

## Chapter 5

## 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.) The chapter includes profiles of the age, sex, and ethnic composition of these 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.

Highlights

- o During the period 1975-1980 the full-time mathematical science faculty *decreased* by 5% and the part-time faculty *increased* by 95%.
- o The percentage of doctorates among two-year college mathematics faculty increased to 15%.
- o The percentage of women among full-time mathematics faculty increased to 25%.
- o High schools continue to be the largest supplier of part-time mathematics faculty in two-year colleges.
- o Teaching loads are up by 30 students per faculty member since 1970, and nearly half of the full-time faculty are teaching overloads as well.
- o Dealing with remediation was identified as the biggest problem facing two-year college mathematics faculty in 1980.

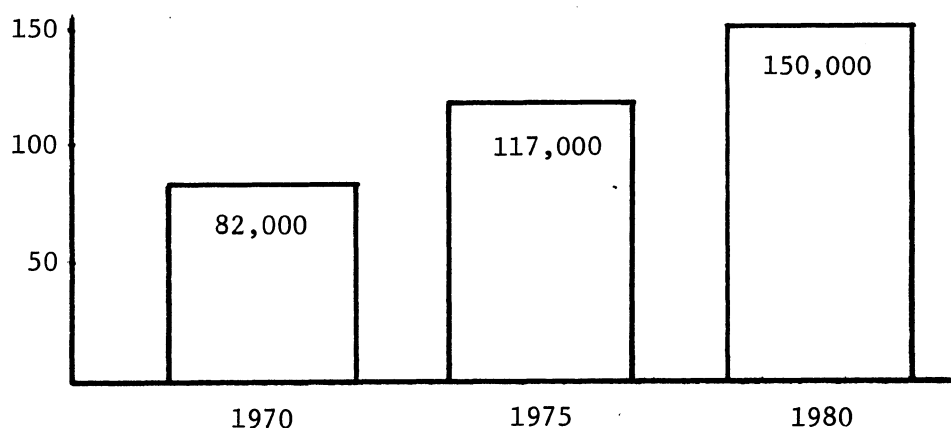
The data in this chapter support and elaborate these and other findings of the 1980 survey.

### 5.1 Number and Educational Qualifications of Two-Year College Faculty

As of fall 1980, two-year colleges employed 105,000 full-time faculty and 134,000 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 15 hours per week.

Since more than 50% of all students enrolled at two-year colleges are taking courses in occupational/technical fields, faculty trained and experienced in such areas as health technologies, business, data processing, and public service fields are currently in greatest demand. Our survey results show, in fact, that the growth of the full-time equivalent (FTE) mathematics faculty was 11%, considerably less than the 28% growth rate of *all* two-year college faculty. This disparity in growth rates is further magnified by the growth of mathematics enrollments (+20%), and has resulted in an average increase of 11 mathematics enrollments per FTE faculty member. The period 1970-75 showed an increase of 19 enrollments per faculty member. Thus, over the last ten years (1970-1980) teaching loads have increased by 30 students per full-time-equivalent faculty member!

Figure 5.1  
(numbers of FTE TYC faculty, all fields, in thousands)

