CHAPTER 6

MATHEMATICAL SCIENCE FACULTY IN TWO-YEAR COLLEGES

This chapter describes the number, educational qualifications, professional activities, and selected personal characteristics of two-year college mathematical science faculty. For two-year colleges the terms "mathematical science" and "mathematics" describe the same faculty and are used interchangeably in that context. There is generally no separate computer science faculty. Computer science type courses are taught in many mathematics departments or divisions and as shown in Table 5-5, are also widely taught in occupational and business type programs. See the questionnaire, Appendix C, for interpretation of "mathematics department". The chapter includes profiles of the age, sex, and ethnic composition of mathematics faculty and information on mobility into, within, and out of two-year college teaching positions. Also included is a section on the teaching environment of mathematics faculty. While, prior to the 1980 report separate profiles were given for public and private tyc faculties, in the 1980 report the two faculties were combined, since only about 5% of the total faculty was in private tyc's. We continue this pattern started in 1980.

HIGHLIGHTS
1980-85

- The full-time mathematics faculty increased by 12% since 1980 and now numbers 6,277.

- The part-time mathematics faculty also increased by 12% and now numbers 7,433. Since 1980, part-timers have accounted for more than

one-half of the total mathematics faculty.

- The percentage of doctorates on the mathematics faculty decreased from 15% to 13% of the total, the first decrease noted by CBMS since 1970.

- The percentage of mathematics faculty having highest degrees in computer science increased from 3% to 8%.

- The percentage of mathematics faculty having highest degrees in statistics increased to 3%.

- Women on the mathematics faculty increased to 31%, a gain of 10 percentage points in ten years.

- Ethnic minorities on the mathematics faculty increased to 12%, up from 8% in 1975.

- Overload teaching, usually for extra pay, remains prominent among tyc mathematics faculty, with 43% of faculty reported as teaching overloads.

- Standard teaching loads decreased for the first time since 1970.

- Remediation was cited as the biggest problem facing mathematics departments in the mid-80's.

NUMBER AND EDUCATIONAL QUALIFICATIONS OF TWO-YEAR COLLEGE FACULTY

As of fall 1985, two-year colleges employed 93,611 full-time faculty and 135,195 part-time faculty. More than 75% hold a master's degree and 14% hold a doctorate. Since two-year colleges emphasize teaching and not research, two-year college faculty spend significantly more time in the classroom than do faculty in four-year colleges and universities. Most two-year college faculty teach about 16 hours per week.

Since more than 50% of all students enrolled at two-year colleges are taking courses in occupational fields, faculty trained and experienced in such areas as health technologies, business, data processing, and public service fields and disciplines that serve these fields are currently in greatest demand. Even so, our survey results show that the growth, since 1980, of the full-time equivalent (FTE) mathematics faculty was 12%, in marked contrast to the 7% decrease of <u>all</u> two-year college faculty shown in Graph 6-A.

GRAPH 6 - A

NUMBERS OF FULL-TIME EQUIVALENT (FTE) TYC FACULTY, ALL FIELDS
(In Thousands)

	1970	1975	1980	1985
FTE Faculty	82,000	117,000	150,000	139,000

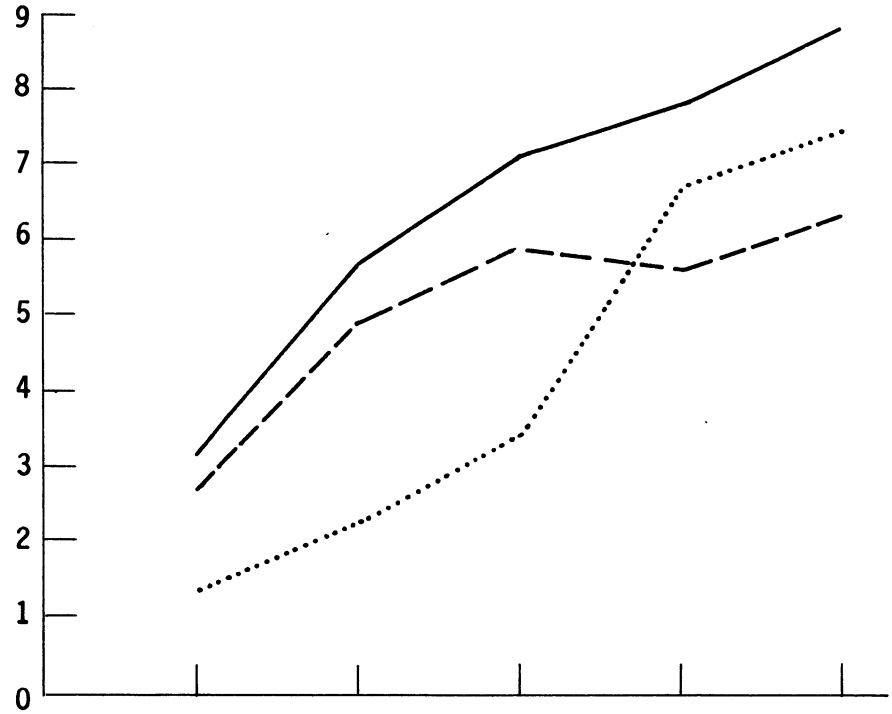
SOURCE: 1986 Community, Junior, and Technical College Directory

