

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. It includes profiles of the age, sex, and ethnic composition of these faculty and a flow chart of mobility into, within, and out of two-year college teaching positions.

Summary of Major Results

In Fall 1975 there were 5,944 full-time and 3,411 part-time mathematical science faculty in two-year colleges. Both the number and characteristics of these faculty are substantially changed from 1970.

- From 1970 to 1975 the full-time faculty increased by 22% and the part-time faculty increased by 54%.
- The number of mathematics enrollments per FTE faculty member increased from 104 to 123, an 18% increase.
- The number of full-time two-year college mathematical science faculty holding doctorates more than doubled, to 11% of the total.
- Only 4% of the two-year college mathematical science faculty are over 60 years of age, with the median age 40 years.
- Women now constitute 21% of the full-time faculty and they are concentrated largely in the younger age category.
- About 8% of full-time faculty are minority -- equally divided among Orientals, Hispanics, and Blacks.

--The most common sources of new full-time two-year college mathematical science faculty are graduate school, secondary teaching, and part-time two-year college positions.

The data supporting each of these major findings are presented in greater detail later in this chapter. When interpreting the results one should keep in mind that data are national estimates for two-year colleges based on responses from a stratified sample of 93 institutions. Because private colleges represent only 5% of total two-year college enrollment and the sample of these schools was small, data are often presented for all colleges or for public colleges alone.

General Information on Two-Year College Faculty

The 1975 study of the mathematical sciences in two-year colleges revealed striking recent changes in the number, qualifications, teaching responsibilities, and personal characteristics of the faculty. But proper interpretation of those changes must take into account the overall pattern of faculty growth in two-year colleges. While there is no regular comprehensive survey of two-year college faculty characteristics, the data collected in Table 6.1 give a useful backdrop for mathematical science faculty patterns mentioned above and elaborated in later sections of this chapter. In addition to data supplied by Table 6.1 it is known that in 1974-75 women comprised 32.7% of public and 44.1% of private two-year college faculty [0].

It appears that since 1970 the total faculty in two-year colleges has grown more substantially than has the mathematical science faculty. The growth has been mainly concentrated in part-time faculty appointments which now outnumber full-time positions. If anything, mathematical science departments appear to have resisted the pressure toward greater numbers of part-time faculty, perhaps because the part-time staff of two-year colleges is heavily involved in the varied non-degree credit programs. Not surprisingly, the number of students per faculty member has increased in two-year colleges overall, about 18%, or essentially the increase in student load of the mathematical science faculty.

Numbers of Mathematical Science Faculty

The Fall 1970 CBMS survey estimated that two-year colleges employed 4,879 full-time and 2,213 part-time mathematical sciences

Table 6.1
TWO-YEAR COLLEGE FACULTY
ALL FIELDS

Numbers of Faculty and Students ^a	1970	% Change	1975			
Faculty (in thousands)						
Full-Time	69	+ 23%	85			
Part-Time	40	+143%	97			
Full-Time Equivalent (FTE)	82	+ 43%	117			
Students (FTE, in thousands)	1518	+ 60%	2428			
FTE Students per FTE Faculty	18.5	+ 12%	20.7			
Highest Earned Degree ^b (1972-73)						
Doctorate	10%					
Master's Degree	74%					
Bachelor's Degree or less	16%					
Age and Sex ^b (1972-73)						
	Under 30	31-35	36-40	41-50	51-60	Over 60
Men	6.1%	14.2%	16.7%	36.0%	20.0%	4.8%
Women	13.3%	13.2%	11.4%	34.3%	18.9%	5.9%

^aSource: 1971 and 1976 Community, Junior, and Technical College Directories, American Association of Community and Junior Colleges.

^bSource: Teaching Faculty in Academe, American Council on Education(1974).

faculty. By Fall 1975 the full-time faculty had increased 22% to 5,944 and the part-time faculty had increased by 54% to 3,411. Employing the usual estimation procedure that counts part-time loads as one-third of full-time yields a 1975 total of 7,081 full-time equivalent mathematical science faculty members, an increase of 26% over 1970, as compared with no growth at all in four-year institutions. Although 26% is a substantial increase in FTE faculty, in the same time period mathematics enrollments increased by 50%.

