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AUTHOR Olstad, Roger G.; Beal, Jack L.
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ABSTRACT

Presented are results of a study of secondary science and mathematics teacher supply and demand in the state of Washington. Data are provided from every institution in Washington State that prepares secondary school teachers and from 87% of the employing school districts within the state for a five-year period (1974-79). Tabular data are reported regarding numbers of secondary certificates endorsed in science and mathematics teacher education programs, and numbers of teaching vacancies in science and mathematics by grade level, geographical region, and school district size. A trend analysis of the supply-demand situation regarding secondary school science and mathematics teachers is also reported. Among the conclusions drawn from the study is that Washington State faces a serious teacher shortage in the years ahead in the fields of secondary school science and mathematics. (CS)

SECONDARY SCHOOL SCIENCE AND MATHEMATICS TEACHER SUPPLY AND DEMAND IN WASHINGTON STATE

by

Roger G. Olstad

and

Jack L. Beal

University of Washington

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Roger G. Olstad
Jack L. Beal
University of Washington

ABSTRACT

The widely reported teacher surplus is rapidly becoming a myth, at least as it pertains to science and mathematics teachers. Each institution in Washington State (100 percent return) preparing secondary school teachers, and each employing district (87 percent return) were contacted. Data were obtained for a five year period (1974-79), which allow for trend analysis of the supply-demand situation regarding secondary school science and mathematics teachers. The generalized conclusion, supported by the data, shows an increasing demand in the face of decreasing supply. Further analysis shows an increasing demand in the face of a decreasing student population. Thus, all signs point to a serious teacher shortage in the years ahead in the fields of secondary school science and mathematics. Additional analyses provide interesting insights into the placement of teachers with less than a major in science or mathematics into science or mathematics teaching positions, the ratio of full-time teaching assignments to assignments which include teaching both in science or mathematics and in other disciplines, the distribution of teaching vacancies by grade level, geographical region, and school district size, and the production of teachers by geographical region.

Introduction

The results of a study of teacher supply and demand in secondary school science and mathematics suggest that hiring officials in the state of Washington will encounter an increasing shortage of these teachers in the 1980's. After years of a teacher shortage in the United States, the surplus of teachers which occurred in the 1970's has contributed to the widely held belief that the problems of teacher shortages are behind us. Yet alarming signs are on the horizon which suggest that the general picture needs to be examined more carefully if proper educational planning and decision-making are to take place.

Early signs of a possible shortage were found in significantly decreased enrollments in preparatory classes for science and mathematics teachers, and hinted at in the literature and at professional meetings. Based on this and other anecdotal evidence of the beginnings of a shortage of science and mathematics teachers, the investigators studied in detail the question in Washington State in hopes of getting sound data from which a more accurate picture might emerge.

Procedures and Findings

To get as exact a picture as possible of the supply of and demand for science and mathematics teachers in the state of Washington, each of the districts in the state employing secondary school teachers was contacted. Also contacted was each of the institutions of higher learning in the state preparing secondary school teachers.

Teacher Supply. All institutions of higher learning in Washington State, both public and private, which prepared secondary school science and mathematics teachers were sent questionnaires concerning the number of graduates with either a major or minor endorsement in the fields of science and mathematics education. All institutions in the state responded and were included in the data analyzed.

Table 1 shows this information for the five year period of interest by subject matter and by type of certificate endorsement.

TABLE 1

Number of Secondary (7-12) Certificates
Endorsed in Science or Mathematics
as Recommended by Teacher Education Programs
in Washington State, 1973-78

	Science		Mathematics	
	Majors	Minors	Majors	Minors
1973-74	122	99	125	57
1974-75	106	75	86	39
1975-76	113	75	72	30
1976-77	91	55	55	26
1977-78	86	62	54	19

As can be seen, the number of teachers preparing to teach either science or mathematics has steadily declined over this five year period. Combining majors and minors, the number of graduates in 1978 was only 70 percent of the 1974 supply in science, and 40 percent in mathematics.

Teacher Demand. Each school district in the state of Washington employing secondary school teachers (N=253) was contacted by mail questionnaire regarding the number of vacancies with either a full or partial teaching assignment in either science or mathematics. With a single follow-up letter, the return was 87 percent, a response rate judged to be acceptable and representative of the total state scene. (This return also represented 87 percent of the total secondary school pupil population.)

