles. It must be noted that 430 teachers is approximately one-sixth of the total number of teachers who have the potential of participating in collaborative activities at any one time since the project's inception in 1984. Thus, results do not reflect the majority of teachers affected by collaboratives, only those who were quite active at the time the questionnaire was distributed.

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Instrument

The Secondary Mathematics Teacher Questionnaire (SMTQ) was designed to collect demographic information and information on teacher attitudes towards six factors that may affect educational quality: 1) demographics, 2) educational background, 3) certification status, 4) professional development, 5) teaching difficult topics and 6) average number of courses taught. The SMTQ is an adaptation of the National Survey of Science and Mathematics Education administered to a national sample of elementary and secondary mathematics and science teachers (Weiss, 1987a; 1987b). Items referring solely to science teachers, and items which referred to elementary teachers were omitted, leaving 37 questions. The SMTQ is Appendix A of this paper.

Normative data

Information provided by the Secondary Mathematics Teacher Questionnaire is compared with information from the national sample of mathematics and science teachers reported by Weiss (1987b). Subjects in the national sample were selected by a two-stage sampling procedure. First, all mathematics and science teachers in the 50 states and the District of Columbia were assigned equal probability weights for selection. Four hundred and twenty-five schools were selected through a process that used population weights to equalize the probability of selecting all teachers regardless of teacher population in schools. Schools were then weighted across eight demographic factors, and teachers were selected from the 425 schools such that courses were representative of the distribution of all mathematics and science courses across the United States.

Five hundred sixty-five mathematics teachers, grades 10 through 12, responded to the national survey. This number represents 57% of the targeted sample. For reasons of clarity, the teachers responding to the national survey will be referred to as "the national sample" henceforth.

III. RESULTS

Results are reported by the six major categories of questions, noted above, included on the SMTQ questionnaire. Information is provided for each collaborative and for the total sample by reporting the frequency of response and the percentage responding in the appropriate categories for each item. When appropriate, mean scores and standard deviations are reported. On a few of the variables, the mode is reported when the teachers' responses are grouped in fewer than four categories. Rank orders are given when appropriate.

Demographics

Sex. Of the 430 teachers completing the SMTQ 206 (47%) were males and 221 (52%) were females. Three participants did not specify gender. Overall percentages, it must be noted, are markedly different from those obtained by Weiss (1987b), who reported a sample of approximately 68% males and 32% females. Respondents from Los Angeles and Cleveland did roughly correspond to national norms (see Table 1).

The proportion of SMTQ respondents by gender, when compared to the distribution of gender across all secondary mathematics teachers from all sites, indicates that in some collaboratives there is a higher proportion of female teachers who are actively involved than might be expected.

The percentage of female teachers who responded to the survey varies greatly by site, from 67% in New Orleans to 25% in the San Diego Unified School District. The percentage of SMTQ respondents by gender reflects the overall within-site distribution in five of the collaboratives (Cleveland, Durham, Los Angeles, New Orleans, and Pittsburgh). In Memphis and Twin Cities, however, there is a greater percentage of female SMTQ respondents than would be expected from the total population of mathematics teachers. In three of the sites, available information is insufficient to determine the degree to which the distribution by gender reflects the within-site composition of all teachers. In at least two of the collaboratives, core teachers are disproportionately female.

Fifty-three percent of the UMC Core teachers were female, as compared with 32% for the national sample. This difference seems less striking when one considers that at least three of the collaboratives--those from the southeast region--have more female mathematics teachers than male within their home districts. It should also be noted that, in general, the urban district populations of mathematics teachers have higher proportions of female teachers than do schools nationally.

Ethnicity. Of the 426 participants who responded to this question, 66% were white, 25% were black, 5% were Asian/Pacific Islander, 3% were Hispanic and 1% represented other ethnic groups. (See Table 2 for a breakdown of ethnicity within all collaborative sites.)

These patterns are distinctly different from those in the national sample (Weiss, 1987), where the group of teachers was fairly homogeneous: 94% of participants were white, non-Hispanic; 3% were black; 1% were Asian/Pacific Islander; and 1% represented other ethnic groups.

In contrast, the UMC sample showed wide variations by ethnicity from site to site. Core groups in three of the collaboratives--Twin Cities, San Diego and Pittsburgh--are predominantly white, while the other collaboratives have a significant proportion of black and other minority groups represented. Each has at least an equal or greater proportion of non-whites responding than in the national sample.

The distribution of SMTQ respondents by ethnicity reflects the total group of mathematics teachers who have the potential of participating within each collaborative (Webb, Pittelman, Romberg, Pitman, Fadell & Middleton, 1989). In the four collaboratives that did vary somewhat in terms of ethnicity, the differences were not significant. The distribution of core teachers by ethnicity for the total group is reflective of the distribution for all possible teachers who have the potential of participating in the UMC project.

Age. The distribution of age across collaboratives is fairly evenly dispersed about the median (44 years). The mean age for the total sample was 41.5 years, with a standard deviation of approximately 8.2 years. The modal number of teachers, 39% of those who responded to this item, were between 31 and 40 years of age. Seventy-six percent were between the ages of 30 and 50 years of age. Durham and Los Angeles appear to have a disproportionate number of younger teachers; they were the only sites whose mean age was less than 40 years. It must be noted, however, that approximately 16% of respondents did not complete this item (see Table 3). The core teachers across the different collaboratives vary substantially by mean age and cannot be considered as similar, at least on this variable. The aggregated data for age of teachers across all collaboratives, however, do correspond closely to the national sample. The mean age for the national sample is 40.2 years, compared with 41.5 years for the collaborative group.

Table 1

Number and Percentage of Male and Female Respondents Within Each of the Eleven Collaboratives and for the Total Possible Population

Collaborative	Total Possible	N Respondents	Male Respondents	Total Males	Female Respondents	Total Females
Cleveland	96	41	28 (67%)	68%	13 (33%)	32%
Durham	139	37	8 (23%)	28%	29 (77%)	72%
Los Angeles	800*	67	45 (67%)	68%	22 (33%)	32%*
Memphis	350	31	6 (19%)	36%	25 (81%)	64%
New Orleans	286	16	5 (31%)	33%	11 (69%)	67%
Philadelphia	146	45	19 (43%)	---	26 (57%)	---
Pittsburgh	114	28	16 (57%)	63%	12 (43%)	37%
St. Louis	104	51	18 (35%)	---	33 (65%)	---
San Diego	227**	25	13 (52%)	75%	12 (48%)	25%**
San Francisco	190	33	20 (59%)	---	13 (41%)	---
Twin Cities	216	53	28 (53%)	61%	25 (47%)	39%
Total	2668	427	187 (47%)		221 (53%)	

*These figures represent teachers from the Los Angeles Unified School District only.
**These figures represent teachers from the San Diego Unified School District only.

Table 2

Percentage of Collaborative Participants by Ethnicity

Collaborative	White	Black	Hispanic	American Indian	Asian	Other	Total
Cleveland	32 (76%)	8 (19%)	0 (0%)	0 (0%)	1 (2%)	1 (2%)	42
Durham	23 (62%)	12 (36%)	0 (0%)	1 (3%)	0 (0%)	0 (0%)	36
Los Angeles	40 (60%)	10 (15%)	12 (18%)	0 (0%)	5 (7%)	0 (0%)	67
Memphis	17 (55%)	14 (45%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	31
New Orleans	6 (38%)	10 (62%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	16
Philadelphia	27 (61%)	17 (39%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	44
Pittsburgh	25 (89%)	3 (11%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	28
St. Louis	21 (41%)	25 (49%)	1 (2%)	0 (0%)	3 (6%)	1 (2%)	51
San Diego	21 (84%)	1 (4%)	0 (0%)	0 (0%)	3 (12%)	0 (0%)	25
San Francisco	20 (61%)	3 (9%)	1 (3%)	1 (3%)	8 (24%)	0 (0%)	33
Twin Cities	50 (94%)	3 (6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	53
Total	282 (66%)	106 (25%)	14 (3%)	2 (<1%)	20 (5%)	2 (<1%)	426

Table 3

Percentage of Collaborative Participants by Age: 0-30; 31-40; 41-50; 51-60; 60+; and Mean Age

Collaborative	N	≤30 %	31-40 %	41-50 %	51-60 %	>60 %	M
Cleveland	34	0	41	53	6	0	42.4
Durham	33	24	45	24	6	0	36.8
Los Angeles	56	25	32	34	5	4	38.6
Memphis	25	12	40	36	12	0	40.3
New Orleans	13	0	31	62	8	0	43.7
Philadelphia	38	0	53	29	18	0	42.4
Pittsburgh	28	0	46	39	7	7	42.8
St. Louis	36	8	47	25	17	3	42.4
San Diego	22	14	27	41	18	0	42.5
San Francisco	27	4	30	48	19	0	44.0
Twin Cities	49	6	33	41	20	0	43.2
Total	361	10	39	37	13	1	41.5

Note. Sixty-nine participants (16%) did not respond to this item.

Number of Years Teaching Courses Related to Mathematics

Teachers were asked to report the number of years they had taught and the number of years they had taught courses related to mathematics usage and application, including courses in mathematics itself, the sciences and courses related to computers.

Overall, the number of years the UMC respondents had been teaching ranged from 1 year to 37 years. The mean number of years they had been involved in the teaching profession was 16.1 (see Table 4). Again, this finding is fairly close to the national sample, where the mean number of years spent in the teaching profession was 14.2 years. The mean number of years UMC teachers spent specifically teaching mathematics was 14.8 (see Table 5). The median number of years teaching mathematics for the UMC sample was approximately 17 years.

Table 4

Minimum, Maximum and Mean Number of Years Collaborative Participants Spent in the Teaching Profession

	Number of Years Teaching			
Collaborative	Min	Max	M	SD
Cleveland	4	35	18.2	5.7
Durham	1	37	12.0	7.8
Los Angeles	0	37	11.9	9.0
Memphis	3	36	15.1	9.1
New Orleans	12	30	19.6	5.4
Philadelphia	6	35	17.4	6.6
Pittsburgh	7	36	18.6	7.0
St. Louis	3	35	17.1	7.5
San Diego	1	32	15.4	8.3
San Francisco	0	35	18.2	7.8
Twin Cities	1	34	17.9	8.4
Total	0	37	16.1	8.1

Table 5

Minimum, Maximum and Mean Number of Years Collaborative Participants Spent Teaching Mathematics

	Number of Years Teaching Mathematics			
Collaborative	Min	Max	M	SD
Cleveland	2	35	17.7	6.4
Durham	1	37	11.5	7.7
Los Angeles	1	31	11.2	11.0
Memphis	0	36	12.8	8.7
New Orleans	12	28	19.1	5.3
Philadelphia	6	33	16.7	6.2
Pittsburgh	3	36	17.4	7.4
St. Louis	3	35	13.3	7.8
San Diego	1	30	11.8	7.3
San Francisco	2	30	17.2	7.4
Twin Cities	1	34	17.4	8.8
Total	0	37	14.8	8.5

Life sciences. Of the 58 participants who have taught courses in life sciences, the modal number of years engaged in teaching these courses was 1 year (N=30). There appears to be a wide variation between sites in terms of the proportion of mathematics teachers who teach life sciences. As indicated in Table 6, the numbers ranged from one person in Pittsburgh (4% of collaborative respondents) to eleven persons in San Francisco (33% of the collaborative respondents).

Physical sciences. Of the 75 participants who have taught a course in physical science (17% of the total sample), the modal number of years teaching that course was again 1 year (32% of those who had taught physical sciences). Seven of the eleven sites showed a larger percentage of teachers involved in teaching physical science courses as compared to teaching life science courses (see Table 6).

Earth sciences. Thirty-five teachers (8% of the total sample) had taught a course in earth sciences, with percentages ranging from 3% in Los Angeles to 16% in the Memphis collaborative. Again, the modal number of years was 1.