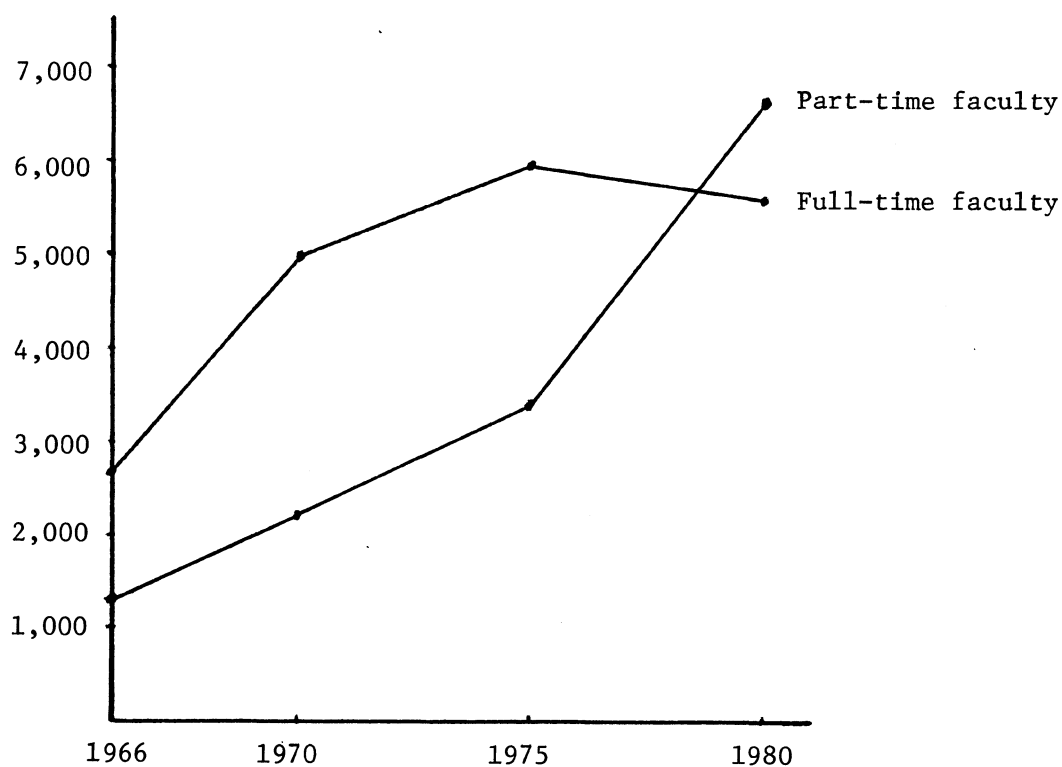


Source: American Association of Community and Junior Colleges Directories, 1971, 1976, 1981.

## 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. The part-time component of the mathematics faculty increased by 95% over the period 1970-1975. Equally striking is the *decrease* in the size of the full-time faculty. For *all* fields in TYC's, part-timers constitute 56% of the faculty.

Figure 5.2  
(numbers of mathematics faculty)



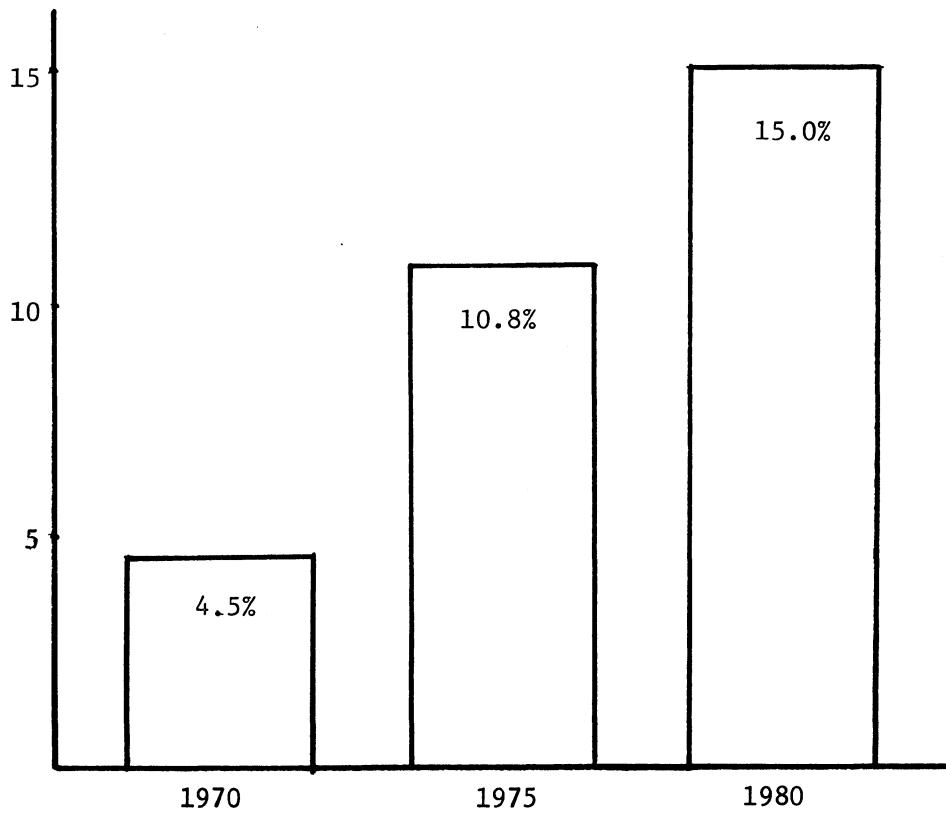
	1966	1970	1975	1980
Full-Time	2677	4879	5944	5623
Part-Time	1318	2213	3411	6661
FTE	3116	5617	7081	7843

## TRENDS IN DOCTORATES AMONG FULL-TIME MATHEMATICS FACULTY

The percentage of doctorates among the full-time mathematics faculty in two-year colleges continued to grow at about one percent per year over the period 1975-1980. Department heads reported that 92 two-year college mathematics faculty earned doctorate degrees between 1979 and 1980, mostly in mathematics education and other fields.