TRENDS IN NUMBERS OF FULL- AND PART-TIME MATHEMATICS FACULTY

For mathematics in two-year colleges, part-time faculty now outnumber full-time faculty, making up 54% of the total. For all fields in tyc's, part-timers constitute 59% of the faculty. The part-time component of the mathematics faculty increased by 12% over the period 1980-1985, down sharply from the 95% increase observed in 1975-1980. The 12% increase in the size of the full-time faculty matched the increase of the part-time faculty.

GRAPH 6 - B

FULL- AND PART-TIME MATHEMATICS FACULTY DISTRIBUTION OVER TIME
(In Thousands)



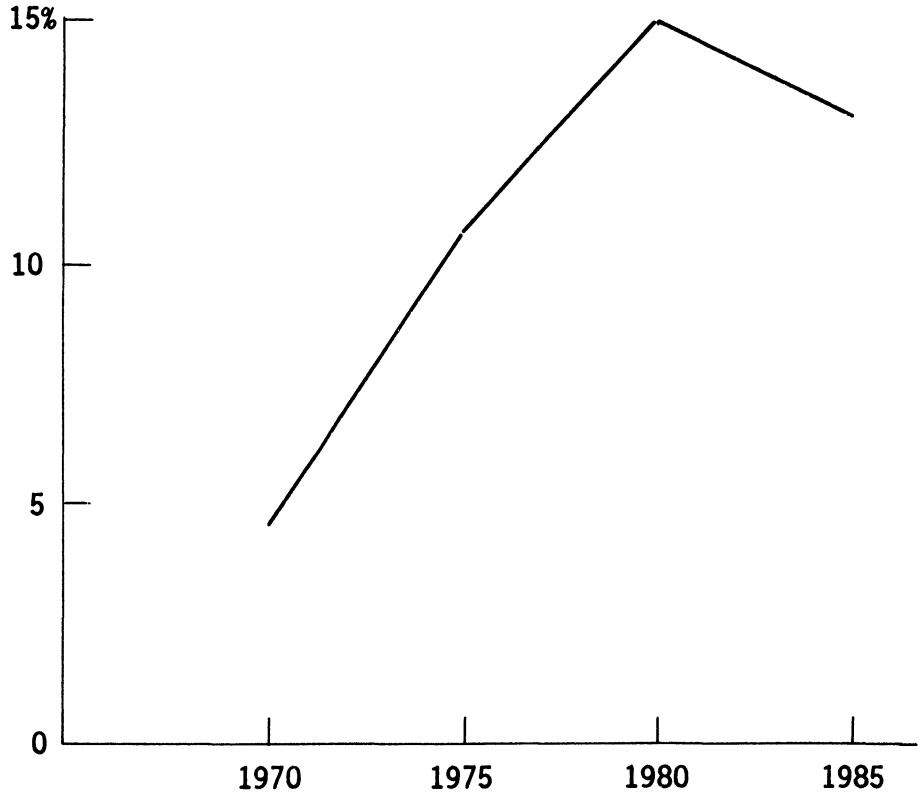
	1966	1970	1975	1980	1985
Full-Time — — — — — — —	2677	4879	5944	5623	6277
Part-Time	1318	2213	3411	6661	7433
Full-Time Equivalents ———	3116	5617	7081	7843	8755

TRENDS IN DOCTORATES AMONG FULL-TIME MATHEMATICS FACULTY

The percentage of doctorates among the full-time mathematics faculty in two-year colleges declined over the period 1980-1985. This ends a period of steady growth in the percentage of doctorates on mathematics faculty. The current figure of 13% is close to the 14% figure of doctorates on the total tyc faculty. The percentage of doctorates on the four-year college and university mathematical and computer science faculty also decreased over the period 1980-1985.