Computer courses. Table 6 illustrates the elevation in the percentage of mathematics teachers who have taught a course dealing with computers compared to other sciences. Of the total, 141 respondents (33%) had, in fact, taught a computer course. While the mode is again 1 year, many more teachers had taught computer science than any of the other science courses listed above. Further, the range for the number of years teaching computer courses varies more from collaborative to collaborative than the range of the number of years teaching science courses.

Educational Background

Table 7 lists the number of participants according to their college major within each site. Fifty-five percent of the teachers who responded to this item had earned a degree in mathematics or mathematics education, while 25% had earned degrees in general education. It must be noted, however, that only 211 participants completed this item. There does appear to be some regional difference among collaboratives, with the two sites in Southern California reporting a much lower percentage of core teachers with mathematics or mathematics education majors.

More than half of all teachers responding to the questionnaire (52%) had earned at least a Master's degree, and over 98% had earned at least a Bachelor's degree (see Table 8). Only three individuals indicated that they had not earned a Bachelor's degree.

Table 6

Percentage of Teachers Who Have Taught Four Subjects Related to Mathematics: Life Science, Physical Science, Earth Science and Computer Science, and the Modal Number of Years Teaching these Subjects

Collaborative	Life Science %	Life Science Mode	Physical Science %	Physical Science Mode	Earth Science %	Earth Science Mode	Computer Science %	Computer Science Mode
Cleveland	14	1	21	1	5	2,14	34	1
Durham	8	1,3,6	19	1	5	1,3	32	1
Los Angeles	7	1	20	1	3	1	22	1,3
Memphis	26	1	23	1	16	1	35	1
New Orleans	13	1,15	13	13,17	13	1,8	38	1,4,5,6,7,14
Philadelphia	4	1,10	9	1,2,7,10	4	1,10	49	3
Pittsburgh	4	1	7	6,25	7	2,3	21	5
St. Louis	16	1	12	1,20	10	1	16	1
San Diego	12	1	12	2	12	1	28	1,2
San Francisco	33	1	30	3	9	1,2,14	33	1,2
Twin Cities	19	2	21	2	13	1	51	1,2
Total	13	1	17	1	8	1	33	1

Table 7

Percentage of Collaborative Participants According to College Major: Mathematics or Mathematics Education, Physical Science (Phy), Life Science (Life), Education (Ed), Social Science (Social), and Other Majors (Other)

Collaborative	N	Math %	Phy %	Life %	Ed %	Social %	Other %
Cleveland	18	50	11	0	17	6	17
Durham	6	67	0	0	33	0	0
Los Angeles	17	35	6	0	24	18	18
Memphis	30	57	0	3	13	10	10
New Orleans	14	64	7	0	21	7	0
Philadelphia	27	59	0	0	26	7	7
Pittsburgh	28	57	4	7	29	4	0
St. Louis	--	--	-	-	--	--	--
San Diego	25	32	4	0	48	12	4
San Francisco	12	58	0	8	8	0	25
Twin Cities	34	68	3	0	21	3	6
Total	211	55	3	2	25	8	6

Note: Only 211 participants responded to this item (49% of the total number of respondents).

Table 8

Percentage of Collaborative Participants by Highest Degree Earned: Associate (A.A.), Bachelors (B.A.), Masters (M. A.), Specialist or 6-year Certificate (Spec.), or Doctorate (Ph.D.)

Collaborative	N %	A.A. %	B.A. %	M.A. %	Spec. %	Ph.D. %
Cleveland	41	0	29	71	0	0
Durham	37	0	68	32	0	0
Los Angeles	68	1	65	31	3	0
Memphis	31	0	32	58	6	0
New Orleans	16	0	44	31	25	0
Philadelphia	45	0	20	64	9	9
Pittsburgh	28	0	18	75	4	4
St. Louis	48	0	22	69	8	2
San Diego	25	0	44	52	0	4
San Francisco	33	0	55	36	3	6
Twin Cities	52	2	38	58	0	1
Total	424	5	40	52	4	2

Although the number of teachers who had acquired post-baccalaureate education appeared similar in both the present study and in Weiss' (1987b) national sample (58% and 55% respectively), the national sample displayed a much larger percentage of teachers who had graduated with mathematics or mathematics education majors (76% vs. 55%) than did the UMC teachers who responded to the questionnaire.

Since the fields of mathematics and mathematics education are constantly changing, expanding with new technologies, and shifting in emphasis (e.g., National Council of Teachers of Mathematics, 1989), information about the number of teachers who are continuing their mathematical education is necessary in determining whether teachers are sufficiently informed to articulate new trends in the classroom. The percentage of teachers who enrolled in a mathematics course for college credit after 1985 varied considerably across sites (see Table 9); for example, only 1% of the teachers surveyed in the Pittsburgh collaborative had taken a mathematics course for credit after 1985, while 40% of the Memphis teachers responded that they had. It should be noted that the age ranges of teachers across collaboratives does not seem to correspond to these trends. Pearson correlations of age (Table 3) with the last year participants took college credit (Table 9) were -.26 and -.09 (both non-significant) for Memphis and Pittsburgh respectively, while the correlation across all collaboratives was -.34, a significant but small relationship ($p < .001$).

Although a number of UMC core teachers are continuing to expand their mathematical coursework, only 24% of all teachers surveyed had taken their last college mathematics course after 1985. Of the national sample, 38% had taken mathematics courses for credit after 1983, within two years of completing the survey; 32% between the years of 1975 and 1982; and 25% before 1975.

Table 9

Number and Percentage of Collaborative Teachers Who Took Their Last College Mathematics Course Within 5 Time Spans: Before 1960, 1961-1970, 1971-1980, 1981-1984 and After 1985

Collaborative	<1960	1961-1970	1971-1980	1981-1984	1985>
Cleveland	1 (2%)	10 (24%)	11 (26%)	11 (26%)	9 (21%)
Durham	0 (0%)	3 (8%)	12 (33%)	12 (33%)	9 (26%)
Los Angeles	3 (5%)	9 (14%)	23 (35%)	12 (18%)	19 (29%)
Memphis	0 (0%)	1 (3%)	12 (40%)	5 (17%)	12 (40%)
New Orleans	0 (0%)	1 (6%)	7 (44%)	2 (13%)	6 (38%)
Philadelphia	0 (0%)	4 (9%)	28 (65%)	7 (16%)	4 (9%)
Pittsburgh	0 (0%)	10 (36%)	14 (50%)	3 (11%)	1 (4%)
St. Louis	1 (2%)	5 (11%)	18 (38%)	10 (21%)	13 (28%)
San Diego	1 (4%)	5 (21%)	7 (29%)	8 (33%)	3 (13%)
San Francisco	0 (0%)	8 (25%)	10 (31%)	7 (22%)	7 (22%)
Twin Cities	0 (0%)	8 (15%)	14 (27%)	10 (19%)	20 (39%)
Totals	6 (1%)	64 (15%)	156 (38%)	87 (21%)	103 (25%)

Certification Status

Of the teachers surveyed, 404 (94%) indicated that they held regular state teaching certificates, with only 25 (6%) indicating that they had been issued temporary/emergency certificates. Only two teachers (less than 1%) indicated that they had no state teacher certification whatsoever. There appears to be very little variance across sites, with the exception of Los Angeles. A relatively high percentage of teachers in the Los Angeles collaborative, 22%, had been issued temporary/emergency certification (see Table 10). This situation may reflect the State's efforts to alleviate the problem of teacher shortages in the face of many certified teachers' reluctance to work in urban Los Angeles classrooms (Webb, et al. 1989). The certification of UMC core teachers is comparable to the national data, which reported that 90% of teachers held regular certification, while 4% had temporary/emergency certification and 4% had no certification.

Eighty-five percent of the UMC core teachers had obtained specialized certification in mathematics (compared to 84% in the national sample). Only 8% of UMC respondents indicated that they held no specialized certification whatsoever. There seems to be a regional trend in the distribution of specialized certification, with the three California sites showing relatively similar distributions, and Pittsburgh and Philadelphia showing nearly identical percentages in all areas except computer science and physics (Table 11). Los Angeles, San Francisco and San Diego collaborative teachers had the lowest percentage of specialized certification in mathematics (70%, 70%, and 72%, respectively), and the highest percentage of non-specialized certification (17%, 18% and 12%, respectively).

Table 10

Number and Percentage of Collaborative Participants by Type of State Teaching Certification

Collaborative	Regular	Temporary	Other	None
Cleveland	39 (93%)	1 (2%)	4 (10%)	1 (2%)
Durham	35 (95%)	2 (5%)	1 (3%)	1 (1%)
Los Angeles	53 (77%)	15 (22%)	8 (12%)	0 (0%)
Memphis	30 (97%)	0 (0%)	6 (19%)	0 (0%)
New Orleans	16 (100%)	0 (0%)	2 (13%)	0 (0%)
Philadelphia	45 (100%)	3 (7%)	2 (4%)	0 (0%)
Pittsburgh	28 (100%)	1 (4%)	3 (11%)	0 (0%)
St. Louis	50 (98%)	0 (0%)	5 (10%)	0 (0%)
San Diego	24 (96%)	3 (12%)	4 (16%)	0 (0%)
San Francisco	32 (97%)	0 (0%)	3 (9%)	0 (0%)
Twin Cities	52 (98%)	0 (0%)	3 (6%)	0 (0%)
Total	404 (94%)	25 (6%)	41 (10%)	2 (<1%)

Note: Participants recorded all types of certification they possess, thus total percentages may exceed 100%.

Table 11

Percentage of Collaborative Participants Possessing Specialized State Teaching Certification in Mathematics, General Science, Biology, Chemistry, Physics, Earth/Space Science, Computer Science, or Other Areas

Collaborative	N	Math %	Science %	Biol %	Chem %	Physics %	Earth %	Comp %	Other %	None %
Cleveland	42	95	10	12	12	12	2	12	26	1
Durham	37	89	8	3	3	5	0	3	5	5
Los Angeles	69	70	6	1	9	4	4	1	23	17
Memphis	31	90	23	10	7	13	0	7	26	10
New Orleans	16	94	31	6	6	6	0	38	19	6
Philadelphia	45	96	13	2	4	9	0	7	16	4
Pittsburgh	28	96	14	4	4	4	4	18	14	0
St. Louis	51	90	24	12	8	12	8	2	25	4
San Diego	25	72	8	4	0	4	4	4	32	12
San Francisco	33	70	6	0	6	9	0	0	39	18
Twin Cities	53	94	19	4	8	9	2	0	25	2
Total	430	85	14	5	7	8	3	6	23	8

Note: Participants responded to all categories in which they had received specialized state certification, thus total percentages may exceed 100%.

Table 12 reports the number of teachers who teach courses for which they are not certified. Seven percent of the total UMC sample indicated that they taught courses for which they had no certification, while 14% of high school mathematics instructors in the national sample reported teaching courses for which they were not certified; computer courses were the most commonly indicated. Since computers are a relatively new addition to the high school curriculum, certification in computer education may have been unavailable when many respondents were certified.

Only four percent of the total UMC sample reported feeling inadequately prepared to teach a course to which they were assigned (Table 13), a finding that is identical to the national sample. Relatively little variation occurred across sites. Thus, it can be surmised that nearly all of the UMC core teachers are teaching courses for which they are certified and for which they feel adequately qualified. Most often, the courses for which teachers were uncertified included computer courses and the more basic mathematics courses (general mathematics and remedial mathematics), rather than the higher level mathematics courses.