Figure 5.3

(doctorates as a percentage of full-time mathematics faculty)



## HIGHEST ACADEMIC DEGREES OF FULL-TIME MATHEMATICS FACULTY, 1980\*

From 1970 to 1980, the percentage of the two-year college mathematics faculty with doctorates has increased from 5% to 15%, the master's fraction has not changed, and the "master's +1" fraction has decreased from 47% to 38%. The 9% *decrease* in the master's +1 group is nearly equal to the 10% *increase* in the doctorate group.

Table 5.1

Field	Percent with Highest Degree			
	Doctorate	Master's +1	Master's	Bachelor's
Mathematics	6.2%	28.8%	25.5%	3.3%
Statistics	0.3%	0.3%	0.1%	0
Computer Science	0.2%	1.3%	0.7%	0.5%
Mathematics Education	5.1%	4.9%	12.1%	0
Other Fields	<u>3.2%</u>	<u>2.7%</u>	<u>3.9%</u>	<u>1.0%</u>
Totals	15.0%	38.0%	42.3%	4.8%

\*Previous CBMS surveys have reported separately on public and private two-year college faculty. Since the private component constitutes approximately 5% of the total faculty, the two components are combined in this report.

## 5.2 Age, Sex, and Ethnic Composition of Two-Year College Mathematics Faculty

Since 1975 the full-time faculty in mathematics has *decreased* by 5%. This has led to an increase in the average age of the faculty, with fewer in the under 35 range and more in the 35-44 range. There are indications of a substantial number of faculty in the 45-60 year age range leaving two-year college mathematics teaching.

During the five year period 1975-1980, the female fraction of two-year college mathematics faculty has risen from 21% to 25%, and there was an actual increase in the number of female faculty from 1250 in 1975 to 1396 in 1980. It thus appears that most of the overall decrease in the mathematics faculty of two-year colleges is due to an outflow of men.

Ethnic minorities have increased slightly, from 8% of the total faculty in 1975 to 9% in 1980. This percentage increase does not, however, suggest an increase in the number of ethnic minority faculty members.

## TRENDS IN AGE DISTRIBUTION OF FULL-TIME MATHEMATICS FACULTY, 1975-1980

As shown in the percentage and number tabulation below, the percentage of full-time mathematics faculty younger than age 35 has decreased over the period 1975-1980, while the percentage in the age range 35-44 has increased correspondingly. Nevertheless, the tabulation of *numbers* of faculty below, suggest that new hires have augmented the group that was under age 35 in 1975. The group that was in the age range 35-44 in 1975 seems to have remained fairly stable, while the group that was over 45 in 1975 has declined in size. The decline may be due to early retirement, "burnout", and moves to employment economically more attractive than teaching.

Table 5.2

Age Range	Percent of Full-Time Mathematics Faculty		Number of Full-Time Mathematics Faculty	
	1975	1980	1975	1980
<30	9	5	535	281
30-34	18	15	1070	843
35-39	20	24	1188	1350
40-44	15	18	892	1012
45-49	13	16	773	900
50-54	13	10	773	562
55-59	8	7	475	394
<u>&gt;60</u>	4	5	<u>238</u>	<u>281</u>
			5944	5623

AGE DISTRIBUTION OF FULL-TIME MATHEMATICS FACULTY  
BY SEX AND BY EDUCATIONAL LEVEL, 1980

From 1975 to 1980 the women on full-time mathematics faculties of two-year colleges increased from 21% to 25% of the total. As might be expected, women are more heavily represented in younger age ranges, with nearly one-third less than 35 years of age.

Faculty in the 35-44 year range are more likely to hold doctorates than the other age groups, with 52% of all doctorates held by faculty in that age group.

Table 5.3

Age Range	Sex		Highest Degree	
	Male	Female	Doctorate	Master's
<35	16%	31%	17%	18%
35-44	45%	35%	52%	43%
45-54	27%	24%	19%	27%
≥55	12%	10%	12%	12%



## ETHNIC GROUPS AMONG FULL-TIME MATHEMATICS FACULTY, 1980

The ethnic-group distribution of the full-time mathematics faculty of two-year colleges in 1980 is shown in the table below. The total minority-group fraction has increased by 1% since 1975.

