

# The Teacher Crisis in Secondary School Science and Mathematics

*Science and mathematics instruction is deteriorating as fewer teachers pursue careers in these fields.*

JAMES A. SHYMANSKY AND BILL G. ALDRIDGE

Our nation faces unprecedented problems in science and engineering education, the most severe of which is the critical shortage of qualified science and mathematics teachers at the secondary level. The problem is not new. Studies by the National Education Association (1981), Howe and Gerlovich (1982), and Akin (1980) have carried this message for several years. Yet school goes on. Is the problem not as severe as the data suggest, or worse than we realize?

We recently conducted surveys of secondary school science and math teachers, secondary school administrators, and placement directors at colleges and universities to get another reading on the science and math supply and demand. The results of our surveys and the highlights from some previous studies are reported here.

## The Demand

In 1980 and again in 1981, Howe and Gerlovich (1982) surveyed the 50 state science supervisors to assess supply and demand for secondary school science and math teachers. Using a scale of 1 (a surplus) to 5 (a critical shortage), they found a shortage of physics (4.15), math (3.71), and chemistry (3.96) teachers in 1980. Shortages in physics and math became more severe in 1981 (physics, 4.45; math, 4.28). Moreover, the shortages are nationwide. Only two state supervisors reported an adequate supply of math teachers; four reported an adequate supply of science teachers; six

reported an adequate supply of chemistry teachers.

Akin's (1980) findings are consistent with the Howe/Gerlovich report. In a survey of teacher placement directors in 1981, Akin reported math and physics as the highest and second highest areas of teacher demand. Chemistry teacher demand was 7th and earth science 11th of the 38 areas ranked. The NEA report (1981) also ranked mathematics and natural and physical sciences as areas where the supply of teachers is least adequate.

The data from these sources are convincing but not compelling because, after all, science and math continue to be taught. In order to provide further insight into the problem, we conducted three surveys in December 1981. Our results are quite revealing.

## The Supply

We surveyed 450 teacher placement offices nationwide to obtain ten-year

data on the number of teachers receiving certification in a science or math area and the number accepting teaching positions. Figures 1 and 2 show the number of persons available for placement and the number accepting teaching positions in math and science from 1971 to 1980. Clearly these graphs show the serious decline in the numbers of persons pursuing teaching degrees (79 percent decline in math and a 64 percent decline in science) and an equally serious decline in rate at which those prepared accept teaching jobs. The 1981 NEA report indicates a comparable decline in persons accepting teaching positions to persons prepared as teachers across all teaching fields between 1962 and 1979.

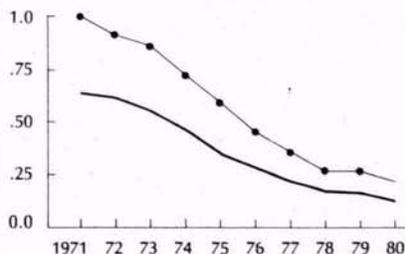
## Who Is Teaching?

We also surveyed 1,000 secondary school administrators to find out who teaches science and math at their

Figure 1. Student Teacher Supply Index: Math—Based on 1971 Supply.

● Student teachers available for placement  
— Number accepting teaching positions

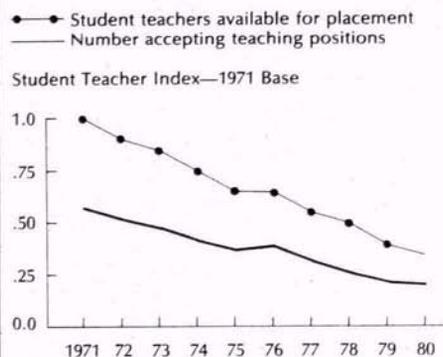
Student Teacher Index—1971 Base



Based on National Science Teachers Association survey of college and university placement officers. Conducted by J. A. Shymansky, The University of Iowa, 1982.

James A. Shymansky is Professor of Science Education, The University of Iowa, Iowa City; and Bill G. Aldridge is Executive Director of the National Science Teachers Association, Washington, D.C.

**Figure 2. Student Teacher Supply Index: Science Based on 1971 Supply.**



Based on National Science Teachers Association survey of college and university placement officers. Conducted by J. A. Shymansky, The University of Iowa, 1982.

schools, how many were retiring, how many were leaving for other jobs, and how many were hired recently. Administrators reported that 91 percent of their science and math teachers were teaching those classes exclusively in 1981-82—a drop from 93 percent in 1980-81. They also reported about a 1 percent rate of retirement in the science and math teaching staff and a 4 percent exodus to nonteaching jobs. Taken alone, these figures are not earthshaking. But data on replacements for the retirees and the job-jumpers are shocking. Nationwide, *half* of all newly-employed science and math teachers for the school year 1981-82 were unqualified to teach science or math. These teachers were reported hired on an "emergency basis." Figure 3 shows, by region, the percentages of emergency science and math teachers hired for the 1981-82 school year; the numbers are staggering but not surprising when viewed in terms of Figures 1 and 2. There simply aren't enough new teachers to replace those leaving or retiring.

### What the Teachers Report

More than 450 teachers responded to a third questionnaire aimed at finding out about their preparation, their assignments, and their plans. From the survey we know that 60 percent of the science teachers report cuts in their budgets for supplies and equipment. These cuts are occurring at a time when school labs are already obsolete and teacher morale is

low. We also learned that 79 percent of these teachers have not completed a ten-hour course or workshop in over ten years; 69 percent have never attended a computer workshop. Finally, 40 percent reported never attending an inservice course or workshop since they began teaching—an average of 16 years!

When asked about their plans for the next five years, a startling 24 percent indicated they plan to seek employment outside of education. Assuming only 4 percent actually leave the classroom for nonteaching jobs (as the administrator data suggests) and assuming the graphs showing the new entries into science and math teaching level out, the forecast for secondary school science and math is still gloomy. The mean age of the science and math teaching population is 41. As that mean moves up so

will the number of retirees and the number of teaching vacancies. Demographic studies predict a leveling off of school-age populations and even a slight increase in the 80s. When these data are mixed together, it is clear that the number of emergency teachers will go up also—and that the quality of math and science instruction will go down.

### Summary

Recent independent surveys all show a severe shortage of qualified secondary school science and math teachers. There has been a catastrophic decline in the number of persons preparing to teach science and math and, of those prepared, less than half take teaching positions. Secondary schools are forced to hire unqualified persons. In addition, as the mean age of the science/math teaching force rises and more experienced teachers seek employment in nonteaching jobs, the quality of instruction in our secondary school science and math classrooms will deteriorate further. We cannot afford to wait for the normal laws of supply and demand to correct the problems. A generation of school-aged children is far too precious a commodity. **EL**

### References

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- Howe, T. G., and Gerlovich, J. A. "Critical Issues Dealing with the Supply and Demand of Science and Mathematics Teachers." Presented to the National Science Teachers Association Meeting, Chicago, April 3, 1982.
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**Figure 3. Percentage of Emergency Science and Math Teachers Hired in 1981-82.**

Census Region	Percentage of Emergency Teachers Hired
Pacific States	84%
Mountain States	23%
West North Central States	43%
West South Central States	63%
East North Central States	46%
East South Central States	40%
North East States	9%
Atlantic States	43%
South Atlantic States	50%
Nationwide	50%

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