Table 12

Number of Collaborative Participants Teaching Courses for Which They are Not Certified and a List of Such Courses

Collaborative	N	Not Certified N	Courses
Cleveland	41	3	Introduction to Computers Computer Programming
Durham	37	2	Second Year Algebra
Los Angeles	69	5	General Mathematics, Grade 9 General Mathematics, Grades 10-12 Computer Programming Advanced Computer Programming Remedial Mathematics
Memphis	31	1	Computer Programming
New Orleans	16	1	Computer Programming
Philadelphia	45	3	Introduction to Computers Remedial Mathematics
Pittsburgh	28	1	Introduction to Computers
St. Louis	51	3	General Mathematics Grades 10-12 Second Year Algebra Geometry Computer Programming Advanced Computer Programming
San Diego	25	1	Introduction to Computers
San Francisco	33	4	First Year Algebra Biology
Twin Cities	53	4	Mathematics Grade 7 Introduction to Computers Computer Programming Advanced Placement Computer Science
Total	429	28	

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Table 13

Number of Collaborative Participants Who Feel Inadequately Qualified to Teach a Course and a List of Such Courses

Collaborative	N	Not Qualified N	Courses
Cleveland	41	2	General Mathematics Grades 10-12 Pre-Algebra
Durham	37	1	Did not indicate
Los Angeles	69	5	General Mathematics Grades 10-12 Consumer Mathematics Computer Programming Advanced Computer Programming
Memphis	31	1	Did not indicate
New Orleans	16	0	
Philadelphia	45	2	Advanced Placement Computer Science
Pittsburgh	28	1	Introduction to Computers
St. Louis	51	1	Trigonometry
San Diego	25	0	
San Francisco	33	2	Biology Trigonometry
Twin Cities	53	4	Advanced Computer Programming Advanced Placement Computer Science Remedial Mathematics
Total	429	19	

Professional Development

Professional development manifests itself in a variety of ways, including the frequency of staff development activities and the level of participation in professional organizations. One goal of the UMC project is increased professional participation. The indicators of professional development for the UMC core teachers reported here have probably been influenced by the collaboratives, since at the time the data was collected the teachers had been involved with the collaborative a year or more. However, evidence that would suggest that results should be attributed solely to collaborative participation is not provided by the SMTQ and any inference goes beyond the scope of the data provided.

Time spent in professional development activities. Table 14 illustrates the amount of time teachers spend on staff development. The percentage of teachers who spent more than five days in professional development activities (workshops, conferences and professional meetings) during the 12 months prior to completing the survey ranged from 26% in Los Angeles to 74% in Pittsburgh. For some sites, there was strong agreement in the amount of time reported--Memphis, Pittsburgh, and San Diego--while some sites reported a wide variance in time spent--Los Angeles and St. Louis. These results suggest differences between site either because of district policy (i.e., number of in-service days provided) or some other factor. Of the total sample, 46% of the teachers had spent more than five days in professional development activities during the past 12 months. Only 9% of UMC teachers had not been involved in any professional development during the past year, whereas nearly 35% of the national sample had not been involved in professional development activities (Weiss, 1987).

Table 14

Percentage of Collaborative Teachers Spending Time (in Days) During the Prior 12 Months on Staff Development of Mathematics or Mathematics Teaching (Including Attendance at Professional Meetings, Workshops and Conferences, but not Including Formal Coursework)

		Time (in days) spent in staff development				
Collaborative	N	0 %	<1 %	1-2 %	3-5 %	5< %
Cleveland	42	12	2	10	19	57
Durham	37	0	3	22	43	32
Los Angeles	69	24	6	23	22	26
Memphis	31	0	0	0	36	64
New Orleans	16	6	6	6	38	44
Philadelphia	45	2	0	16	38	44
Pittsburgh	28	0	0	0	25	74
St. Louis	51	31	8	27	4	27
San Diego	25	0	4	0	28	68
San Francisco	33	9	6	6	21	52
Twin Cities	53	6	8	23	23	40
Total	430	9	4	15	25	46

Support for professional development. As seen in Table 15, UMC teachers most often identified the local school district as providing support for professional development activities (74% of the total sample), with the local UMC collaborative being chosen second most frequently (58% of the total sample). The Memphis and San Diego collaborative organizations were ranked by teachers in those two sites as the greatest supporter of professional development. Memphis and San Diego were also two of the three collaboratives that reported the highest amount of time spent in staff development. At the third collaborative, Pittsburgh, collaborative-sponsored staff development is structured through the district and is highly related to district-sponsored events. Teachers from the Twin Cities ranked a professional association second (after the district) in providing funding for staff development. This is probably related to collaborative sponsorship of the Twin Cities Pre-College Mathematics Society and a very active state mathematics teachers organization. It is interesting to note that state education agencies, which in many cases supply the majority of monies to school systems, was ranked sixth for the amount of money allocated for professional development.

Of particular note is the great variance across collaboratives in the forms of support teachers receive. In some sites, a high percentage of teachers receive stipends while at other sites few stipends are granted. Some districts provide release time to teachers, while in four UMC sites, only about one-third of teachers had received release time for staff development. In two of the districts, travel expenses had been provided to more than half of the SMTQ respondents, while in four districts travel expenses had been provided to less than 10% of the sample. This information, considered in conjunction with time spent in staff development, gives a strong indication that the staff development climate varies greatly among the sites.

Of the various types of support available to the teacher for professional development, release time was the most common, with 53% of the total sample reporting that they had received this type of support. Thirty-seven percent of teachers indicated that they had received stipends to attend professional meetings, 22% reported receiving travel funds and 25% reported receiving no support (see Table 16). The highest percentage of teachers who reported receiving stipends were from San Diego and Memphis, two of the collaboratives with the greatest level of staff development. As indicated in Table 17, teachers reported that workdays and the summer months were the most convenient times for in-services, with evenings and weekends being rated as inconvenient. However, there appears to be a high degree of variability between ratings within collaboratives, indicating that, as could be expected, the perception of convenience may be influenced by lifestyle and personal schedules.

Table 15

<u>Rank Order (1 = Highest) of Perceived Sources of Funding for Professional Development. Sources Include: The Local School District, A State Education Agency, Private Industry, A College or University, A Professional Association, A Government Agency, The Urban Mathematics Collaborative and Other Funding Sources</u>

Collaborative	District	State	Industry	Univ.	Prof.	Govt.	UMC	Other
Cleveland	1	6	4	3	5	7	2	8
Durham	1	5	3	6	4	8	2	7
Los Angeles	1	6	4	5	3	8	2	7
Memphis	2	7	5	4	3	6	1	8
New Orleans	1	7	3	4	5	7	2	8
Philadelphia	1	5	7	4	3	8	2	7
Pittsburgh	1	6	4	5	4	7	2	8
St. Louis	1	6	3	5	5	7	2	8
San Diego	2	5	7	4	3	7	1	8
San Francisco	1	8	4	5	4	6	2	8
Twin Cities	1	5	6	4	2	7	3	8
Total	1	6	5	4	3	7	2	8

Table 16

<u>Percentage of Collaborative Participants Who Received Support for Attending Professional Meetings, Workshops and Conferences: Release Time, Travel, Stipends and No Support</u>

Collaborative	N %	Time %	Travel %	Stipend %	None %
Cleveland	42	31	29	52	33
Durham	37	76	43	14	14
Los Angeles	69	32	19	42	29
Memphis	31	94	35	65	10
New Orleans	16	81	6	6	25
Philadelphia	45	49	11	29	22
Pittsburgh	28	93	54	50	11
St. Louis	51	35	4	10	25
San Diego	21	72	52	96	16
San Francisco	33	18	6	42	36
Twin Cities	53	58	8	26	34
Total	430	53	22	37	25

These findings echo those of the national sample. Sixty-one percent of mathematics teachers in the national sample responded that workdays were very convenient for in-service, and 40% reported that summers were very convenient. Furthermore, the two most inconvenient times for in-service programs as reported by Weiss were evenings and Saturdays (only 19% and 18% rated these convenient, respectively).

Organizational membership. Table 18 illustrate the percentage of teachers belonging to eight professional mathematics organizations: Association for Computing Machinery (ACM); Association for Educational Data Systems (AEDS); Mathematical Association of America (MAA); National Council of Teachers of Mathematics (NCTM); School Science and Mathematics Association (SSMA); National Association of Science and Mathematics Teachers (NASMT); a state mathematics education organization; or a local mathematics education organization. Of the national organizations, NCTM had by far the largest percentage of teachers as members (54%). Fifty-five percent of participants indicated that they were members of a local mathematics education organization.

There is variation among sites in regard to teacher participation in professional organizations. Over 70% of the core teachers from New Orleans and San Diego are members of NCTM, while less than 30% of the teachers from St. Louis belong. State organizations seem to attract more of the core teachers from San Diego and Twin Cities than those in the other collaborative sites. Local organizations are prevalent in San Diego, Cleveland, Twin Cities and Philadelphia, with over 60% of respondents in these sites reporting that they participated in these organizations.

Table 17

Mean Ratings of the Convenience of Times for In-Service Programs on a Scale of 1 to 5 (1 = Very Convenient, 5 = Very Inconvenient)

Collaborative	After School	Evenings	Weekends	Summers	Work Days
Cleveland	2.6	3.2	3.2	2.3	2.1
Durham	2.4	3.1	3.9	2.1	2.0
Los Angeles	2.9	3.5	3.1	3.0	2.8
Memphis	2.9	3.2	3.5	1.7	2.0
New Orleans	3.5	4.0	3.7	2.8	2.1
Philadelphia	2.6	3.6	3.2	2.3	1.9
Pittsburgh	2.9	4.0	3.4	2.8	1.9
St. Louis	2.6	3.8	3.8	2.7	2.1
San Diego	2.5	3.5	3.2	2.2	2.5
San Francisco	3.0	3.9	3.7	2.1	2.7
Twin Cities	3.0	3.3	3.5	1.9	1.8
Total	2.8*	3.5**	3.4*	2.4**	2.2*

*SD = 1.4
**SD = 1.3

Table 18

Percentage of Collaborative Participants by Membership in Eight Professional Organizations

Collaborative	N	ACM %	AEDS %	MAA %	NCTM %	SSMA %	NASMT %	State %	Local %
Cleveland	42	0	0	7	60	0	2	50	76
Durham	37	0	0	14	70	0	0	49	43
Los Angeles	69	1	0	3	30	0	1	23	38
Memphis	31	0	3	10	68	6	6	48	55
New Orleans	16	0	0	0	75	6	0	44	44
Philadelphia	45	4	3	13	62	2	6	38	67
Pittsburgh	28	0	0	7	57	21	0	39	46
St. Louis	51	2	2	12	29	4	4	24	39
San Diego	25	0	0	8	72	4	4	72	84
San Francisco	33	0	0	21	42	0	0	39	47
Twin Cities	53	0	2	4	70	0	2	62	70
Total	430	1	1	9	54	2	3	42	55

Teaching Difficult Topics

Of the ten topics indicated most often by teachers as being difficult to teach (see Table 19), the one most frequently cited is geometry, including logic and proofs. Nine percent (N=34) of the total sample reported that this was particularly difficult. Named second in difficulty was advanced mathematics, including trigonometry and calculus; 8% of teachers indicated this subject as being particularly difficult to teach. Despite this limited consensus, the ten topics named most often account for only 40% of participants, indicating a high degree of variability in the perceived difficulty of topics. In addition, secondary mathematics teachers tend to cover a wide range of topics, making it very difficult to reach agreement on any one topic. It should be noted that only 60% of the respondents completed this item.

When asked to rate the utility of ten proposed strategies to help them teach their most difficult topic, teachers indicated that a) discussions with other teachers, b) observation of a skilled teacher and c) more time to develop relevant material were the most helpful tactics for improving teaching. These results are very consistent with one of these three help strategies receiving the highest mean rating for each of the eleven collaboratives. Discussion with other teachers not only had the highest mean rating (4.2 on a 5-point scale), it also showed the lowest variability (SD = 0.9), indicating high agreement among participants. Learning more about mathematics itself was rated least important (see Table 20).

Table 19

Rank Order of the Ten Most Difficult to Teach Topics as Reported by Collaborative Participants

Topic	Rank	N	%
Geometry (including logic and proofs)	1	44	10%
Advanced Math (including trig. and calculus)	2	31	7%
Probability and Statistics	3	25	6%
Problem Solving	4	19	4%
Basic or Remedial Mathematics	5	15	3%
Word Problems	6	11	3%
Factoring and Systems of Equations	8	8	2%
Graphing	8	8	2%
Fractions	9	6	1%
Measurement and Metrics	10	5	1%
Other		85	20%
Total		257*	60%

*One hundred seventy-three participants (40%) did not complete this question.