Table 5.4

Ethnic Group	Percentage of Total*
Caucasian	93
Asian	3
Hispanic	1
Black	3
Amerindian	1

\*Percentages do not add to 100% because of rounding.

The age distribution of the ethnic minority part of the full-time mathematics faculty of two-year colleges in 1980 is shown below. It differs from the overall age distribution (Table 5.2) primarily in having a larger fraction under age 35 and a smaller fraction of age 55 or over.

Table 5.5

Age Range	Percent of Total Ethnic Minority Faculty
<35	28
35-44	38
45-54	30
>55	4

### 5.3 Part-Time Mathematical Science Faculty in Two-Year Colleges

While the full-time faculty decreased in size over the period 1975-1980, the part-time component increased by nearly 100%. Part-timers now outnumber full-timers by more than 1000. Overall, for all fields, part-timers account for 45% of the two-year college faculty. Mathematics, until the year 1980, used part-timers more sparingly than did other departments. For all intents and purposes, mathematics faculty now have the dubious distinction of being on a par with other departments.

The growth of the part-time sector is often linked to fiscal concerns. Of late, during periods of relatively high inflation, part-timers have been employed at an increasing rate to staff full-time positions that have resulted from deaths, retirements, etc. Until economic conditions improve, given that part-timers cost less, there is little reason to believe that the part-time fraction will decrease. Qualifications of part-time faculty may thus take on added importance in the 80's.

EDUCATIONAL QUALIFICATIONS OF PART-TIME MATHEMATICS FACULTY

As compared with the 1970 figures, the percentages of part-time mathematics faculty in the doctorate or "master's +1" highest degree categories have declined. Given an increase in the number of industrial opportunities for mathematicians, it is not likely that the educational qualifications of part-timers will increase in the near future.

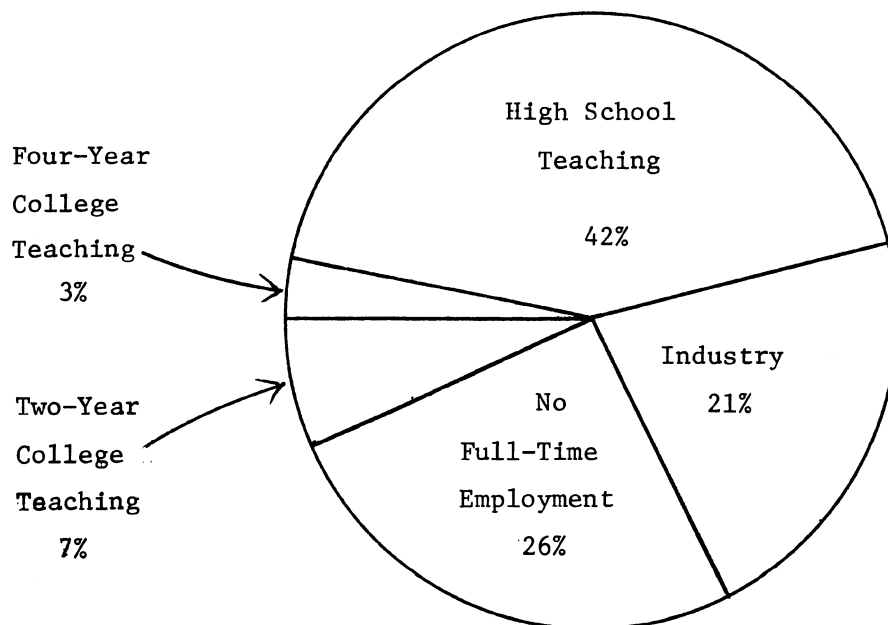
Table 5.6

Highest Degree	1970	1975	1980
Doctorate	9.5%	3.9%	6.7%
Master's + 1 year	31.0%	29.9%	18.1%
Master's	45.5%	49.6%	57.6%
Bachelor's	14.0%	16.6%	17.4%

For 1980, high school teachers constitute the largest source of part-time mathematics faculty in two-year colleges, as shown in the figure below.

Figure 5.4

(percent of part-time faculty from source shown)



## HIGHEST ACADEMIC DEGREES OF PART-TIME MATHEMATICS FACULTY, 1980

In general, the highest-degree qualifications of the full-time faculty (Table 5.1) exceed those of the part-time faculty, as would be expected.