The most striking feature of Table 6.2 is the 18% increase in enrollments per FTE faculty member since 1970. Reversing a promising change from 1966 to 1970, it appears that the average two-year college mathematical science faculty member has assumed responsibility for 19 additional students. Typical credit-hour teaching loads have not changed since 1970, so the increase in enrollments must be reflected in greater class size. A similar pattern of increased teaching loads has been observed in universities

Table 6.2

TWO-YEAR COLLEGE MATHEMATICAL SCIENCE
FACULTY GROWTH: 1966-1975

	1966	Change	1970	Change	1975
Faculty Size					
Full-Time	2677	+82%	4879	+22%	5944
Part-Time	1318	+68%	2213	+54%	3411
FTE	3116	+80%	5617	+26%	7081
Mathematics Enrollments (in thousands)	348	+68%	584	+50%	874
Enrollments per FTE	112	- 7%	104	+18%	123

and four-year colleges, prompting the American Mathematical Society Council to express its concern in a "Statement on Teaching Loads and Class Size" in January 1976 [Q].

Educational Qualifications of Mathematical Science
Faculty in Public Two-Year Colleges

The enrollment data in Chapter 5 show that teaching responsibilities of two-year college mathematical science faculty are divided among remedial (40% of total enrollment), pre-calculus and calculus (26%), and elementary service courses (30%). Nearly three quarters of all enrollments are below the level of calculus. There is no clear consensus on the appropriate educational and experience preparation for this type of teaching assignment. The data presented in this section stress formal qualifications of two-year college mathematical science faculty -- primarily because they are the only easily obtained measures of quality. Emphasis is on public college data since responses from private colleges were too sparse to produce reliable estimates.

The 1970 CBMS survey report noted significant increases from 1966 in the level of educational qualifications of public two-year college mathematical science faculty. Between 1970 and 1975 there were similar changes

--The number of doctorates is up to nearly 11% of all mathematical science faculty;

--The decline in master's degree holders equalled the doctorate increase and the percent of bachelor's degree holders remained essentially constant.

Table 6.3 gives the details of each pattern.

The apparent sharp drop in two-year college faculty holding master's degree plus one year status has several possible explanations. There is evidence from mobility data presented later, and corroborating AMS survey data, that roughly 40 two-year college faculty members completed doctorates during 1975 -- a pattern which, if extrapolated over the five-year period back to 1970, might account for a quarter of the change. Another factor is the inclusion in the 1975 survey of a new degree category "Master's Degree (special program) to cover such degrees as Master of Arts

Table 6.3

HIGHEST DEGREES OF FULL-TIME PUBLIC TWO-YEAR COLLEGE
MATHEMATICAL SCIENCE FACULTY

Degree	1970	1975
Doctorate	4.5%	10.8%
Master's Plus 1 Year	46.7%	34.8%
Master's	42.2%	47.4%
Bachelor's	6.6%	7.0%

in Teaching. As Table 6.4 shows, this response covered 10% of two-year college faculty and there is a good chance that many in this category have advanced work in addition to the master's degree.

Table 6.4

EDUCATIONAL QUALIFICATIONS OF FULL-TIME PUBLIC TWO-YEAR
COLLEGE MATHEMATICAL SCIENCE FACULTY, 1975

Highest Degree	Mathematics	Statistics	Computer Science	Mathematics Education	Other Fields	Total
Doctor's	240	-	-	274	90	604
Master's + 1 yr.	1521	33	19	287	87	1947
Master's	1314	-	28	447	283	2072
Master's (Special Program)	404	-	-	76	101	581
Bachelor's	192	-	-	32	168	392
Total	3671	33	47	1116	729	5596

The data of Table 6.4 are national estimates, in some cells based on very small raw data counts. One must exercise great caution when interpreting the small numbers, but various aggregates of cell entries provide interesting insight into the characteristics of two-year faculty.

Table 6.5 shows that since 1970 the fraction holding their highest degree in mathematics education has dropped from 25% to 20%. Concurrently, the fraction of two-year mathematical science faculty holding highest degree in a non-mathematical field has increased from 9% to 13%.