Table 20

Mean Response on a Scale of 1 to 5 of the Utility of Ten Proposed Help Strategies (1 = Not Useful, 5 = Very Useful) in Facilitating the Teaching of Difficult Mathematics Topics

	Collaborative*											
Help Strategies	CL	DU	LA	MS	NO	PH	PB	SL	SD	SF	TC	TOTAL
Discussions with other teachers	4.0	4.4	4.2	4.3	4.5	4.2	4.1	3.9	4.2	3.9	4.4	4.2
Observation of a skilled teacher	3.7	4.3	4.3	4.1	4.0	4.3	3.9	4.0	4.0	4.0	4.1	4.1
More time to develop material	4.0	4.3	4.1	4.3	4.2	4.2	4.1	3.9	3.7	3.9	4.3	4.1
Learning new teaching methods	3.9	3.9	4.0	3.9	3.8	3.9	3.5	3.8	3.5	3.8	3.9	3.9
Learning about available resources	3.8	3.9	4.1	4.0	3.8	4.1	3.7	3.8	3.4	3.8	3.9	3.9
More time to teach the topic	3.9	3.4	3.6	3.5	4.0	3.5	3.8	3.3	2.8	3.3	3.8	3.6
Learning more about applications	3.3	3.9	4.0	3.5	3.4	3.3	3.6	3.6	3.8	3.6	3.6	3.6
Help in the use of computers	3.4	3.4	3.7	3.5	3.3	3.5	3.5	3.2	2.6	3.2	3.1	3.4
More money to buy materials	3.8	3.1	3.6	3.8	3.5	3.5	3.1	3.3	3.0	3.3	3.0	3.4
Learning more about mathematics	2.3	3.3	3.0	2.8	2.7	2.8	2.3	2.8	3.3	2.8	3.1	2.9

Number responding ranged from 392 in "Help in the use of computers" to 402 in "Learning more about applications."

*CL = Cleveland
DU = Durham
LA = Los Angeles
MS = Memphis
NO = New Orleans
PH = Philadelphia
PB = Pittsburgh
SL = Saint Louis
SD = San Diego
SF = San Francisco
TC = Twin Cities

Of the 20 factors that were hypothesized to be harmful to mathematics instruction (see Table 21), three were rated by more than half of the total sample as a serious problem in their school: a) student absences (59% of the total sample); b) inadequate student reading ability (52%) and c) lack of student interest in mathematics (51%). Receiving the lowest ratings were: lack of teacher interest (5% reported this to be a serious problem), low enrollments in mathematics courses (5% reported this a serious problem) and pull-out of students for such programs as Chapter 1 and learning disabled (7% felt this was a serious problem).

Table 21

Percentage of Collaborative Participants Who Reported that Each of 20 Factors That May Influence Mathematics Instruction Who Felt that Each Factor is a Serious Problem in His or Her School

	Collaborative											
Factors that influence instruction	CL %	DU %	LA %	MS %	NO %	PH %	PB %	SL %	SD %	SF %	TC %	TOTAL %
Student absences*	74	38	77	29	63	64	82	57	52	24	47	59
Inadequate student reading ability	50	22	71	45	63	64	79	55	44	39	36	52
Lack of student interest in math**	60	35	70	35	56	51	75	57	56	24	25	51
Class sizes too large	29	32	41	32	38	31	21	18	36	42	38	33
Insufficient funds	40	8	26	26	31	18	18	24	16	42	23	25
Inadequate access to computers	29	27	28	32	44	20	36	16	16	15	25	25
Inadequate articulation of instruction across grade levels	12	16	26	13	31	18	29	14	16	18	15	18
Insufficient number of textbooks	17	19	22	0	19	16	11	22	12	33	11	17
Difficulty in maintaining discipline	14	8	16	6	19	20	29	35	0	12	15	17
Lack of time to teach mathematics	24	3	17	19	50	20	21	12	4	9	19	17
Lack of teacher planning time	17	38	13	13	19	24	4	6	4	6	17	17
Inadequate facilities	24	3	26	6	13	18	11	6	12	21	9	15
Poor quality of teaching materials	2	0	20	3	19	16	14	29	8	27	9	14
Mainstreaming of disabled students	12	3	6	6	31	9	18	22	12	3	11	11
Inadequate diversity of electives	17	16	20	3	6	9	4	8	4	15	9	11
Belief that math is less important than other subjects	7	3	7	6	13	13	19	12	20	6	2	9
Inadequate preparation of teachers	2	3	10	6	13	4	7	2	24	33	0	8
Pull-out of students e.g., Chapter 1, learning disabled etc.	5	0	4	3	19	11	7	18	4	6	7	7
Lack of teacher interest	5	0	3	6	13	2	11	2	4	18	2	5
Low enrollments in mathematics courses	7	3	4	3	6	18	18	2	4	6	0	5

*88% overall indicated that this was either a serious problem or somewhat of a problem in their school.

**89% overall indicated that this was either a serious problem or somewhat of a problem in their school.

Results of the present survey correspond to trends identified in the national sample, in which teachers also reported that student absences, student reading ability and lack of student interest were the three most serious problems in their schools (24%, 23%, and 22% of the national sample, respectively). In addition, lack of teacher interest and low enrollments in mathematics courses also were rated by the national sample as being least problematic (1% and 3% of the national sample, respectively). Although the trends are similar, a much larger percentage of UMC core teachers rated absences, reading ability and student lack of interest as serious problems (twice as many as in the national sample). In fact, none of the teachers in the Los Angeles and Pittsburgh collaboratives felt that lack of student interest was not a serious problem. These data, and their divergence from the national sample indicate that problems for the core UMC teachers-student absenteeism, low reading ability and level of interest--are problems shared by teachers in the nation as a whole, but are amplified in the inner city.

Description of "Average" Courses

In order to obtain an accurate description of the work environment of UMC teachers, the survey included questions pertaining to class duration, demographics, student ability, classroom management, use of educational materials and technology, course objectives and teaching techniques. Teachers were asked to select one of the courses they taught and to answer the remaining seventeen questions in the survey as they pertained to that course. Of the total, 47% of respondents identified three courses: first year algebra, 19%; second year algebra, 12%; and geometry, 16% (see Table 22). These percentages correspond roughly to course selections made by teachers in the national sample, 36% of whom selected algebra, and 21% of whom selected geometry. Although this study provides description of these three "average" courses, the national survey did not evaluate statistics for individual courses; as a result, data for these subjects are not directly comparable.

Duration. Table 23 illustrates the average duration of these three courses. Most courses lasted the entire school year with only a few taught for only a semester, and none were restricted to only a quarter. Ninety-one percent of first-year algebra teachers indicated that their course lasted for the school year, 96% of second-year algebra teachers indicated that their course lasted for the school year, and 90% of geometry teachers indicated that the course lasted for the school year.

Over all courses, 86% lasted for a year, 11% lasted for a semester, and 1% lasted for some other time period. Two percent of respondents did not indicate the duration of their courses. These figures reflect those from the national sample. Eighty-two percent of courses were indicated by the national sample as lasting for one year, 15% lasted for a semester and 1% lasted quarterly.

Ethnic composition. The typical class across all collaboratives contained approximately twenty-nine students, as compared to a mean of twenty-one students in the national sample. Of the male students, an average of four were white, six were black, two were Hispanic, and two were Asian. Of the female students, an average of four were white, seven were black, two were Hispanic and two were Asian. Again, wide variation exists across collaboratives. For instance, the three California sites reported a much larger proportion of Hispanic and Asian students than the other sites, while Twin Cities reported a larger number of white students (See Table 24 for the mean number of students according to ethnic origin within each collaborative).

Table 22

Percentage of Collaborative Participants by Mathematics Course Selected

	Collaborative											
Mathematics courses	CL %	DU %	LA %	MS %	NO %	PH %	PB %	SL %	SD %	SF %	TC %	TOTAL %
Grade 7 Mathematics	19	3	1	6	0	0	0	0	16	0	9	5
Grade 8 Mathematics	19	11	0	3	0	0	0	0	8	0	6	4
General Mathematics Grade 9	7	2	3	6	0	2	0	6	0	3	4	3
General Mathematics Grade 10-12	2	0	17	0	0	22	4	2	0	6	2	7
Business Mathematics	2	0	0	0	0	0	0	0	0	0	0	0
Consumer Mathematics	2	0	1	0	0	0	7	4	0	0	0	1
Pre-Algebra / Intro. to Algebra	2	5	7	13	6	0	0	2	20	6	13	7
First-year Algebra	14	14	19	19	31	22	14	20	12	33	13	19
Second-year Algebra	5	19	14	10	38	7	14	14	12	3	11	12
Geometry	14	11	13	22	13	13	14	31	16	9	11	16
Trigonometry	5	0	4	0	0	0	21	12	0	12	2	5
Probability / Statistics	0	0	0	0	0	0	0	0	0	3	2	0
Computer Programming	0	0	0	0	0	2	0	2	0	0	2	1
Advanced Computer Programming	0	0	1	0	6	0	4	0	0	0	0	1
Advanced Placement Computer Science	0	0	0	0	0	2	0	0	0	0	0	0
Remedial Mathematics	0	3	3	0	0	7	0	2	0	0	0	2
Advanced Mathematics not including Calculus	0	8	3	6	6	7	4	0	4	6	9	5
Advanced Mathematics including Calculus	2	5	0	0	0	0	0	0	0	6	4	2
Calculus	2	0	0	0	0	0	0	0	0	0	6	1
Advanced Placement Calculus	2	3	3	10	0	0	11	0	0	3	2	3
Other Mathematics	0	0	1	0	0	4	4	2	8	6	4	3

Table 23

Duration of the Three Courses Most Frequently Selected by Collaborative Participants

Duration of Course	Collaborative											
	CL %	DU %	LA %	MS %	NO %	PH %	PB %	SL %	SD %	SF %	TC %	TOTAL** %
First-year Algebra												
Year	100	100	100	100	80	100	100	100	100	45	100	91
Semester	0	0	0	0	20	0	0	0	0	55	0	9
Other*	0	0	0	0	0	0	0	0	0	0	0	0
Second-year Algebra												
Year	100	88	100	100	83	100	100	100	100	100	100	96
Semester	0	13	0	0	17	0	0	0	0	0	0	4
Other*	0	0	0	0	0	0	0	0	0	0	0	0
Geometry												
Year	100	100	89	100	100	100	100	88	66	33	83	90
Semester	0	0	11	0	0	0	0	12	0	67	0	7
Other*	0	0	0	0	0	0	0	0	0	0	17	1
All Courses												
Year	100	89	87	90	88	96	89	82	80	36	92	86
Semester	0	3	13	6	13	0	4	18	12	61	0	11
Other*	0	0	0	0	0	0	0	0	0	3	8	1

*Note. No teacher taught a course lasting for one quarter.

**Note. Two percent of participants did not respond to this item, thus totals may not add to 100%.

Student ability. The ability level typically exhibited by students in the three courses most frequently selected (Algebra I, Algebra II and Geometry) appears to be slightly above average (see Table 25). Forty-six percent of the teachers in first-year algebra rated their pupils to be either average or high in ability. Sixty-four percent of second-year algebra teachers rated their students as being either average or high ability students. Fifty-three percent of those teaching geometry rated their students to be either average or high in ability.

In considering the percentages of teachers rating class ability as low, only 11% of first-year algebra teachers, 8% of second-year algebra teachers and 7% of geometry teachers rated their classes as including primarily low or average ability students. A number of teachers, however, reported that their classes included a wide range of student abilities (42%, 28%, and 37% of teachers in first-year algebra, second-year algebra and geometry, respectively).

Over all of the courses reported by collaborative teachers, 26% felt that the typical ability of their students was high, 24% felt students were primarily average, 16% felt that student ability was low, while 32% felt that ability was widely diverse. Again, findings closely resemble those of the national sample. Fifty-six percent of teachers in the national sample rated their classes as either average or high in ability, while 12% rated their classes as low in ability. Thirty percent rated their classes as diverse in ability.

