

DOCUMENT RESUME

ED 128 161

SE 020 660

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 TITLE A Shortage of Science Teachers by 1982?
 PUB DATE Mar 76
 NOTE 12p.; Paper presented at the annual meeting of the National Science Teachers Association (Philadelphia, Pennsylvania, March 19, 1976)

EDRS PRICE MF-\$0.83 HC-\$1.67 Plus Postage.
 DESCRIPTORS Educational Problems; Educational Research; *Science Education; *Science Teachers; *Secondary Education; Secondary School Science; Teacher Education; *Teacher Shortage; *Teacher Supply and Demand

IDENTIFIERS Research Reports

ABSTRACT

The consequences of an aging teaching force in secondary school science during this decade are discussed. Statistics are provided for teacher production, teacher age distribution, declining enrollments in teacher education programs, and teacher demand. The major conclusion is that a science teacher shortage will occur in the next decade and that steps should be taken to expand teacher education programs to avoid this problem. (MH)

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A SHORTAGE OF SCIENCE TEACHERS BY 1982?

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A Paper Presented to the AETS Program Session at the
NSTA Meeting in Philadelphia, Pennsylvania

March 19, 1976

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A SHORTAGE OF SCIENCE TEACHERS BY 1982?

The consequences of an aging teaching force in secondary school science during this decade may be serious. Consider this scenario:

The 1960s were an era of growth in the schools. Science teachers increased in number, with most of the increase at the younger age levels. When older teachers left the classroom (retirement, administration, death, personal reasons, etc.) ultimately a young, recent college graduate was hired somewhere in the system. Growth and youth marked the 1960s.

Suddenly, by the early 1970s, the outlook changed markedly. The declining birth rate had caused an enrollment drop in the elementary schools which had drastically reduced hiring of new teachers. The enrollment decline will hit the high schools by 1977 and 1978. Student attitudes toward science began to change in the late 1960s, and science course enrollments have suffered a bit. School budgets had increased rapidly, teacher salary improvements being a large factor. Now there are fiscal restraints, combined with static enrollments, which preclude expansion of the teaching force. Student/teacher ratios will no longer be reduced because of high costs, even if discharging teaching staff is the alternative. Teacher retention rights have become a concern of teacher unions; no veteran teacher with high seniority will be laid off without a classic battle. With the constriction of the job market mobility of teachers has been curtailed -- no shopping

around for other jobs, in or out of education. Even the younger women who traditionally resign to raise a family and then return are starting to react differently. Young college graduates can't find jobs in teaching. The word filters back: fewer undergraduates enter teacher preparation programs. Colleges and universities are having troubles of their own. A department with decreased enrollment is penalized. Younger faculty are denied tenure. Young PhD's can't find college or university jobs. The establishment for training teachers winds down, even becomes partially dismantled.

In these ten years (1970 to 1980) very few teachers will probably leave the system, except for retirement or for reasons beyond their control. Even those will probably not be replaced one-for-one; vacancies will not always be filled, and the remaining staff covers. Or else, surplus teachers from other disciplines will be pressed into service to teach science because of their seniority and retention rights. In ten years, the average age of teachers will climb by nearly ten years. CONDITION: STASIS.

Then comes 1980, with a wave of teachers approaching retirement age. In the early 1980s a large proportion (most) of the over-50s leave teaching. But there will be few replacements from among new BA and BS degrees. Potential teachers trained eight or more years earlier will be sorely out of date for science teaching, even if they should want to become teachers. The teacher training apparatus will be dismantled and reassembled in a five year period.

CONDITION: SHORTAGE.

REACTION: CRISIS

Fantastic? Is there evidence one way or the other?