Table 2 shows the number of vacancies for the reporting districts by the proportion of assignment in science or mathematics for a five year period. It was assumed that graduates of any given academic year would generally enter the job market the following academic year. Thus, the data concerning vacancies are reported for 1974-79, while the data concerning supply are reported for 1973-78.

TABLE 2

Number of Teaching Vacancies in Science and Mathematics in Washington State Secondary Schools, 1974-79

	Full-time		More than half-time but less than full-time		Less than half-time	
	Sci	Math	Sci	Math	Sci	Math
1974-75	45	52	26	27	21	7
1975-76	29	54	37	32	10	11
1976-77	59	79	37	49	17	18
1977-78	66	77	44	46	19	24
1978-79	65	77	42	42	17	32

The number of vacancies for science and mathematics teachers has steadily increased over the five year period. Combining full and partial assignment positions, there was a 35 percent increase in the demand for science teachers and a 76 percent increase in the demand for mathematics teachers.

Over the same five year period (1974-79), the data showed a decrease of 11,000 in the number of secondary school students. Thus, the increase in demand for science and mathematics teachers occurred during a time of decreasing student population.

In questioning school districts, "vacancy" was defined as any position which was filled by a certificated teacher newly employed by the district. Thus, internal faculty transfers were discounted, and the data collected indicate actual vacancies which were filled by newly hired personnel.

Responding districts indicated that approximately two-thirds of these science and mathematics vacancies occurred at the junior high/middle school level and that this ratio held relatively constant over the five year period studied.

Distributions by Region and District Size

It may be of interest to some readers to examine teacher preparation patterns and teaching vacancies by geographic regions of the state and district size.

When teacher preparation institutions are separated into "east" and "west" by the Cascade Mountains, there are eight institutions in the eastern part of the state and seven in the west. Over the period of time studied, the percentage of science and mathematics teachers prepared "east" and "west" are shown in Table 3.

TABLE 3

Science and Mathematics Teachers Prepared by Geographical Region

		East	West
Science	Majors	43%	57%
	Minors	77%	23%
Math	Majors	44%	56%
	Minors	76%	24%

If teaching vacancies in science and mathematics are similarly compared by "east" and "west" regions, these vacancies were found as shown in Table 4.

TABLE 4

Science and Mathematics Teaching Vacancies by Geographical Region*

	East	West
Science Vacancies		
Vacancy (V) Full-time (100%)	33%	67%
50% < V < 100%	42%	58%
V < 50%	30%	70%
Mathematics Vacancies		
V = 100%	24%	76%
50% < V < 100%	35%	65%
V < 50%	34%	66%

*In terms of pupil enrollment, 27% of the students attend schools in the "east," 73% in the "west."

The distribution of total vacancies (1974-79) by size of district (student population) is reported in Table 5. As might be expected, positions with full-time assignments in major fields are more likely to be found in larger districts, and positions which require teaching across several disciplines are more likely to be found in smaller districts.

TABLE 5

Distribution of Science and Mathematics Vacancies by District Size

	Pupil Enrollment		
	0-2500 (N=152)	2500-5000 (N = 31)	> 5000 (N = 36)
Science Vacancy			
V = 100%	39%	19%	42%
50% < V < 100%	49%	15%	36%
V < 50%	50%	30%	20%
Mathematics Vacancy			
V = 100%	38%	16%	46%
50% < V < 100%	46%	12%	42%
V < 50%	55%	23%	22%

Limitations

It was not possible to determine the number of vacancies being filled by teachers prepared in out-of-state institutions or the number of newly prepared teachers leaving the state or not entering the teaching profession. Also, no data were available on vacancies occurring in private secondary schools. The addition of this data would probably not significantly affect the results of the study. In fact, if the data were known they would most likely accentuate the projected shortage of secondary science and mathematics teachers. Finally, no attempt was made to determine the number of science vacancies by subject, e.g. physics, biology, chemistry, etc.

Supply-Demand Comparisons

Science. Figure 1 provides a profile of supply and demand comparisons of secondary school science teachers from 1974 through 1979. Based upon an 87 percent return which was judged to be representative of the total state, the number of science vacancies was adjusted to reflect a theoretical 100 percent return of the questionnaire. This adjustment was necessary to reflect more closely the real number of vacancies occurring over the period of time studied. It is clearly evident that if the trend-lines continue, the number of vacancies for full-time science teachers will exceed the number of majors endorsed in science by 1979-80. The number of majors and minors endorsed in science will not be able to meet the need for partial or full-time assignments, and this shortage will become increasingly acute in the 1980's.