Table 24

Mean Number of Students, by Gender and Ethnicity Enrolled in Courses Taught by Collaborative Participants

Collaborative	White Boys	White Girls	Black Boys	Black Girls	Hispanic Boys	Hispanic Girls	Asian Boys	Asian Girls	Indian Boys	Indian Girls
Cleveland	2.9	3.1	9.5	9.9	0.5	0.5	0.1	0.1	0.0	0.0
Durham	7.3	6.9	5.0	5.4	0.5	0.1	0.1	0.1	0.0	0.0
Los Angeles	1.6	1.9	5.4	6 4	9.8	9.5	3.1	1.1	0.0	0.0
Memphis	4.4	5.0	6.7	9.5	0.0	0.0	0.4	0.5	0.0	0.0
New Orleans	0.7	0.5	8.2	12.1	0.3	0.3	0.7	0.5	0.0	0.0
Philadelphia	1.3	1.2	8.9	11.5	0.2	0.5	0.6	0.5	0.0	0.0
Pittsburgh	6.8	5.4	4.9	5.1	0.0	0.0	0.4	0.2	0.0	0.0
St. Louis	2.5	2.3	8.3	10.4	0.1	0.4	0.1	0.0	0.0	0.0
San Diego	3.8	2.9	2.5	2.4	4.2	5.2	5.9	6.2	0.0	0.0
San Francisco	2.3	2.5	1.8	1.5	1.5	1.0	11.1	9.5	0.0	0.0
Twin Cities	12.1	11.8	1.8	2.1	0.3	0.2	1.3	1.0	0.3	0.4
Total	4.3	4.2	5.8	6.9	2.1	2.0	2.0	1.5	0.1	0.1

Percentage of class time spent in instruction. A mean of 81% of total class time for all participants is spent in instruction (see Table 26). This percentage is fairly representative among collaboratives, as the range varied from 76% in Los Angeles to 88% in San Francisco. The remaining 19% of class time is distributed approximately as follows: 1) daily routines such as passing out materials (7%); 2) interruptions such as fire drills and announcements, (4%); and 3) getting students to behave (7.4%). Teachers in Los Angeles and St. Louis reported spending more time on the average in regulating student behavior (9.8% and 9.9% of class time, respectively) than did the rest of the sample.

Table 25

Percentage of Collaborative Teachers Reporting on the Typical Ability Level of Students in the Three Courses Most Frequently Selected

Average Ability Level	CL %	DU %	LA %	MS %	NO %	PH %	PB %	SL %	SD %	SF %	TC %	TOTAL %
	Collaborative											
First-year Algebra												
High	17	33	8	17	0	0	0	0	33	27	57	16
Low	0	17	23	17	0	10	0	10	0	9	14	11
Average	17	33	15	33	75	40	75	30	30	36	14	30
Diverse	67	17	54	33	25	40	25	60	67	27	14	42
Second-year Algebra												
High	0	25	20	0	33	33	50	57	33	100	33	32
Low	0	0	10	0	0	33	25	0	0	0	17	8
Average	50	25	40	100	0	0	25	14	67	0	50	32
Diverse	50	50	30	0	67	33	0	29	0	0	0	28
Geometry												
High	0	25	0	71	0	17	50	19	50	67	50	28
Low	0	0	11	0	100	0	0	13	0	0	0	7
Average	17	75	33	14	0	17	50	25	25	0	33	25
Diverse	83	0	56	14	0	67	0	44	25	33	17	37
All Courses												
High	14	27	10	35	13	13	32	18	28	42	55	26
Low	19	16	19	6	19	24	14	14	12	12	13	16
Average	12	27	30	39	19	20	29	25	28	21	17	24
Diverse	67	22	41	16	50	36	18	43	24	24	15	32

Teachers reported that students in collaborative classrooms receive approximately one-half hour of homework every evening (see Table 27). Across the three most represented courses, second-year algebra teachers tended to give slightly more homework that either first-year algebra or geometry teachers. Most collaborative sites indicated similar amounts of homework, with means ranging from 26.1 minutes/day in Philadelphia to 41.1 minutes/day in San Francisco. In the national sample, the mean amount of homework assigned in mathematics courses was approximately 32 minutes per day, corroborating data from the present sample.

Table 26

Mean Percentage of Class Time Collaborative Teachers Devoted to Instruction and Other Activities

Collaborative	Routines	Interruptions	Discipline	Instruction
Cleveland	9.9	3.9	7.7	78.3
Durham	6.9	3.5	5.8	83.8
Los Angeles	7.1	6.1	9.8	76.4
Memphis	5.6	4.4	5.2	84.8
New Orleans	7.3	5.6	6.8	79.6
Philadelphia	7.0	4.3	8.4	78.1
Pittsburgh	5.6	3.9	4.7	82.9
St. Louis	7.5	5.0	9.9	77.3
San Diego	6.7	3.5	5.4	84.4
San Francisco	5.5	2.4	4.5	87.5
Twin Cities	7.1	4.2	7.4	81.3
Total	7.1	4.4	7.4	80.6

Table 27

Mean Number of Homework Minutes Collaborative Teachers Assign Typical Students Each Day for the Three Most Selected Courses

Collaborative	Algebra I		Algebra II		Geometry		Total	
	M	SD	M	SD	M	SD	M	SD
Cleveland	30.8	18.5	42.5	24.7	24.0	12.6	34.2	15.2
Durham	24.5	5.3	30.0	8.4	31.2	10.3	29.1	10.6
Los Angeles	37.3	7.2	42.9	24.8	39.3	15.9	37.8	16.8
Memphis	38.8	12.4	40.3	11.7	25.0	10.8	35.8	17.2
New Orleans	32.0	2.7	45.0	13.4	35.0	7.1	38.8	11.8
Philadelphia	26.9	13.9	36.0	5.3	30.5	9.4	26.1	11.7
Pittsburgh	28.9	2.5	28.3	7.7	28.3	3.5	28.4	14.5
St. Louis	41.5	14.7	38.3	15.7	35.8	12.3	37.7	13.2
San Diego	26.7	2.9	40.0	11.1	37.5	11.9	32.8	12.3
San Francisco	38.3	17.7	54.0	----	43.3	15.3	41.1	18.0
Twin Cities	35.7	9.3	34.5	5.3	32.5	12.5	37.1	14.9
Total	34.4	12.6	38.2	14.5	32.8	12.3	34.6	15.1

Availability of computers. Fifty-one percent olrticipants reported having computers available for use in the classroom, with percenta from 31% in New Orleans to 67% in St. Louis. It appears that there are more compute in the advanced courses. Fifty-one percent of geometry teachers had computers while 45% of second-year algebra, and only 42% of first-year algebra teachers had acc>uters as instructional aides (see Table 28).

Of the 74% of teachers in the national sample whputers available, only 27% indicated that they were readily available. Forty-six perce although computers were technically available, they were quite difficult to access, an(no access to computers for classroom use.

The mean number of microcomputers available for ussroom for the total sample was 7.8 (24.3 in the national sample), while the mean numbeials available for classroom use was 3.9 (3.4 in the national sample). However, raried considerably across collaborratives (see Table 29). Standard deviations of 11 for microcomputers and terminals respectively, and median scores of 0 computers forratives, indicate that most teachers had very few, if any, computers available. In somwever, a few teachers reported that a number of computers were available (i.e., a in Los Angeles reported having access to 60 microcomputers). Unfortunately, 17%UMC respondents did not indicate the number of terminals available, and 14% of reslid not report the number of microcomputers available.

Table 28

Percentage of Collaborative Teachers Who Have Computers Available for Use

Collaborative	First-year Algebra		Second-year Algebra		Geometry		All Courses	
	%	N	%	N	%	N	%	N
Cleveland	75	4	100	2	50	3	54	42
Durham	17	6	50	8	100	4	59	37
Los Angeles	31	13	40	10	33	9	48	69
Memphis	0	6	100	3	43	7	52	31
New Orleans	20	5	17	6	0	2	31	16
Philadelphia	33	9	67	3	50	6	49	43
Pittsburgh	0	4	25	4	25	4	36	28
St. Louis	70	10	57	7	79	16	67	51
San Diego	67	3	0	3	0	3	35	25
San Francisco	55	11	100	1	67	3	52	33
Twin Cities	86	7	33	6	67	6	60	53
Total	42	81	45	53	51	67	51	430

Table 29

Percentage of Collaborative Teachers Who Reported One or More Computers Available and the Mean Number of Terminals and/or Microcomputers Available

Collaborative	Computers Available		Terminals			Microcomputers		
	N	%	N	M	SD	N	M	SD
Cleveland	22	54%	9	18.1	7.6	18	19.8	5.2
Durham	22	59%	13	18.3	12.8	15	17.7	9.4
Los Angeles	33	49%	17	22.7	12.2	19	22.4	17.0
Memphis	16	52%	4	18.5	4.4	14	19.6	9.0
New Orleans	5	31%	0	----	----	5	13.8	8.5
Philadelphia	22	49%	1	1.0	0.0	22	23.7	9.1
Pittsburgh	10	36%	1	8.0	0.0	8	13.6	7.3
St. Louis	34	67%	13	16.7	10.7	19	16.4	9.9
San Diego	8	35%	2	31.5	0.7	6	11.5	12.4
San Francisco	17	52%	6	28.7	31.4	13	15.8	12.6
Twin Cities	32	60%	5	12.2	9.6	25	11.1	9.2
Total	221	51%	71	19.5	13.8	164	17.6	11.0

Note: Only 17% of the total sample indicated that they had one or more terminals and only 38% indicated that they had more than 1 microcomputer available for use in the classroom.

Table 30 reports the ways in which computers are integrated into collaborative classrooms. The most common computer application to coursework appears to be drill-and-practice programs, with 30% of the total sample of teachers indicating that their classes used computers in this way. Computers are also used for teaching mathematics content and teacher demonstrations, with 25 and 23 percent of teachers indicating these uses, respectively. These findings differ from the national sample primarily in that much larger percentages of collaborative teachers indicated that they used computers in these specific ways. The largest discrepancy between groups emerged in the area of drill-and-practice, a use which was reported by only 12% of the national sample. The smallest difference between the UMC group and the national sample occurred in the testing and evaluation category, with 8% of the UMC sample using computers compared to 5% of the national sample. The only category in which the national sample showed greater classroom use involved learning how to program. Fourteen percent of teachers in the national sample used computers for programming, compared to 10% in the UMC sample. These findings are especially interesting in light of the large discrepancy between numbers of microcomputers available to collaborative teachers compared to the numbers reported available nationally by Weiss (1987b).

Table 30

Percentage of Collaborative Teachers by the Ways in Which Their Classes Use Computers

		Collaborative											
Type of Computer Use	N	CL %	DU %	LA %	MS %	NO %	PH %	PB %	SL %	SD %	SF %	TC %	TOTAL %
Drill and Practice	127	40	35	33	26	19	31	18	45	28	15	17	30
Learning Mathematics Content	108	24	30	26	19	19	27	11	37	28	21	23	25
Teacher Demonstration	101	25	35	19	35	19	33	18	16	12	12	34	23
Using Computer Graphics	88	17	24	20	23	13	31	18	24	8	18	19	20
Games	78	19	24	25	23	19	16	11	24	8	12	11	18
Using Simulations	70	12	19	13	19	0	20	14	18	12	18	23	16
Learning How to Program	44	10	27	4	3	19	13	7	8	4	6	15	10
Testing and Evaluation	33	7	11	12	6	6	11	4	8	8	0	6	8

Degree of emphasis on course objectives. Of the eight course objectives presented in Table 31, teachers emphasize: 1) the development of a systematic approach to problem solving, and 2) the knowledge of mathematical facts, principles, algorithms, or procedures (M = 4.3 for both items on a 5-point scale). This appears to be a stable finding in that both objectives were consistently rated highest by each collaborative. The objective consistently rated the lowest in emphasis for all classes was learning about the career relevance of mathematics (M = 3.2). Only teachers from New Orleans and St. Louis did not rate this objective, on the average, as the least important.