An excellent analysis of the educational personnel system of the United States has been conducted by the RAND Corporation, under contract to the US Office of Education. In eight paper-bound volumes published in 1973 and early 1974 they critique existing manpower estimates, construct theoretical models, test them with empirical data, and derive probable conclusions. Summarizing this information without discussing the underlying assumptions and arguments is not the best course of action, but in this brief paper it is all we can do. Here are some of RAND's findings and conclusions; they are applied to all secondary school teachers as a group, not separately by subject area:

1. Teacher production (new BA degrees) declined each year from 1966 to 1972. It will continue to decline. Supplies of new teachers will be sharply reduced throughout the 1970s.
2. There is a demonstrable lag between a reported surplus or shortage in teacher supply and undergraduate career decisions which accommodate to market conditions. The enrollment drop in teacher education programs will increase.

N.B.: The American Council on Education's annual surveys of freshmen show that the proportion of entering freshmen intending to seek teaching careers in elementary or secondary education dropped from 23.5% of the class in 1968 to 12.1% in 1972. (Continuing beyond that report, it had dropped to 7.7% for entering freshmen in 1974.)

3. The surplus of teachers will end around 1980, based on supply conditions alone. Teacher production, however, will continue to decline for another two to four years beyond 1980 because of lags in the pipeline (career decisions by freshmen four years

earlier.) Thus, if and when the surplus ends, it will be followed by an immediate and drastic shortage.

4. With stagnation and few new people entering, the teaching force will age. Retirements will drop for a while, then retirements will start to be quite high after 1980.
5. Teacher terminations other than retirements will fall because teaching will be viewed as an attractive career compared to alternatives. This will be especially true for older teachers, who would have difficulty matching their economic position outside the field. The rate for all terminations (including retirement) had fluctuated between 7 and 10% of the force in the 1960s. It should be lower by two or three points in the 1970s, then rise again to the 7 to 10% range in the 1980s.
6. There is little reliable data on the annual numbers of new teachers produced. NEA has been issuing annual reports, which RAND found technically deficient, but even NEA has issued none since 1973 and has no plans to continue. No other agency is doing so.
7. Information is needed not only on numbers of new teachers, but specifically by academic subject to be taught: science, math, English, etc. Also needed are better estimates of the reserve pool of potential teachers, those who left teaching in the past or who were trained but never employed as teachers: their numbers, qualifications, and readiness to take positions if offered, by subject area.

Our ~~game~~ scenario had been constructed before seeing the RAND studies from current reports in the education press. In fact, the RAND conclusions have not been widely discussed or received much attention.

RAND's studies lumped secondary school teachers from all disciplines; do they apply to science? Authoritative demographic information on teachers for single subject areas are very rare. NEA has some figures on teacher production by field, at BA level. Although flawed in methodology, it is consistent and the best available. They show a 2.3% drop in BS science teacher output from 1972 to 1973. For women there was no decline, but for men it was 5%. By contrast, it had increased by 69% from 1960 to 1970. The peak was in 1971, and the decline from 1971 to 1973 for all science teaching degrees, not just bachelor's, was 9%.

Of the studies on science teachers, the best designed and most useful for this discussion was done by Schlessinger, Howe, et al. at Ohio State University in 1970-71. A stratified random, national sample of secondary school science teachers was surveyed for teaching practices and much more. Their ages, spring 1971:

	Below 30	29.3%
	30 - 39	32.2
(See Table, Col. B)	40 - 49	22.9
	50 - 59	12.2
	60 & over	3.4

If the worst assumptions are made, that most of those who are 50 & over will have left teaching permanently by 1980, that nobody in other age groups leave, that no expansion of the science teaching force is permitted nor any improvement in student/teacher ratios, that only the 50s and over are replaced (but these one-to-one and by people under 30), a good estimate of teacher age distribution in 1981 would be:

	Below 30	15.6%
	30 - 39	29.3
(See Table, Col. C)	40 - 49	32.2
	50 - 59	22.9
	60 & over	2.7

Of course if there is very little turnover except for the oldsters and no expansion it is inevitable that the group get older. The 40 - 49 group of ten years earlier looms large, but so does the former 30 - 39s. What that might mean in terms of disastrous education will not be mentioned now; it does indicate a sweeping wave of retirements in the years subsequent to 1980.