Table 6.5

FIELD OF HIGHEST LEVEL OF TRAINING OF FULL-TIME PUBLIC TWO-YEAR
COLLEGE MATHEMATICAL SCIENCE FACULTY, 1970-1975

Field of Highest Degree	1970	1975
Mathematical Sciences	66%	67%
Mathematics Education	25%	20%
Other	9%	13%

From 1970 to 1975 growth in part-time mathematical science faculty (54%) greatly outstripped growth in full-time faculty (22%). Economic uncertainty during this period may be responsible for some of the disparity between growth rates. The generally depressed mathematics job market has focused attention on the increasing use of part-time faculty, making survey of their characteristics particularly timely.

Table 6.6 reveals a general decline in the educational qualifications of part-time faculty. The percent of doctorates is more than cut in half, while the number holding bachelor's degrees has increased to one in six. The total of all master's degrees is up slightly over 1970, with the new category "Master's Degree (special program)" probably accounting for the differences. A more detailed breakdown of the level and major field for the part-time faculty degrees is given in Table 6.7.

Table 6.6

HIGHEST DEGREES HELD BY PART-TIME MATHEMATICAL SCIENCE
FACULTY IN PUBLIC TWO-YEAR COLLEGES

Type of Degree	1970	1975
Doctorate	9.5%	3.9%
Master's Plus 1 Year	31.0%	29.9%
Master's	45.5%	49.6%
Bachelor's	14.0%	16.6%

Table 6.7

EDUCATIONAL QUALIFICATIONS OF PART-TIME PUBLIC TWO-YEAR
COLLEGE MATHEMATICAL SCIENCE FACULTY, 1975

Highest Degree	Mathematics	Statistics	Computer Science	Mathematics Education	Other Fields	Total
Doctor's	61	-	-	25	42	128
Master's + 1 yr.	626	7	3	230	116	982
Master's	761	40	54	359	206	1420
Master's (Special Program)	137	-	-	45	31	213
Bachelor's	351	-	12	46	137	546
Total	1936	47	69	705	532	3289

It is interesting to note that the number of part-time faculty with degrees in non-mathematical fields has declined while among full-time faculty the reverse was noted. A similar reversal can be seen for mathematics education.

Table 6.8

FIELD OF HIGHEST LEVEL OF TRAINING OF PART-TIME PUBLIC
TWO-YEAR COLLEGE MATHEMATICS FACULTY, 1970 AND 1975

Field of Highest Degree	1970	1975
Mathematical Sciences	62%	62%
Mathematics Education	15%	21%
Non-mathematical Fields	23%	16%

(Columns may not add to 100% due to rounding)

Age, Sex, and Ethnic Group of Public Two-Year
College Mathematical Science Faculty

Age distributions are of course very important to anyone attempting to forecast job opportunities in two-year college mathematics faculty. Sex and ethnic-group distributions are basic to assessing the influence of affirmative action legislation on hiring, as well as having intrinsic interest. We begin by considering age distributions.

A brief look at Table 6.9 shows that the two-year college mathematics faculty is young, with nearly half (47%) of the faculty under 40 years, although not as young as faculty in four-year colleges and universities. Given the explosive growth of two-year colleges during the last decade, a young faculty is to be expected. The fact that only 4% of the full-time faculty is 60 or more years of age shows that we can expect only about 50 jobs per year for the next five years due to retirement alone. We shall say more about this when considering faculty employment and mobility in a later section.

Table 6.10, showing a distribution of faculty by degree and age, contains few surprises.

Table 6.9

AGE PROFILE OF FULL-TIME PUBLIC TWO-YEAR COLLEGE
MATHEMATICAL SCIENCE FACULTY, FALL 1975

	Under 30	30-34	35-39	40-44	45-49	50-54	55-59	And 60 Over
Percent of Total	9%	18%	20%	15%	13%	13%	8%	4%

Table 6.10

DISTRIBUTION BY DEGREE AND AGE FOR FULL-TIME PUBLIC TWO-YEAR
COLLEGE MATHEMATICAL SCIENCE FACULTY, FALL 1975

	Under 30	30-34	35-39	40-44	45-49	50-54	55-59	And 60 Over
Master's Degree	9%	18%	20%	14%	13%	13%	8%	4%
Doctor's Degree	6%	28%	19%	14%	17%	7%	4%	5%

The survey shows that women now constitute 21% of the full-time faculty, a figure which is consistent with data from the 1975 AMS Survey [M]. The later survey indicates that women as a fraction of full-time faculty grew by 2% in a one year period! It is thus to be expected that the percent of the female faculty under 30 years of age would be large, as indicated in Table 6.11.