Table 5.7

Field	Percent with Highest Degree			
	Doctorate	Master's +1	Master's	Bachelor's
Mathematics	2.9%	10.7%	35.3%	11.2%
Statistics	0	0.4%	0.9%	0.1%
Computer Science	0.2%	0.1%	0.6%	0.2%
Mathematics Education	0.8%	5.0%	13.1%	3.4%
Other Fields	<u>2.8%</u>	<u>1.9%</u>	<u>7.7%</u>	<u>2.5%</u>
Totals*	6.7%	18.1%	57.6%	17.4%

\*Totals do not add to 100% because of rounding.

#### 5.4 Faculty Mobility

This section reports our findings regarding flows into and out of the full-time mathematics faculty of two-year colleges in 1980. For those with highest academic degree at the bachelor's level these flows were negligibly small. Mathematics faculty mobility within the two-year college community, that is, faculty moving from one two-year college to another, of course did not contribute to these overall net flows and occurred at only about one-quarter the level of these overall flows.

The primary sources of new full-time mathematics faculty in two-year colleges are, in order, four-year colleges and universities, high schools, and part-timers. In spite of our observed decrease in the size of the full-time faculty from 1975 to 1980, the data for 1980 alone show the number leaving two-year colleges (237) to be less than the number entering (304). Perhaps the decline in size of the full-time faculty is reversing.

SOURCES OF NEW FULL-TIME MATHEMATICS FACULTY IN  
TWO-YEAR COLLEGES, 1980

One-third of new full-time mathematics faculty in 1980 have previously taught in four-year colleges or universities. Most of the members of that transfer group were holders of master's degrees. High schools continue to be a strong source of new faculty. Overall, over 60% of all mathematics faculty in two-year colleges have previously taught in secondary schools. Teaching part-time in a two-year college also seems a viable path to full-time status.

Table 5.8

Source	Doctorates		Master's	Total
	Mathematics	Mathematics Education		
Graduate school	0	8	21	29
Teaching in a four-year college or university	13	0	88	101
Teaching in a secondary school	0	4	92	96
Part-time employment in institution	10	0	50	60
Non-academic position	6	0	12	18
Other sources, or unemployed	0	0	0	0
Total new TYC faculty	29	12	263	304
Transfers between TYC's	16	6	45	66

## FULL-TIME MATHEMATICS FACULTY LEAVING TWO-YEAR COLLEGES, 1980

The "death or retirement" category is consistent with the 1975 age distribution constructed by CBMS. The 1975 age distribution showed 4% of the faculty to be over 60 years of age. That translates to approximately 48 retirements per year.

Table 5.9

	Doctorates		Master's	Total
	Mathematics	Math. Ed.		
Death or retirement	0	0	65	65
Teaching in four-year college or university	13	6	10	29
Non-academic position	6	0	17	23
Secondary school teaching	0	0	20	20
Returned to graduate school	0	0	21	21
Other, or unemployed	<u>0</u>	<u>0</u>	<u>79</u>	<u>79</u>
Total leaving TYC's	19	6	212	237

### 5.5 The Teaching Environment of Mathematics Faculty in Two-Year Colleges

Two-year colleges have changed rapidly over the last 20 years. Their explosive growth of the sixties, coupled with open-door admission policies, has changed the complexion of these institutions in significant ways. Gone are the days of their nearly exclusive junior college transfer role. Many two-year colleges, particularly in the west and southwest, have greatly expanded their scope to include a host of vocational programs. The great growth in part-time and female enrollments has also changed their clientele in a significant way.

Over the last five years, we have observed changes in two-year colleges which probably relate directly to the economic plight of these institutions:

1. Teaching loads have increased substantially.
2. Nearly half of the faculty are teaching overloads.
3. The part-time faculty has nearly doubled in size since 1975!
4. The full-time faculty has decreased in size!