GRAPH 6 - C

PERCENTAGE OF DOCTORATES AMONG FULL-TIME MATHEMATICS FACULTY



	1970	1975	1980	1985
Percentage Doctorates	4.5%	10.6%	15.0%	13.0%

HIGHEST ACADEMIC DEGREES OF FULL-TIME MATHEMATICS FACULTY 1985

Table 6-1 gives the percentages of the total tyc mathematics faculty by field of highest degree and the level of that training. Since 1980 the percentages of the faculty holding highest degrees in statistics and in computer science went up markedly, from 1% to 3% in statistics and from 3% to 8% in computer science. But note that fewer than one-half of one percent had doctorates in these areas. Except for increases at the non-doctorate levels in computer science and statistics, the overall matrix for 1985 is very similar to that for 1980. The degree level "Masters +1" (or Mast. +1) refers to one year beyond the Masters level.

TABLE 6 - 1

TYC FULL-TIME MATHEMATICS FACULTY BY FIELD AND LEVEL OF HIGHEST DEGREE

	Degree Level				
Field	Doct.	Mast.+ 1	Masters	Bachelors	Total
Mathematics	6%	26%	24%	2%	58%
Statistics	0%	1%	1%	1%	3%
Computer Science	0%	3%	4%	1%	8%
Mathematics Educ.	4%	6%	8%	0%	18%
Other Fields	3%	3%	6%	1%	13%
Total	13%	39%	43%	5%	100%

TABLE 6 - 2

DEGREE STATUS OF FULL-TIME TYC MATHEMATICS FACULTY, 1970-1985
(As Percent of Total Full-Time Mathematics Faculty)

Highest Degree	1970	1975	1980	1985
Doctorate	4%	11%	15%	13%
Masters + 1 year	47%	35%	38%	39%
Masters	42%	47%	42%	43%
Bachelors	7%	7%	5%	5%

AGE, SEX, AND ETHNIC COMPOSITION OF TWO-YEAR COLLEGE MATHEMATICS FACULTY

Since 1980 the full-time faculty in mathematics has increased by 12% at a time when there has been a percentage decrease in the group under age 40 and a percentage increase in the 40-49 age group. There are continuing indications that a substantial number of faculty in the over 45 age group are leaving two-year college mathematics teaching.

During the ten-year period 1975-85, the female percentage of two-year college full-time mathematics faculty has risen from 21% to 31%, with a numerical increase in the number of female faculty from 1,250 in 1975 to 1,946 in 1985. From 1980 to 1985, the rate of growth of the number of women on the two-year college mathematics faculty was three times the growth rate of the overall mathematics faculty.

Ethnic minorities have continued to increase, from 8% of the total faculty in 1975 to 12% in 1985.

TRENDS IN AGE DISTRIBUTION OF FULL-TIME MATHEMATICS FACULTY, 1975-1985

Trite as it may sound, the full-time tyc mathematics faculty is not getting any younger. In 1975, 47% of the faculty was under 40 years of age; today the figure is 34%. Over the same ten year period, the percentage between 40 and 49 has increased from 28% to 42%. The percentage of faculty over 50 years of age has remained fairly steady.

In Table 6-3 the trends since 1975 of the age composition of the full-time faculty are shown. The diagonal arrows indicate the translation of an age group to the corresponding five year older group five years later. Clearly, hiring occurs up to age 45 or 50. The table also indicates early retirements or dropouts among faculty who were over 45 years of age in 1980.

TABLE 6 - 3

AGE DISTRIBUTION OF FULL-TIME TYC MATHEMATICS FACULTY

	Percent of Full-Time Mathematics Faculty			Number of Full-Time Mathematics Faculty			Change: 1980-1985
Age Range	1975	1980	1985	1975	1980	1985	
< 30	9%	5%	5%	535	281	314	314
30-34	18%	15%	11%	1070	843	690	409
35-39	20%	24%	18%	1188	1350	1130	287
40-44	15%	18%	24%	892	1012	1506	156
45-49	13%	16%	18%	773	900	1130	118
50-54	13%	10%	13%	773	562	816	-84
55-59	8%	7%	7%	475	394	439	-123
60 or more	4%	5%	4%	238	281	252	-142
Totals				5944	5623	6277	

AGE DISTRIBUTION OF FULL-TIME MATHEMATICS FACULTY BY SEX, 1985

From 1975 to 1985 the number of women on full-time mathematics faculties of two-year colleges has increased from 21% to 31% of the total. As might be expected, women are more heavily represented in younger age groups, with more than one-fourth less than 35 years of age. Only 28% of female faculty members are 45 or more years of age as contrasted to 48% of male faculty members. The total number of men is 4,331 and the total number of women is 1,946.