Teachers of science are apparently older than those in fields like English and Social Studies. Those fields grew at rates two to three times as much as science during the 1960s, and, with younger people filling the ranks, their proportions of youth were even greater than for science. Therefore, if you see statistics for all secondary school teachers showing a better age distribution, do not be deceived. Science may well be in worse shape than the others. NEA estimates these ages for teachers in all secondary school subject areas in 1970-71:

	Below 30	38.7%
	30 - 39	25.9
(See Table, Col. A)	40 - 49	18.6
	50 & over	16.8

New teacher production through 1973 declined in general. An attempt was made to learn about science teacher production by piggybacking on a survey made in 1975 by AAAS on implementation of the AAAS/NASDTEC guidelines for preparing science teachers. The responses were inconclusive. Recipients of the survey form often did not possess complete statistics and did not obtain them from the several different sources on the campus. We asked the resources to follow up on this systematically. Summarizing the returns we did receive, a decline is apparent in many colleges and universities, and the rest are about holding even with the late 1960s. The Northeast and Midwest report downward trends fairly consistently in our returns, but no other trends can be reported. Indirect information from comments indicates that a few states in the

south and west today can absorb all the science and math teachers turned out in their states, with room for more. This conforms to population trends of recent years.

The issue remains: we lack important information on science teacher manpower, including its composition, turnover, and replacement potential. There are indicators pointing to stagnation in the immediate future followed by panic in about six or seven years. This should be monitored.

What should we be doing? AETS is a key group to mobilize for constructive action. Reports from some institutions tell of retrenchments in science teacher preparation programs, along with those in other disciplines. What will the demand be in your state in six or seven years? We should be organizing to collect information without delay.

We do have a golden opportunity to prepare for the future. At the moment the situation in teacher training institutions is static, not booming. Now is the time to be preparing improvements in the program before the anticipated big push in the 1980s. New concepts in teacher preparation have been circulating for years; for example, there are the AAAS/NASDTEC Guidelines of 1971. Trial of these concepts might take place right now, to experiment with local adaptations and shape up the revamped program. After all, we are preparing teachers for the remainder of the twentieth century and on into the next. The patterns of the 1950s and 1960s should no longer dominate, as they might if we hold everything in place or in mothballs while waiting for a break in the outlook.

As for undergraduate enrollments in science teaching program, it takes four years or more to turn out a new teacher. The 1982 BS graduate is a freshman enrolling in 1978. Will he or she be recruited for science teaching? Can we present an optimistic recruitment picture of a turn-around in the near future? Will the talk of surplus still govern our actions? Into what kind of preparation program will the 1978 freshmen be placed? Will it be suited to the times, or will it be the result of austere budgets and protective thinking of the immediate present?

We have work to do!

AGES OF TEACHERS
SECONDARY SCHOOLS

	(A)	(B)	(C)
	All Teachers <u>1971 (1)</u>	Science Teachers <u>1971 (2)</u>	Science Teachers <u>1981 (est.) (3)</u>
Below 30	38.7%	29.3%	15.6%
30 - 39	25.9	32.2	29.3
40 - 49	18.6	22.9	32.2
50 - 59	16.8	12.2	22.9
60 & over		3.4	2.7

- (1) From Graybeal, W.S., Teacher Supply and Demand in Public Schools, 1973, National Education Association, Washington, D.C. 1974. p. 42.
- (2) From Schlessinger, F. R., Howe, R. W., et al, Survey of Science Teaching in Public Schools of the United States (1971) Volume 1 -- Secondary Schools, Center for Science and Mathematics Education, The Ohio State University, Columbus, Ohio, 1973. p. 87.
- (3) Projections, assuming no expansion, no turnover, replacement only of 1971's 50 and over group.

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