The 1975 survey marks the first time that CBMS has tried to gather information on the ethnic composition of two-year college mathematical science faculties. As in four-year institutions, only 8% of the full-time two-year faculty belong to ethnic minorities. For the 670 faculty reported by responding institutions, the ethnic distribution is given in Table 6.12.

Table 6.11

DISTRIBUTION BY AGE AND SEX OF FULL-TIME PUBLIC TWO-YEAR
COLLEGE MATHEMATICAL SCIENCE FACULTY, 1975

	Under 30	30-34	35-39	40-44	45-49	50-54	55-59	And 60 Over
Men	5%	19%	21%	14%	14%	14%	8%	5%
Women	22%	17%	14%	16%	11%	8%	8%	5%

(Rows may not add to 100% due to rounding.)

Table 6.12

DISTRIBUTION BY ETHNIC GROUP OF FULL-TIME PUBLIC TWO-YEAR
COLLEGE MATHEMATICAL SCIENCE FACULTY, 1975

Ethnic Group	Fraction of Total
Caucasian	92%
Oriental	2%
Hispanic	3%
Black	3%

Full description of the age distribution for ethnic minority faculty was not possible, owing to small raw data entries in most cells of the detailed table. But Table 6.13 gives an aggregated distribution showing that minority faculty tend to be somewhat younger than the average two-year college mathematics faculty member.

Table 6.13

AGE DISTRIBUTION OF ETHNIC MINORITIES ON TWO-YEAR PUBLIC
COLLEGE MATHEMATICAL SCIENCE FACULTIES, 1975

	Under 35	35-44	45-59	60 and over
Percent of all Minorities	44%	33%	20%	3%

The Mathematical Science Faculty in Private Two-Year Colleges

In Fall 1975 the number of mathematical science faculty in private two-year college was 348, down 17% from 421 in 1970. The number of part-time faculty was 122, down 40% from 205 in 1970. These figures combine to yield a decline in full-time-equivalent faculty from 489 in 1970 to 389 in 1975, a 20% decrease. Over the same time period mathematical science enrollments declined by 10% from 50,000 to 45,000. The total number of existing private two-year colleges and the total number of faculty in private two-year colleges also declined, by 11% and 7% respectively. However, the total number of students in private two-year colleges actually increased by 10% over the same period. These patterns of change are detailed in Table 6.14. As previously noted, private college responses to more detailed faculty questions yielded numbers in sample cells regarded as too small to justify extrapolation to national totals on any fine structure basis.

Faculty Employment and Mobility

This section reports the sources of new full-time faculty members in two-year college mathematics departments for the year 1975-76 and the destinations of those who left two-year college positions at the end of the academic year 1974-75. Combining the two types of information one can estimate the increase in faculty for the year 1975-76 and get another perspective on the characteristics of two-year faculty.

Comparison of Tables 6.15 and 3.24 shows that the sources of two-year college faculty are quite different from those of

Table 6.14

FACULTY AND ENROLLMENTS IN PRIVATE TWO-YEAR COLLEGES

	1970	Change	1971
Mathematics Faculty			
Full-Time	421		348
Part-Time	205	-17%	122
FTE	489	-40%	389
Total Faculty (All Fields)*	9377	-20%	8677
Mathematical Science Enrollments	50,000	-7%	45,000
Total Enrollments*	134,000	-10%	148,000
		+10%	

*Sources: AACJC. Community, Junior, and Technical College Directory, 1971, 1976 [P].

four-year and university faculty. Nearly one-fifth (19%) of the new two-year faculty in 1975 came from secondary school positions. In 1970 the comparable figure was 17%. It thus appears that high schools are continuing to be a strong source of new full-time two-year college faculty. Data from the 1975 AMS survey [M] confirm this picture, suggesting that almost one-half of current two-year faculty have taught at some time in secondary schools. Graduate school and part-time positions in two-year colleges are the other major suppliers of new two-year faculty. However, the graduate school share of 33% is down from 44% in 1970 and the part-time to full-time share of 16% is up from 4% in 1970.