TABLE 6 - 4

1985 AGE DISTRIBUTION OF FULL-TIME FACULTY BY SEX

Age Range	Male	Female
< 35	13%	26%
35-44	40%	45%
45-54	36%	19%
55 or more	12%	9%

Totals may not be 100% due to rounding.

ETHNIC GROUPS AMONG FULL-TIME MATHEMATICS FACULTY, 1985

The ethnic-group distribution of the full-time mathematics faculty of two-year colleges in 1985 is shown in the Table 6-5. The total minority-group fraction is now 12%, up from 8% in 1975. Hispanics registered the greatest gains. (The total number of non-Caucasian ethnic group faculty is 753.)

TABLE 6 - 5

1985 ETHNIC GROUP DISTRIBUTION OF FULL-TIME FACULTY

Ethnic Group	Percentage of Total
Caucasian	88%
Asian	3%
Hispanic	4%
Black	4%
American Indian	1%

The age distribution of the ethnic minority part of the full-time mathematics faculty of two-year colleges in 1985 is shown in Table 6-6. It differs from the overall faculty age distribution shown in Table 6-3 primarily in having a larger fraction under age 35 and a smaller fraction of age 55 or over, but is quite similar to the female faculty age distribution shown in Table 6-4.

TABLE 6 - 6

1985 AGE DISTRIBUTION OF ETHNIC MINORITY FACULTY

Age Range	Percent of Total Ethnic Minority Faculty
< 30	27%
35-44	46%
45-54	20%
55 or more	7%

PART-TIME MATHEMATICAL SCIENCE FACULTY IN TWO-YEAR COLLEGES

The part-time faculty now numbers 7,433 and increased by 12% over the period 1980-1985, down sharply from a 95% increase in 1975-1980. Overall, for all fields, part-timers account for 59% of the two-year college faculty. Mathematics, until the year 1980, used part-timers more sparingly than did other departments, but now the part-time fraction is 54%. For all intents and purposes, mathematics faculty now have the dubious distinction of being on a vertical par with other departments.

As compared with the 1970 figures, the percentages of part-time mathematics faculty in the doctorate or "masters + 1" highest degree categories have declined. During the same fifteen-year period, the percentage of part-timers in the bachelors category has doubled and is now more than one-fourth of the total. Given an increase in the number of industrial opportunities for mathematicians, it is not likely that the educational qualifications of part-timers will soon increase.

TABLE 6 - 7

DEGREE STATUS OF PART-TIME MATHEMATICS FACULTY SINCE 1970
(As Percentage of Total Part-time Mathematics Faculty)

Highest Degree	1970	1975	1980	1985
Doctorate	9%	4%	7%	7%
Masters + 1	31%	30%	18%	15%
Masters	46%	49%	58%	50%
Bachelors	14%	17%	17%	28%

HIGHEST ACADEMIC DEGREES OF PART-TIME MATHEMATICS FACULTY, 1985

As might be expected, the degree qualifications of the full-time faculty exceed those of the part-time faculty. Compare Table 6-8 below with Table 6-1.