Data from the national sample reflects these findings. Seventy-five percent of teachers rated development of a systematic approach to solving problems and 71% rated knowing mathematical facts, principles and algorithms as having heavy emphasis in their classrooms. Only 29% of teachers in the Weiss (1987b) study placed heavy emphasis on learning about the career relevance of mathematics.

Most common teaching techniques. Table 32 illustrates the modal responses regarding the regularity with which eighteen teaching techniques are used in the classroom. Teachers indicated that they used lecture (73% of teachers responding), discussion (64% responding), student seatwork (55%), teacher demonstrations (45%) and homework (91%) almost daily in instructing students. In addition, teachers indicated that most classes were tested at least once a week (67%). Techniques that were rarely ever used included students using computers (40% of collaborative teachers indicated they almost never used computers), guest speakers (67% almost never had guest speakers in their classrooms), library work (71% almost never assigned library work) and field trips (80% almost never took their students on field trips). Remaining techniques showed wide variations in the rate of usage across collaboratives. For example, 44% of the New Orleans teachers responded that their students almost never used calculators, while only 15% of the teachers in Pittsburgh reported that students almost never used calculators (59% of respondents in Pittsburgh reported that students used calculators almost daily in their classes).

These findings reflect those of the national sample. Eighty-nine percent of teachers nationwide indicated that they had lectured, 86% used discussion, 75% assigned homework and 66% had students do seatwork assigned from a textbook in the last class period they had taught. Twenty-six percent of teachers nationwide reported using calculators in their most recent lesson.

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Table 31

Mean Rating on the Degree of Emphasis that Teachers Place on Eight Classroom Objectives on a Scale of 1 to 5 (1 = no emphasis, 5 = very heavy emphasis)

	Collaborative											
Classroom Objective	CL	DU	LA	MS	NO	PH	PB	SL	SD	SF	TC	TOTAL
Know mathematical facts, principles, algorithms, etc.	4.5	4.4	4.1	4.5	4.4	4.4	4.3	4.2	4.0	4.1	4.3	4.3
Develop a systematic approach to solving problems.	4.4	4.5	4.1	4.5	4.5	4.4	4.4	4.2	4.5	4.4	4.3	4.3
Develop an attitude of inquiry.	3.6	3.7	3.5	3.9	3.9	4.2	4.0	3.9	4.0	4.1	4.0	3.9
Develop an awareness of the importance of math in everyday life.	3.9	3.7	3.4	3.9	3.6	4.0	3.8	3.7	3.7	3.4	3.4	3.7
Become interested in math.	3.5	3.4	3.4	3.5	3.5	3.8	3.3	3.4	3.0	3.7	3.6	3.5
Perform computations with speed and accuracy.	3.8	3.7	3.4	3.6	4.2	3.9	3.3	3.8	3.1	2.8	3.0	3.5
Develop an awareness of the importance of math in the basic and applied sciences.	3.6	3.5	3.1	3.8	3.7	3.4	3.4	3.7	3.3	3.1	3.1	3.4
Learn about the career relevance of math.	3.3	3.1	3.0	3.3	3.6	3.4	3.3	3.5	3.0	2.8	2.8	3.2

Table 32

Modal Responses on How Often Collaborative Teachers Use Each of Eighteen Techniques to Teach Mathematics

Technique	CL #* %	DU # %	LA # %	MS # %	NO # %	PH # %
Lecture	5(76)	5(79)	5(81)	5(79)	5(60)	5(64)
Discussion	5(43)	5(79)	5(69)	5(83)	5(93)	5(47)
Student reports or projects	2(57)	2(66)	1(46)	1(50)	2(56)	2(41)
Library work	1(69)	1(66)	1(80)	1(23)	2(63)	1(77)
Students working at chalkboard	4(33)	4(47)	4(44)	3(38)	4(44)	5(40)
Students using computers	1(40)	2(40)	1(32)	2(50)	1(56)	1(48)
Students using calculators	3(31)	2(37)	1(30)	2(30)	1(44)	5(39)
Students using manipulatives	1(29)	2(39)	1(34)	3(40)	1(40)	2(39)
Students doing seatwork	5(36)	5(47)	5(74)	5(50)	5(56)	5(47)
Students completing worksheets	4(43)	4(62)	4(43)	4(57)	4(44)	4(44)
Teacher-led small groups	2(41)	2(27)	1(36)	4(33)	4(44)	4(33)
Peer-led small groups	1(38)	2(32)	1(32)	4(47)	4(44)	4(34)
Student-to student tutoring	4(33)	4(29)	5(32)	4(40)	4(44)	4(32)
Field trips, excursions	1(73)	1(77)	1(87)	1(73)	1,2(44)	1(84)
Guest speakers	1(60)	1(51)	1(64)	1(53)	2(63)	1(84)
Teacher demonstrations	5(45)	5(56)	5(39)	5(70)	5(63)	4(36)
Tests or quizzes	4(69)	4(80)	4(81)	4(80)	4(88)	4(60)
Homework assignments	5(100)	5(94)	5(85)	5(90)	5(88)	5(85)

*1 = Never
2 = Less than once a month
3 = At least once a month
4 = At least once a week
5 = Just about daily

(Table Continues)

Table 32 (continued).

Modal Responses on How Often Collaborative Teachers Use Each of Eighteen Techniques to Teach Mathematics

Technique	PB #* %	SL # %	SD # %	SF # %	TC # %	TOTAL # %
Lecture	5(69)	5(65)	5(75)	5(79)	5(72)	5(73)
Discussion	4(39)	5(70)	5(61)	5(64)	5(77)	5(64)
Student reports or projects	2(50)	1(41)	1(50)	1(49)	1(51)	2(40)
Library work	1(74)	1(59)	1(63)	1(84)	1(77)	1(71)
Students working at chalkboard	4(44)	4(41)	3(38)	4(33)	3,4(26)	4(36)
Students using computers	1(52)	2(39)	1(63)	1(55)	2(38)	1(40)
Students using calculators	5(59)	4(28)	2(63)	5(33)	5(36)	5(31)
Students using manipulatives	2(31)	2(34)	2(38)	1,2(42)	2(43)	2(32)
Students doing seatwork	4(33)	5(56)	5(58)	5(61)	5(68)	5(55)
Students completing worksheets	3(37)	4(51)	4(52)	4(38)	4(38)	4(45)
Teacher-led small groups	1,2(33)	2,4(26)	1(33)	1(39)	1,3(29)	1(27)
Peer-led small groups	1(46)	2,3(27)	4(40)	1(39)	3(25)	1(25)
Student-to-student tutoring	2,3(30)	4(30)	4(40)	3(31)	4,5(34)	4(32)
Field trips, excursions	1(74)	1(80)	1(84)	1(89)	1(87)	1(80)
Guest speakers	1(74)	1(77)	1(52)	1(79)	1(70)	1(67)
Teacher demonstrations	5(41)	5(76)	5(48)	4(36)	4(40)	5(45)
Tests or quizzes	4(56)	4(65)	3(56)	4(36)	4(55)	4(67)
Homework assignments	5(89)	5(94)	5(96)	5(94)	5(90)	5(91)

*1 = Never
2 = Less than once a month
3 = At least once a month
4 = At least once a week
5 = Just about daily

Use of educational materials and equipment. Table 33 illustrates the number of collaborative teachers who use various educational equipment in their classes, including games and puzzles, calculators, computers, metric measurement tools, nonmetric measurement tools, activity kits, manipulatives, geometric tools, models and solids, graph paper and audio-visual media. Although sites differ in terms of the frequency with which teachers use materials, one rather striking pattern emerges. A large percentage of teachers in all collaboratives do not or rarely use these classroom aids in their classes. Only calculators, graph paper and audio-visual materials were used more than 10 days per course by the majority of teachers.

The ways in which collaborative teachers encourage their classes to use calculators differ slightly from teachers in the national sample (See Table 34). The majority of UMC teachers indicated that they encouraged their students to use calculators for checking their answers (68%), doing computations (62%), and solving problems (60%), while only 39% encouraged calculator use in taking tests. Teachers in the national sample indicated that only 29% of classes used calculators for checking answers, 47% used calculators for doing computations, 37% for solving problems, and 35% for taking tests. These differences may reflect the availability of calculators, differences in teacher attitudes between reference populations, random sampling error, or a difference affecting teaching in an urban setting. Present data is insufficient to explain the difference.

Table 33

Distribution of Teachers Within Collaboratives by Frequency of Use of Specified Materials

Equipment/Materials	Collaborative CL	DU	LA	MS	NO	PH	PB	SL	SD	SF	TC	TOTAL
Games and Puzzles												
Do Not Use	8	4	16	9	8	11	12	20	4	14	18	124
Use < 10 Days	21	20	30	9	6	20	8	22	13	16	13	178
Use Between 10 and 50 Days	12	9	16	11	2	11	6	9	7	1	16	100
Use > 50 Days	0	0	3	1	0	1	0	0	0	1	1	7
Hand-Held Calculators												
Do Not Use	6	7	21	9	11	10	3	20	1	11	6	105
Use < 10 Days	14	8	9	4	3	7	0	13	2	5	8	73
Use Between 10 and 50 Days	9	5	14	9	0	11	4	5	2	5	15	79
Use > 50 Days	1	13	22	8	1	16	20	12	19	12	23	158
Computers or Computer Terminals												
Do Not Use	15	13	18	12	9	20	15	16	15	19	16	178
Use < 10 Days	18	10	17	10	1	10	5	22	4	9	24	130
Use Between 10 and 50 Days	8	11	18	7	5	6	4	8	4	5	7	83
Use > 50 Days	0	1	4	1	1	8	3	2	1	0	3	24
Metric Measurement Tools												
Do Not Use	14	13	23	10	6	18	16	8	7	14	25	161
Use < 10 Days	20	13	27	8	7	14	9	26	10	11	11	156
Use Between 10 and 50 Days	7	9	9	9	2	11	2	15	6	6	13	89
Use > 50 Days	0	1	2	3	0	1	0	2	1	0	3	13
Nonmetric Measurement Tools												
Do Not Use	11	14	25	9	5	12	13	10	7	18	22	146
Use < 10 Days	21	15	23	10	6	17	11	21	11	10	19	164
Use Between 10 and 50 Days	4	5	10	8	3	11	2	15	5	2	9	74
Use > 50 Days	1	0	6	3	1	2	0	3	0	1	1	18
Activity Cards or Kits												
Do Not Use	26	18	51	21	11	28	24	32	8	28	24	281
Use < 10 Days	11	14	11	6	3	7	3	14	13	4	13	99
Use Between 10 and 50 Days	4	3	5	1	1	6	0	1	3	0	5	29
Use > 50 Days	1	0	0	2	1	1	0	1	0	0	0	6
Numeration and Place Value Manipulatives												
Do Not Use	30	24	47	24	15	32	27	37	18	27	43	324
Use < 10 Days	10	8	12	4	1	9	0	8	5	5	5	67
Use Between 10 and 50 Days	2	3	3	1	0	3	0	4	1	0	3	20
Use > 50 Days	0	0	2	1	0	0	0	0	0	1	1	5

(Table Continues)

Table 33 (continued)

Distribution of Teachers Within Collaboratives by Frequency of Use of Specified Materials

Equipment/Materials	CL	DU	LA	MS	NO	PH	PB	SL	SD	SF	TC	TOTAL
	Collaborative											
Geometric Tools												
Do Not Use	7	8	32	8	10	13	15	21	5	20	17	156
Use < 10 Days	18	15	21	9	1	16	5	13	9	6	13	126
Use Between 10 and 50 Days	14	10	10	6	3	12	5	10	9	5	17	101
Use > 50 Days	0	2	5	5	1	3	2	6	1	2	5	32
Models and Solids												
Do Not Use	12	4	37	7	12	19	11	21	3	18	14	156
Use < 10 Days	20	20	19	11	1	14	9	17	15	11	23	160
Use Between 10 and 50 Days	7	9	12	8	1	10	5	9	5	3	10	79
Use > 50 Days	0	2	1	4	1	0	1	2	1	1	5	18
Graph Paper												
Do Not Use	1	3	8	7	3	4	0	1	0	3	3	33
Use < 10 Days	19	6	20	7	6	8	5	10	7	7	11	106
Use Between 10 and 50 Days	21	22	32	13	5	29	16	34	13	20	30	235
Use > 50 Days	1	3	8	3	2	3	6	6	4	3	9	48
Audio Visual Materials												
Do Not Use	6	3	22	1	5	5	5	13	2	18	4	89
Use < 10 Days	14	8	17	2	5	1	1	21	6	9	17	111
Use Between 10 and 50 Days	9	8	11	8	4	7	7	10	4	1	6	86
Use > 50 Days	12	16	18	19	2	14	14	7	12	4	25	133

Table 34

Percentage of Collaborative Teachers by Ways in Which Their Classes Use Calculators

Type of Calculator Use	CL %	DU %	LA %	MS %	NO %	PH %	PB %	SL %	SD %	SF %	TC %	TOTAL %
	Collaborative											
Checking Answers	71	62	54	65	69	69	93	62	88	70	70	68
Doing Computations	67	41	52	58	44	62	93	55	92	61	72	62
Solving Problems	74	38	54	39	38	64	89	51	92	58	68	60
Taking Tests	31	27	36	23	18	29	82	37	88	30	45	39

IV. DISCUSSION

The 430 respondents to the SMTQ essentially comprise the group of Urban Mathematics Collaborative core teachers at the time the questionnaire was administered. Participants were either self-selected by noting on another questionnaire that they were frequent participants in collaborative activities, or they were identified by the collaborative administrator as active project members. It should be noted that responses to the questionnaire and the conclusions drawn from them refer only to these frequent participants, and cannot be generalized to include all collaborative participants or urban mathematics teachers in general.