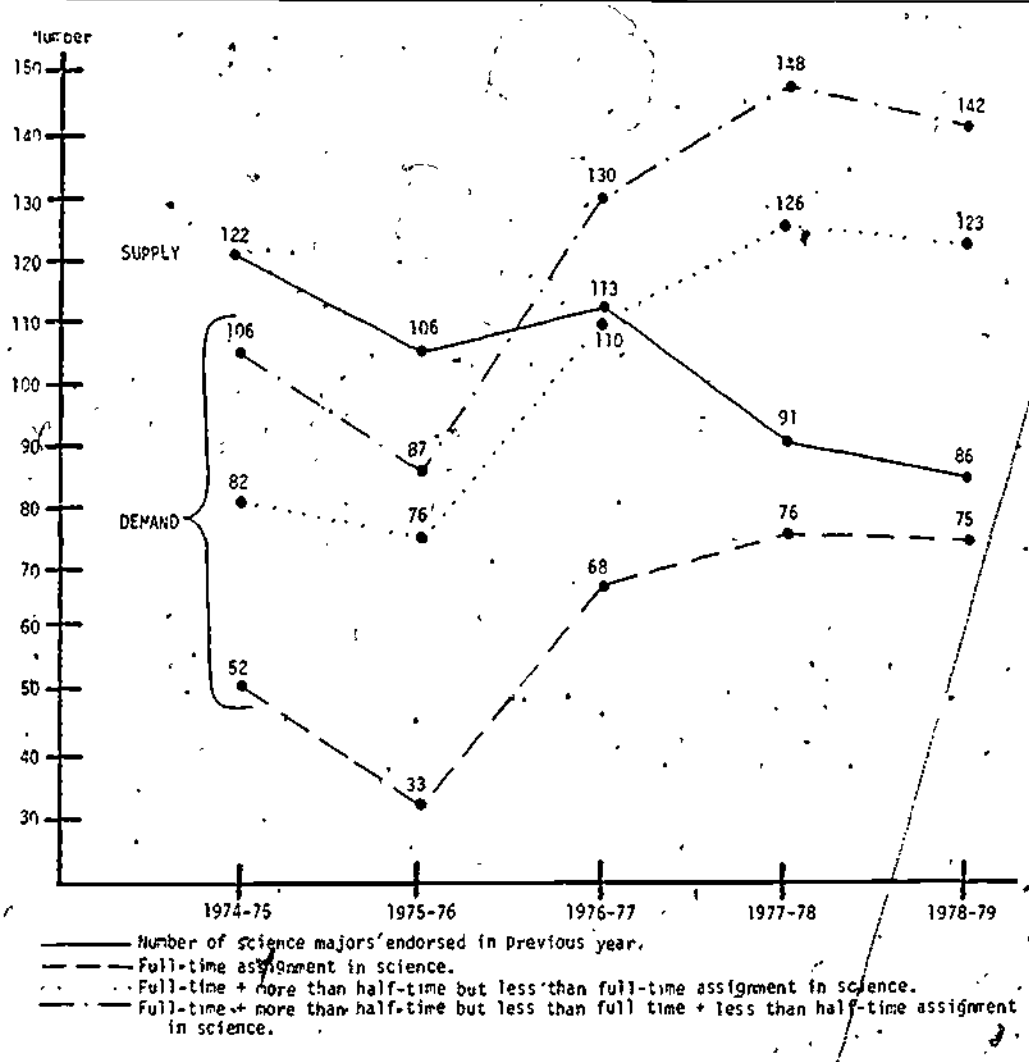

FIGURE 1

A Profile of Supply and Demand of Washington State Secondary School Science Teachers from 1974 through 1979

Mathematics. Figure 2 provides a similar profile of supply and demand comparisons of secondary mathematics teachers from 1974 through 1979. Again, the number of mathematics vacancies has been adjusted to reflect a theoretical 100 percent return of the questionnaire. The shortage in mathematics is even more serious than that for science as evidenced by the fact that only 54 majors were certified in 1977-78 and therefore available for 89 full-time positions in 1978-79. If the number of minors certified in mathematics is added to the 54 majors, there are only 73 certificated teachers available for 89 full-time positions in mathematics. The data suggest that this acute situation will continue into the 1980's.