TABLE 6 - 8

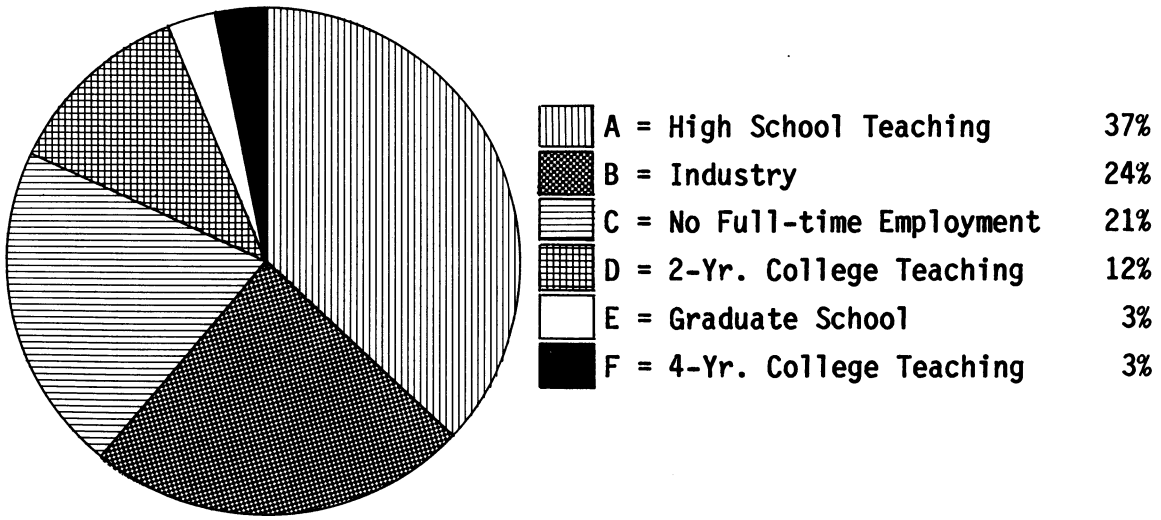
TYC PART-TIME MATHEMATICS FACULTY BY FIELD AND LEVEL OF HIGHEST DEGREE

Field	Percent with Highest Degree			
	Doctorate	Masters + 1	Masters	Bachelors
Mathematics	3%	8%	30%	17%
Statistics	1%	0%	0%	0%
Computer Science	0%	1%	1%	3%
Mathematics Educ.	1%	4%	7%	3%
Other Fields	2%	2%	12%	5%
Totals	7%	15%	50%	28%

For 1985, high school teachers constitute the largest source of part-time mathematics faculty in two-year colleges, as shown in Graph 6-D.

GRAPH 6 - D

SOURCES OF PART-TIME FACULTY AS PERCENTAGES OF TOTAL



SOURCES OF NEW FULL-TIME MATHEMATICS FACULTY IN TWO-YEAR COLLEGES, 1985

Twenty-nine percent of new full-time mathematics faculty in 1985 entered two-year college mathematics teaching directly from graduate school. Teaching part-time in a two-year college continues to be a viable path to full-time status, with 25% of new hires coming from that source. High schools seem to be a smaller source of new faculty than they were earlier. A 1979 survey showed that more than 60% of all mathematics faculty in two-year colleges had previously taught in secondary schools.*

TABLE 6 - 9

INFLOW OF NEW FULL-TIME MATHEMATICS FACULTY 1985

Source	- - - - Type of Doctorate - - - - Math.	Math. Ed.	Other	None	Totals
Graduate School	17	0	2	134	153
Employed by same tyc	2	0	4	123	129
Teaching in another tyc	0	0	2	76	78
Teaching in a secondary school	0	7	4	59	70
Non-academic employment	0	0	0	39	39
Teaching in four-year college or univer.	2	0	2	13	17
Otherwise occupied or unknown	0	0	32	2	34
Totals	21	7	46	446	520

* Robert McKelvey, Donald J. Albers, Shlomo Liebeskind, and Don O. Loftsgaarden, An Inquiry into the Graduate Training Needs of Two-Year College Teachers of Mathematics, Rocky Mountain Mathematics Consortium, 1979.

FULL-TIME MATHEMATICS FACULTY LEAVING TWO-YEAR COLLEGES, 1985

The "death or retirement" category is at variance with the 1980 age distribution constructed by CBMS. The 1980 age distribution showed 5% of the faculty to be over 60 years of age. Assuming retirement at an average age of 65 that translates to approximately 56 retirements per year. Our total of 217 is about four times that estimate and suggests other phenomena at work, perhaps early retirements. A substantial portion of the 55-59 age group left two-year college teaching between 1980 and 1985. Many of them may be in the retiree group. In contrast to retirement conditions in four-year colleges and universities, many two-year colleges may have retirement systems like the those in public school systems, thereby presumably encouraging early retirements.

TABLE 6 - 10

OUTFLOW OF FULL-TIME MATHEMATICS FACULTY 1985

Source	Type of Doctorate				Totals
	Math.	Math. Ed.	Other	None	
Died or retired	10	10	2	195	217
Teaching in 4-Yr. College or Univ.	10	0	5	47	62
Teaching in a sec. school	0	0	0	42	42
Non-academic employment	0	0	5	29	34
Teaching in a 2-Yr. College	10	0	0	18	28
Otherwise occupied or Unknown	0	0	0	66	66
Returned to Grad. school	0	0	0	0	0
Totals	30	10	12	397	449

THE TEACHING ENVIRONMENTS OF MATHEMATICS FACULTY IN TWO-YEAR COLLEGES

There is evidence in our CBMS Survey data that the teaching environments of two-year college mathematics faculty have improved since 1980. The bulk of that evidence is contained in the next three tables dealing with the number of students taught by an average faculty member, professional activities, and problems of the mid-80's. These tables tell us the following about two-year college mathematics faculty over the period 1980-85:

1. Student loads per FTE faculty have decreased.
2. Professional activity of faculty has increased.
3. There is a greatly increased concern about the use of part-time faculty for instruction and a heightened interest in maintaining vitality of faculty.