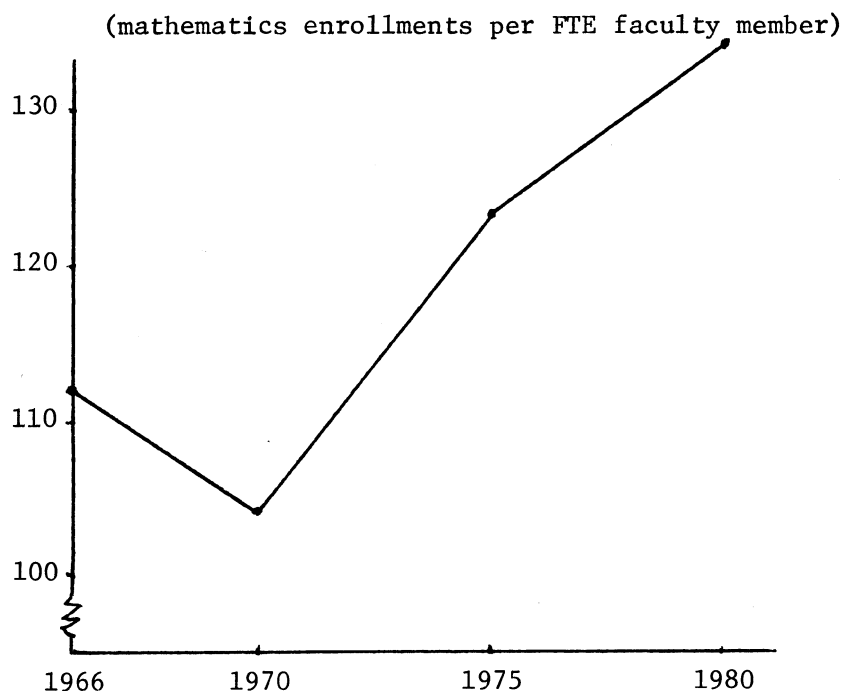
In this section, we report on trends in mathematics teaching loads in two-year colleges, trends in professional activities of full-time mathematics faculty outside the classroom, and problems of the administration of mathematics programs in two-year colleges.



## TRENDS IN MATHEMATICS TEACHING LOADS IN TWO-YEAR COLLEGES

Since 1970, teaching loads have increased sharply in TYC mathematics programs, up by 30 students per FTE faculty member. In 1980, mathematics program heads reported that 44% of the full-time faculty were teaching overloads, usually one additional course beyond the standard load of 15 contact hours. While 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 responsibility means even more students to whom they must provide mathematics instruction. Overload teaching was reported at 88% of responding TYC's.

Figure 5.5



	1966	1970	1975	1980
Mathematics Enrollments	348,000	584,000	874,000	1,048,000
Full-Time E. Faculty	3,116	5,617	7,081	7,843
Enrollments per FTE	112	104	123	134

## PROFESSIONAL ACTIVITIES OF FULL-TIME MATHEMATICS FACULTY

Mathematics program heads in two-year colleges reported an increase in professional activities of the faculty from 1975 to 1980. There is now more participation in conferences and reading of journals. Only textbook writing appears to have declined.

Table 5.10

Activity	Percent of Faculty Engaging in Activity	
	1975	1980
Attendance at at least one mathematics conference per year	47	59
Taking additional graduate courses during the academic year or summer	21	22
Giving talks on mathematics at conferences	9	13
Giving talks on mathematics education at conferences	9	16
Regular reading of journal articles on mathematics	47	56
Regular reading of journal articles on mathematics education	47	58
Writing journal articles on mathematics	5	5
Writing journal articles on mathematics education	5	6
Writing textbooks	15	10

## ADMINISTRATION OF MATHEMATICS PROGRAMS IN TWO-YEAR COLLEGES

The existence of separate mathematics departments in two-year colleges is far from universal: only 38% of TYC's have separate mathematics departments. Another 45% maintain combined mathematics and science units. No departmental structure was reported in 6% of TYC's, and 11% have other types of structures containing mathematics.

Department heads have served in their positions for an average period of 7 years. Rotating department heads can be found in 11% of those TYC's reporting the existence of a department head, with 2 years being the typical length of term. When asked to indicate the most serious problems they faced, the administrators mentioned frequently only "dealing with remediation". More than half the administrators saw no problems concerning the part-time component, increased teaching loads, coordination of vocational-technical programs, continuing education of faculty, losing faculty to industry, and coordination with four-year colleges.\*

Table 5.11

Problem	Major and Continuing Problem	Minor Irritant	No Problem
Dealing with remediation	60%	23%	17%
Holding part-time component in check	20%	28%	52%
Maintaining academic standards	19%	52%	29%
Increasing class sizes	16%	42%	42%
Maintaining momentum of faculty	14%	46%	40%
Increasing teaching loads	12%	38%	50%
Coordinating/developing math. for voc./tech. programs	11%	27%	62%
Continuing education of faculty	10%	31%	59%
Coordinating math courses with FTC's and universities	7%	31%	62%
Losing faculty to industry	1%	6%	93%

\*Apart from remediation, administration and faculty views of problems of the 80's are largely opposed. See Reference 8 on page 112.