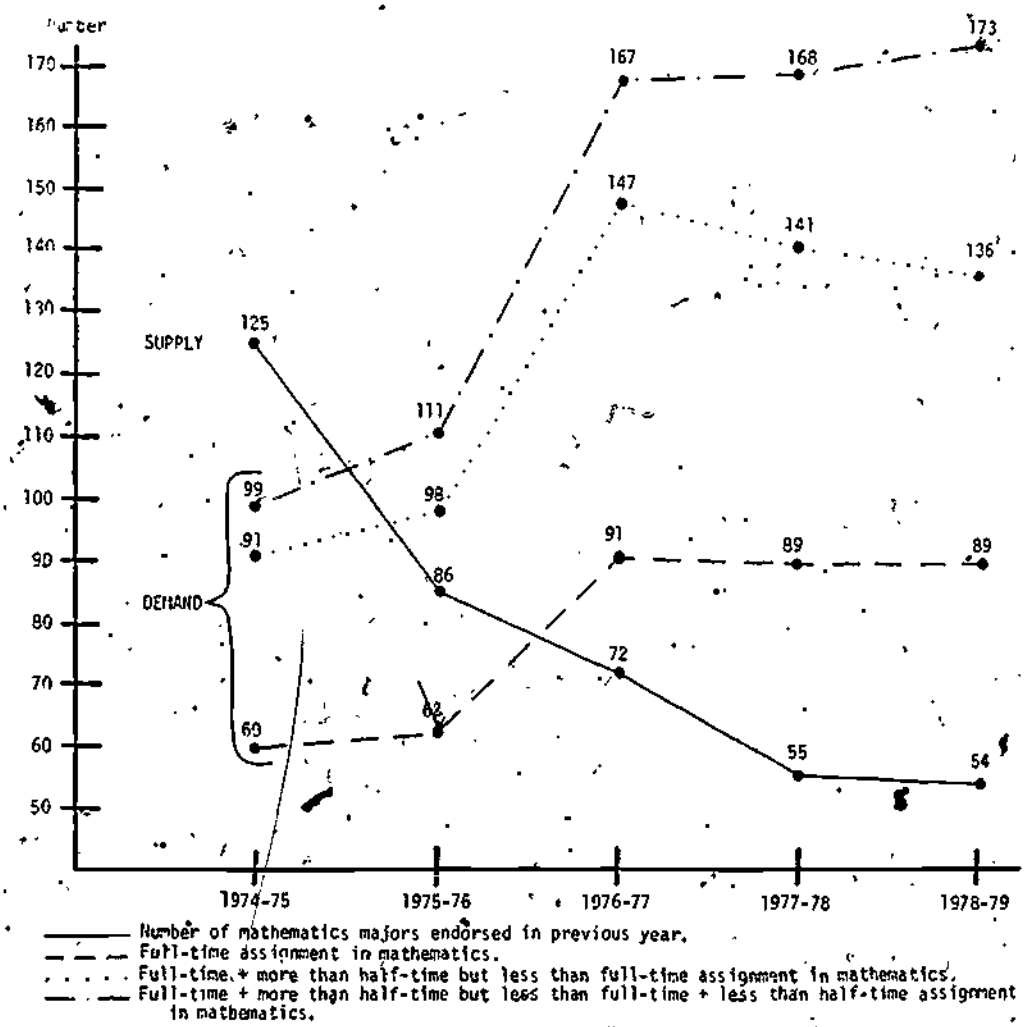

FIGURE 2

A Profile of Supply and Demand of Washington State Secondary School Mathematics Teachers from 1974 through 1979

Summary and Conclusions

Based on the findings of this study, the following conclusions are offered:

1. The number of vacancies in science and mathematics has steadily increased from 1974 through 1979.
2. The number of majors and minors in science and mathematics recommended for a secondary certificate has steadily decreased from 1973 through 1978.
3. The supply of science majors is insufficient to meet the demand for full-time science teachers.
4. The demand for secondary mathematics teachers far exceeds the supply at this time.
5. The shortage will probably become more acute in the 1980's.
6. The majority of vacancies in science and mathematics occurs at the junior high/middle school level.

These results suggest there will be a number of minimally qualified teachers filling science and mathematics positions in the 1980's. Therefore, it is vitally important that professional associations, public schools, and institutions of higher learning cooperate to encourage more qualified science and mathematics majors to enter the teaching profession.