TRENDS IN STUDENT LOADS FOR TWO-YEAR COLLEGE MATHEMATICS FACULTY

Student loads have decreased sharply in two-year college mathematics programs, down by 16 students per FTE faculty member. In 1985, mathematics program heads reported that 43% of the full-time faculty were teaching overloads, usually one additional course (3 semester hours) beyond the standard load of 16 contact hours. Department heads reported that not all faculty teaching overloads received additional pay for such work. They, in fact, reported that 29% of faculty teaching overloads did <u>not</u> receive extra compensation. This overload faculty work might mask an undercount of the part-time share in FTE faculty time and thus overestimate the number of students per FTE faculty member. For the faculty actually teaching the overloads, the added responsibility means they must provide mathematics instruction for even more students.

The total number of sections taught by part-time faculty was 11,900, 28% of the total number of sections. This figure is supported by the FTE number of part-time faculty, 2,478, which is 28% of the total FTE faculty. (The average teaching load of full-time faculty is 16.1 contact hours and for part-timers it is 5.7). The ratio 5.7/16.1=0.35 provides support for the 1/3 conversion factor used in computing FTE (full-time equivalent faculty) numbers.

GRAPH 6 - E

MATHEMATICS ENROLLMENTS PER FTE FACULTY MEMBER

	1966	1970	1975	1980	1985
Math. Enrollments	348,000	584,000	874,000	1,048,000	1,034,000
Full-Time Equiv. Faculty (FTE)	3,116	5,617	7,081	7,843	8,755
Enrollments per FTE	112	104	123	134	118

PROFESSIONAL ACTIVITIES OF FULL-TIME MATHEMATICS FACULTY

Mathematics program heads in two-year colleges reported a continuing increase in professional activities of the faculty from 1975 to 1985. There is now more participation in conference attendance, reading of journals, and continuing education. Only textbook writing appears to have declined.

TABLE 6 - 11

PERCENT OF FACULTY ENGAGING IN ACTIVITY

Activity	1975	1980	1985
Attends at least one profess. mtg. per year	47	59	70
Taking additional math. or computer science courses during the year	21	22	31
Attend mini-courses or short courses	NA*	NA	31
Giving talks at professional meetings	9	15	16
Regular reading of articles in prof. journals	47	57	72
Writing of expository and/or popular articles	5	6	6
Publishing research articles	NA	NA	3
Writing textbooks	15	10	4

*NA denotes not available

ADMINISTRATION OF MATHEMATICS PROGRAMS IN TWO-YEAR COLLEGES

Department heads have served in their positions for an average period of 8 years. Rotating department heads can be found in 22% of those two-year colleges reporting the existence of a department head, with 3 years being the typical length of term. When asked to indicate the most serious problems they faced, the administrators mentioned most frequently the use

of temporary faculty, "dealing with remediation", the use of part-time faculty, salary patterns, and problems related to computer facilities.

TABLE 6 - 12

PROBLEMS OF THE MID-80's

	Rank	Percent Classifying Problem As Major
The need to use temporary faculty for instruction	1	61%
Remediation	2	60%
Salary levels/patterns	3	53%
Computer facilities for classroom use	4	50%
Departmental support sources (travel funds, staff, secretary, etc.)	5	41%
Maintaining vitality of faculty	6	39%
Staffing computer science courses	7	34%
Upgrading/maintaining computer facilities	8	30%
Computer facilities for faculty use	9	27%
Class size	9	27%
Advancing age of tenured faculty	11	25%
Coordinating math. courses for four-year colleges and universities	12	22%
Classroom/lab facilities	13	21%
Coordinating and/or developing math. with voc./tech. programs	14	20%
Coordinating math. courses with sec. schools	15	19%
Office/lab facilities	15	19%
Library: holdings, access, etc.	17	7%
Lack of experienced senior faculty	17	7%
Losing full-time faculty to industry/government	17	7%

* Department heads used a six-point scale in rating the problems. "Major problem" corresponds to an answer of 5 or 6 on the six-point scale.