The core teacher group is significant in that it is the population that is most likely to be affected by the collaboratives and most likely to influence what the collaboratives will do. Understanding these teachers, their educational backgrounds, their mathematics experiences, their professional interests, and their teaching practices reveals more about what the collaboratives are and who they are trying to effect. As defined by the 430 teachers responding to the questionnaire, the UMC core group consists of about one-sixth of all of the mathematics teachers within the districts who have the potential of becoming active members in the collaborative. The number of respondents is significant, particularly when one considers the potential impact of teacher leaders and the number of teachers the core group may influence. The information from the questionnaire does illuminate some aspects of the working lives of inner-city teachers, and does identify consistencies and inconsistencies between UMC teachers and their counterparts nationwide. It also allows us to recognize differences among and between the eleven collaboratives themselves.

Demographically, the UMC sample is distinctly different from the national sample. While the Weiss (1987b) sample was comprised primarily of white males, the UMC sample is much more diverse in both gender and ethnicity. The UMC sample included slightly more females than males, and each of the ethnic groups accounted for a larger percentage of teachers as compared with the national survey. The higher frequency of females in the core group is representative of the distribution of female teachers in the combined populations of the urban districts that participated; these school districts, particularly those in the southeastern region, tend to have a greater number of female secondary mathematics teachers. The higher percentage of female teachers in the UMC core group seems to be more of an artifact of district composition than any particular factor due to the formation of the collaboratives. Only two of the collaboratives had a notably higher percentage of female participants than would be expected from the district population of mathematics teachers of which they are a part. The distribution of core teachers by ethnicity is essentially identical to the distribution within the districts. Available data suggest that the UMC core teachers, in general, are representative of the target population, at least in distribution by gender and ethnicity. The age of the core teachers is comparable to the age of mathematics teachers in the national sample, with an average age of 40 to 42 years; there is, however, a significant variation among collaboratives in average age of the core teachers.

Results indicate further that the average collaborative core teacher has had 14 years of experience teaching mathematics. Although some of the core teachers had taught courses other than mathematics, relatively few had done so for any length of time. In addition, core teachers appeared to be quite well educated; nearly 60% of the UMC sample had earned a post-baccalaureate degree, and a considerable number are continuing their college education concurrently with their teaching.

Contrary to the report by Urbanski (1987) referenced at the beginning of this report, UMC core teachers appear to be exceptionally well qualified to teach compared to other samples, at least insofar as their certification stipulates. Nearly all of the core teachers (>99%) held state teaching certification, as opposed to the 92% reported by Urbanski. In fact, 92% of core teachers had obtained specialized certification in some subject, only 6% of core teachers had taught a course for which they were not certified, and only 4% had taught a course they felt unqualified to teach. Again, these results differ from those reported by Urbanski, who placed the number of persons who have taught a course for which they were unqualified at approximately 16%.

Although the level of education and advanced degrees of the UMC sample are comparable to those of mathematics teachers in general, the exposure to mathematics may not be as great for the collaborative core teachers. There is some indication that, as a group, the UMC core teachers may be less educated in mathematics than mathematics teachers in general. This is evident in the lower percentage of the core teachers who have mathematics or mathematics education college majors than do mathematics teachers in general, and the larger number of teachers who had not taken a college mathematics course within two years. In addition, fewer than three-quarters of the core teachers from the three California collaboratives have a mathematics certification.

Not surprisingly, core teachers in the UMC project also seem to be exceptionally involved in professional enrichment and staff development. Nearly one half of the sample had spent more than five days in professional development in the past year, while only 9% had not been involved in any professional development activities. This increased in-service activity is associated in part with the impact of the collaboratives, with core teachers from all of the sites rating the collaborative as a primary source of staff development. Teachers in the national sample were four times more likely to be uninvolved in professional development. Unfortunately, collaborative teachers receive little in the way of district support for in-service activities aside from release time. In fact, one-fourth receive no support at all.

Teachers reported involvement with other teachers as their most important strategy for improving instruction in difficult topics. These results confirm the need for teacher collaboration, for sharing of successes and strategies, and for collegial support of effective practice.

When asked about the factors that are particularly problematic to their instruction, core teachers reflect the findings of the Carnegie Foundation's (1988) report on urban teachers. More than one-half of the core teachers indicated that student absences, low student reading ability and poor student motivation towards mathematics were serious problems in their schools. Low student ability was not considered a serious problem, in general, for core teachers; in fact, they tended to rate the ability level of their classes as slightly above average.

Fewer than one in five core teachers rated discipline as a serious problem in their schools. These findings are supported by the small percentage of class time devoted to discipline, with core teachers reporting that only about 7% of class time is spent correcting students' behavior. This is in stark contrast to the general perception that discipline is a major destructive factor in inner-city classrooms. Core teachers' classes averaged twenty-nine students, eight students more than the class size of the average mathematics teacher in the nation.

Computers are not generally available for use by the majority of core teachers. Those that do use computers in the classroom tend to focus on drill-and-practice programs, teacher demonstrations and learning mathematics content, rather than using simulations, graphics or programming. This may be due to the high cost of software for these applications, or it may however be due to lack of teacher expertise in computer science. Since relatively few teachers had taken courses in computers, they may feel inadequately prepared to use more complex programs. This conjecture is supported to some degree in that teachers cited computer courses 20 times out of 39 when asked to name the courses they were either not certified or not qualified to teach.

UMC core teachers place fairly heavy emphasis on developing students' knowledge of mathematical facts and principles and on developing students' approach to systematic problem-solving. They tend to hold neutral feelings towards developing students' awareness of the career relevance of mathematics. They tend to use lecture, discussion, seatwork, teacher demonstrations and homework almost daily as instructional strategies. Although technology such as computers are used infrequently, this is most likely due to limited access or limited training opportunities. When technology such as calculators is readily available, core teachers tend to use it frequently where applicable. In this way, UMC core teachers are more progressive than teachers in general, with a greater percentage using calculators more frequently.

Frequent participants in the UMC project, then, tend to be experienced teachers, with suitable or exceptional educational background, who teach because they love to teach (Romberg, Pitman, Pittelman, Webb, Fadell, & Middleton, 1988). They tend to appreciate interaction with their colleagues and to view such activity as beneficial to their teaching practice. Although most tend to belong to professional organizations in addition to their local collaboratives, many spend little time in professional development activities, perhaps because of a lack of support, either financially, temporally or collegially, outside of the collaborative. Like other urban teachers (e.g., Urbanski, 1987) UMC core teachers have problems teaching undermotivated students who attend class sporadically. Even so, discipline is not seen as a serious problem, and low student ability is not perceived as contributing to problems in instruction.

Results indicate that UMC core teachers are quite different in several ways than teachers from the national sample. Unlike the urban teachers described in other reports (e.g., National Research Council, 1989; Urbanski, 1987), UMC core teachers seem to be competent, motivated instructors with a desire to better their abilities and to develop their professionalism. Whether this is a function of collaborative impact or whether such teachers tend to seek out activities similar to those that the collaboratives offer is a question that remains to be answered. In any case, collaborative involvement responds to those needs articulated by the core participants: collegial support, professional development, and an opportunity to share their experiences with other teachers to improve mathematics education in our urban schools.

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APPENDIX

Secondary Mathematics Teacher Questionnaire

Urban Collaborative Documentation Project
University of Wisconsin - Madison

Date ______________________
(month) (day) (year)

SECONDARY MATHEMATICS TEACHER QUESTIONNAIRE

Please fill in today's date in the upper right hand corner and your name, school, city, and state in the spaces provided below.

Name ______________________________
(first) (last)

School ______________________________

City, State ______________________________

Answer the questions on both sides of the following pages. All responses will be strictly confidential. Only summary information will be shared.

THANK YOU FOR YOUR COOPERATION IN COMPLETING THIS QUESTIONNAIRE.

SECTION A: BACKGROUND INFORMATION

1. Indicate your sex:

	(Circle one)
Male	1
Female	2

2. Indicate your ethnic origin:

	(Circle one)
a. White (not of Hispanic origin)	1
b. Black (not of Hispanic origin)	2
c. Hispanic	3
d. American Indian or Alaskan Native	4
e. Asian or Pacific Islander	5
f. Other (please specify) ______________________ .	6

3. How old are you? __________ (optional)

4. How many years have you taught? (Include the current year.) __________

5. How many years have you taught each of the following? (Include the current year.)

   a. Mathematics _____
   b. Life sciences _____
   c. Physical sciences _____
   d. Earth sciences _____
   e. Computer awareness, literacy, programming _____

6. Indicate whether you belong to each of the following professional organizations.

(Circle "Yes" or "No" for each organization)

	Yes	No
a. Association for Computing Machinery	1	2
b. Association for Educational Data Systems . . .	1	2
c. Mathematical Association of America	1	2
d. National Council of Teachers of Mathematics . .	1	2
e. School Science and Mathematics Association . .	1	2
f. National Association of Science and Mathematics Teachers	1	2
g. State-level mathematics education organization.	1	2
h. Local mathematics education organization . . .	1	2

(Please turn page for Question 7)

7. What is the highest academic degree you have earned?

	(Circle one)
a. No degree	1
b. Associate	2
c. Bachelor's	3
d. Master's	4
e. Specialist or 6-year certificate	5
f. Doctorate	6

8. Check the box that best represents the number of all UNDERGRADUATE and GRADUATE credit hours (semester or quarter) you have accumulated in each of the course areas listed.

	SEMESTER						OR	QUARTER					
	None	1 to 5	5 to 8	9 to 12	13 to 24	25 or more		None	1 to 6	7 to 12	13 to 18	19 to 36	37 or more
EDUCATION COURSES:													
a. Methods of teaching secondary school mathematics													
b. Instructional uses of computers													
c. Other education courses													
MATHEMATICS AND SCIENCE COURSES													
d. College algebra, trigonometry, elementary calculus													
e. Advanced calculus, differential equations geometry													
f. Upper division probability, statistics													
g. Upper division abstract algebra, linear algebra, number theory													
h. Mathematical problem solving, applications of mathematics													
i. Foundations, history or philosophy of mathematics													
j. Computer science													

9. In what year did you last take a course for college credit in mathematics (not including computer courses) or in the teaching of mathematics? __________

10. What type of state teaching certification do you have?

(Circle all that apply)

a. Regular certification 1
b. Temporary or emergency certification 2
c. Other certification 3
d. Not certified . . . . 4 - SKIP TO QUESTION 12

11. In which subject areas do you have specialized state teaching certification?

(Circle all that apply)

a. I do not have specialized certification in any particular subject area 1
b. Mathematics 2
c. Science (general) 3
d. Biology 4
e. Chemistry 5
f. Physics 6
g. Earth/space science 7
h. Computer science 8
i. Other (please specify) 9

____

____

____

SECTION B: STAFF DEVELOPMENT

12. During the last 12 months, what is the total amount of time you have spent on staff development in mathematics or the teaching of mathematics. (Include attendance at professional meetings, workshops, and conferences, but do not include formal courses either for college credit or CEU's.)