Of the individuals who left two-year colleges for reasons other than death or retirement, nearly all returned to graduate schools.

The combination of tables 6.15 and 6.16 yields a net gain of 174 full-time faculty for 1975-76. From Fall 1970 to Fall 1975,

Table 6.15

SOURCES OF NEW FULL-TIME MATHEMATICS FACULTY
IN TWO-YEAR COLLEGES, 1975-76

Source	Doctorates		Master's & Bachelor's	Total
	Math.	Math. Ed.		
Graduate School	20*	7*	80	107
Teaching in a Four-Year College or University	13*	7*	7	27
Secondary School Teaching			60	60
Part-Time Employment in Institution			53	53
Non-Academic Position	7	7	7	21
Other Sources, or Unemployed		7	47	54
Total New-Year College Faculty	40	28	254	322
Transfers Between Two-Year Colleges				33

*These figures agree very closely with 1975 AMS data [M].

the net gain in full-time faculty was 1065 (See Table 6.2.) Dividing 1065 by 5, we get an average yearly gain of 213 full-time faculty members. The two figures are not incompatible with each other.

Department heads were asked to estimate the number of additional full-time faculty members to be recruited for 1976-77. Their pooled estimate of 201 additional full-time faculty agrees well with the additional full-time figure for 1975-76, calculated in the last paragraph. The department heads are somewhat less optimistic for 1977-78, forecasting only 114 additions.

Professional Activities

In 1975 for the first time, the CBMS survey asked department heads to estimate the professional activity of their full-time mathematical science faculty members. The estimates of membership:

Table 6.16

FULL-TIME MATHEMATICS FACULTY LEAVING
TWO-YEAR COLLEGES, 1975-76

Reason for Leaving	Doctorates		Master's & Bachelor's	Total
	Math.	Math. Ed.		
Death or Retirement	-	7	80	87
Teaching in a Four-Year College or University	-	-	-	-
Non-Academic Position	-	-	-	-
Secondary School Teaching	-	-	7	7
Returned to Graduate School	-	-	47	47
Other, or Unemployed	-	-	7	7
Total Leaving Two-Year Colleges	-	7	141	148

in professional organizations, given in Table 6.17, agree very closely with data available from at least two of the organizations (MAA and NCTM).

Table 6.17

ESTIMATED MEMBERSHIPS OF FULL-TIME TWO-YEAR COLLEGE MATHEMATICS
FACULTY IN PROFESSIONAL ORGANIZATIONS, 1975-76

Organization	NCTM	MAA	AMS	SIAM	STATE AFFILIATE AMATYC	STATE ORGAN.	CITY ORGAN.	OTHER ORGAN.
Percent of Faculty Belonging	29%	25%	5%	2%	17%	22%	4%	9%

It is clear from Table 6.17 that no single professional organization has captured the interest and loyalty of two-year college mathematics faculty. Of the organizations listed, the first five are known to regularly publish a journal. Even assuming that the memberships of the five are pairwise disjoint, it is then estimated that at least 22% of all full time faculty do not regularly receive a professional journal devoted to mathematics or mathematics education. Additional information on professional activities of two-year college mathematical faculty is given in Table 6.18.

Table 6.18

PROFESSIONAL ACTIVITIES OF FULL-TIME TWO-YEAR COLLEGE
MATHEMATICS FACULTY, 1975-76

Activity	Percent of Faculty Engaging in Activity
1. Attendance at at least one mathematics conference per year	47%
2. Taking additional graduate mathematics courses during the year or summer	21%
3. Giving talks on mathematics at conferences	9%
4. Giving talks on mathematics education at conferences	9%
5. Regular reading of journal articles on mathematics	47%
6. Regular reading of journal articles on mathematics education	47%
7. Writing journal articles on mathematics	5%
8. Writing journal articles on mathematics education	5%
9. Writing textbooks	15%

The like responses to 3 and 4, 5 and 6, and 7 and 8 suggest the possibility that mathematics and mathematics education were not separated by respondents.