(Circle one)

a. None . . . . 1 (SKIP TO QUESTION 15)
b. Less than one day 2
c. 1-2 days 3
d. 3-5 days 4
e. More than 5 days 5

If you circled None (Number 1) SKIP TO QUESTION 15.

13. Indicate the sponsors or co-sponsors of these meetings, workshops, or conferences.

(Circle all that apply)

Your local school or district 1
Your state education agency 2
Private industry 3
A college or university 4
A professional association 5
National Science Foundation 6
National Aeronautics and Space Administration 7
U. S. Department of Energy 8
U. S. Department of Education 9
Other 10
Math collaboratives (please specify) 11

____

____

14. What support have you received for attending these professional meetings, workshops, and conferences?

(Circle all that apply)

Released time from teaching 1
Travel 2
Stipends 3
None 4
Other (please specify) 5

____

____

15. On a scale of 1 to 5, how convenient would you find each of the following times for in-service programs?

(Circle one on each line)

	Very Convenient				Very Inconvenient
After school	1	2	3	4	5
Evenings	1	2	3	4	5
Weekends	1	2	3	4	5
Summers	1	2	3	4	5
Teacher work days	1	2	3	4	5

16. How would you rate each of the following possible locations for in-service programs?

(Circle one on each line)

	Excellent	Good	Fair	Poor
At home (e.g., via TV, telecommunications, or correspondence . .	1	2	3	4
Your school building.	1	2	3	4
Another location in your district . . .	1	2	3	4
A regional site, accessible to teachers from several districts . . .	1	2	3	4
A college or university	1	2	3	4

17. Think about a specific mathematics topic that you find difficult to teach.

a. What is the topic? ______________________________

b. On a scale of 1 to 5, how useful would each of the following be to you in facilitating your teaching of that topic?

(Circle one on each line)

	Not Useful				Extremely Useful
Learning more mathematics	1	2	3	4	5
Learning more about about applications of the mathematics	1	2	3	4	5
Learning new teaching methods	1	2	3	4	5
Learning about available instructional resources	1	2	3	4	5
Help in use of computers	1	2	3	4	5
More money to buy instructional materials	1	2	3	4	5
Discussing with other teachers what works for them	1	2	3	4	5
Observing a skilled teacher teaching that topic	1	2	3	4	5
Having time to develop instructional materials	1	2	3	4	5
More class time to teach the topic	1	2	3	4	5

SECTION C: MATHEMATICS INSTRUCTION IN YOUR SCHOOL

18. The following factors may affect mathematics instruction in your school as a whole. In your opinion, how great a problem is caused by each of the following?

(Circle one on each line)

	Serious Problem	Somewhat of a Problem	Not a Significant Problem
a. Belief that mathematics is less important than other subjects	1	2	3
b. Inadequate facilities	1	2	3
c. Insufficient funds for purchasing equipment and supplies	1	2	3
d. Insufficient numbers of textbooks	1	2	3
e. Poor quality of instructional materials	1	2	3
f. Inadequate access to computers .	1	2	3
g. Lack of student interest in mathematics	1	2	3
h. Inadequate student reading abilities	1	2	3
i. Difficulty in maintaining discipline	1	2	3
j. Not enough time to teach mathematics	1	2	3
k. Lack of teacher interest in mathematics	1	2	3
l. Teachers inadequately prepared to teach mathematics	1	2	3
m. Student absences	1	2	3
n. Mainstreaming of handicapped students	1	2	3
o. "Pull-out" of students; e.g., Chapter 1, learning disabled .	1	2	3
p. Lack of teacher planning time .	1	2	3
q. Inadequate articulation of instruction across grade levels	1	2	3
r. Class sizes too large	1	2	3
s. Inadequate diversity of mathematics electives.	1	2	3
t. Low enrollments in mathematics courses	1	2	3

19. Are you currently teaching any courses you are not certified to teach? If yes, write in the code for this course. (Refer to the list of code numbers at the end of this questionnaire.)

Code No.

Yes . . . . 1 Please specify: a. ____________

No . . . . 2 b. ____________

c. ____________

20. Are you currently teaching any courses that you do not feel adequately qualified to teach? If yes, write in the code for the course. (Refer to the list of code numbers.)

Code No.

Yes . . . . 1 Please specify: a. ____________

No . . . . 2 b. ____________

c. ____________

SECTION D: YOUR MATHEMATICS TEACHING

The remaining questions relate to your mathematics teaching in a particular class. If you teach more than one class of mathematics per day, select one class for which these questions should be answered.

21. a. What is the title of this course? ____________

b. Indicate the code number of this course. ____________ (Refer to the list of code numbers at the end of the questionnaire.)

22. a. How many students are there in this class? ____________

b. Please indicate the number of students in this class in each race/sex category:

	Male	Female
White (not of Hispanic origin)	____	____
Black (not of Hispanic origin)	____	____
Hispanic	____	____
Asian or Pacific Islander	____	____
American Indian or Alaskan Native	____	____
Other:		
(Please specify) ____________	____	____

23. What is the duration of this course?

	(Circle one)
Year	1
Semester	2
Quarter	3
Other	4
(Please specify) ____________________	

24. The ability makeup of this class is best described by which of the following? (Comparison should be with the average student in the grade.)

	(Circle one)
Composed primarily of high ability students	1
Composed primarily of low ability students	2
Composed primarily of average ability students . .	3
Composed of students of widely differing ability levels	4

25. On the average, about what percentage of this class's time allocated for mathematics instruction is spent in each of the following activities?

	Percent
a. Daily routines (such as passing out materials) . . .	_______
b. Interruptions (such as fire drills, school announcements, etc.)	_______
c. Getting students to behave	_______
d. Instruction	_______
Total	100%

26. Think about your plans for this class for the entire course. On a scale of 0 to 5, how much emphasis will each of the following objectives receive? (Circle one on each line.)

	None	Minimal Emphasis				Very Heavy Emphasis
a. Become interested in mathematics	0	1	2	3	4	5
b. Know mathematical facts, principles, algorithms, or procedures	0	1	2	3	4	5
c. Develop an attitude of inquiry	0	1	2	3	4	5
d. Develop an awareness of the importance of mathematics in everyday life	0	1	2	3	4	5
e. Perform computations with speed and accuracy	0	1	2	3	4	5
f. Develop an awareness of the importance of mathematics in the basic and applied sciences	0	1	2	3	4	5
g. Develop a systematic approach to solving problems?	0	1	2	3	4	5
h. Learn about the career relevance of mathematics	0	1	2	3	4	5

27. How often do you use each of the following techniques in teaching mathematics to this class? If a technique does not apply to your class, please circle 1, "Never."

	Never	Less Than Once a Month	At Least Once a Month	At Least Once a Week	Just About Daily
a. Lecture	1	2	3	4	5
b. Discussion	1	2	3	4	5
c. Student reports or projects .	1	2	3	4	5
d. Library work	1	2	3	4	5
e. Students working at chalkboard	1	2	3	4	5
f. Student using computers . . .	1	2	3	4	5
g. Students using calculators .	1	2	3	4	5
h. Students using hands-on, manipulative materials . .	1	2	3	4	5
i. Students doing seatwork assigned from the textbook	1	2	3	4	5
j. Students completing supplemental worksheets . .	1	2	3	4	5
k. Students working in teacher-led small groups	1	2	3	4	5
l. Students working in peer-led small groups	1	2	3	4	5
m. Student-to-student tutoring	1	2	3	4	5
n. Field trips, excursions . . .	1	2	3	4	5
o. Guest speakers	1	2	3	4	5
p. Teacher demonstrations . . .	1	2	3	4	5
q. Tests or quizzes	1	2	3	4	5
r. Homework assignments	1	2	3	4	5

28. For the following equipment and materials, please indicate the approximate number of days each is used in this mathematics class during the entire course. For those that you do not use, circle either 1, "Not needed" or 2, "Needed but not available."

(Circle one on each line)

	DO NOT USE Not Needed	DO NOT USE Needed But Not Available	Use Less Than 10 Days	Use Between 10 and 50 Days	Use More Than 50 Days
a. Games and puzzles	1	2	3	4	5
b. Handheld calculators	1	2	3	4	5
c. Computers or computer terminals	1	2	3	4	5
d. Metric measurement tools (rulers, containers, weights, etc.)	1	2	3	4	5
e. Nonmetric measurement	1	2	3	4	5
f. Activity cards or kits	1	2	3	4	5
g. Numeration and place value manipulative (rods, blocks, etc.)	1	2	3	4	5
h. Geometric tools	1	2	3	4	5
i. Models and solids	1	2	3	4	5
j. Graph paper	1	2	3	4	5
k. Audio visual materials (including overhead projector)	1	2	3	4	5

29. a. Are you using one or more published textbooks or programs for teaching mathematics to this class?

	(Circle one)	
Yes	1	(GO TO QUESTION 30)
No	2	(GO TO QUESTION 29b)

b. Briefly describe what you are using instead of a published textbook or program. THEN SKIP TO QUESTION 32.

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30. Indicate the title, author, publisher, copyright date, and edition of the one textbook/program used most often by the students in this class.

Title: ______________________________

Author: ______________________________

Publisher: ______________ Copyright Date: ______________

Edition: ______________

31. Approximately what percentage of the textbook will you "cover" in this course?

	(Circle one)
Less than 25%	1
26-40%	2
41-65%	3
66-80%	4
81-90%	5
More than 90%	6

32. Are computers (microcomputers or mainframe) available for use with this class?

Yes . . . . 1 (GO TO QUESTION 33)
No . . . . 2 (GO TO QUESTION 36)

33. How many computers are available for student use?

______ terminals

______ microcomputers

34. How does your class use computers? (Circle all that apply)

a. Teacher demonstration using a computer 1
b. Learning how to program 2
c. Learning mathematics content 3
d. Drill and practice 4
e. Using simulations 5
f. Using computer graphics 6
g. Games 7
h. Testing and evaluation 8
i. Other 9

35. On the average, how many minutes per week does a typical student spend working with computers?

_________________________ minutes/week

36. Do you encourage students to use calculators for the following things in this class?

(Circle one on each line)

	Yes	No
a. Checking answers	1	2
b. Doing computations	1	2
c. Solving problems	1	2
d. Taking tests	1	2

37. On the average, how many minutes of mathematics homework is the typical student in this class expected to complete each day?

_______________ minutes/day

PLEASE GO BACK AND CHECK THAT YOU HAVE RESPONDED TO ALL THE APPROPRIATE ITEMS. THANK YOU!

(The list of code numbers is on the back of this page.)

CODE LIST FOR COURSE TITLES

SECONDARY ONLY

MATHEMATICS	201	Mathematics, grade 7
	202	Mathematics, grade 8
	203	General mathematics, grade 9
	204	General mathematics, grades 10-12
	205	Business mathematics
	206	Consumer mathematics
	207	Pre-algebra/introduction to algebra
	208	First-year algebra
	209	Second-year algebra
	210	Geometry
	211	Trigonometry
	212	Probability/statistics
	213	Intro. computer awareness or literacy
	214	Advanced computer programming
	215	Computer programming
	216	Advanced placement computer science
	217	Remedial mathematics
	218	Advanced senior mathematics, not including calculus
	219	Advanced senior mathematics, including some calculus
	220	Calculus
	221	Advanced placement calculus
	222	Other mathematics

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