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## Science and Math Teachers: A National Survey of Supply and Demand

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# **THE CRISIS IN SCIENCE EDUCATION: PROBLEMS AND RECOMMENDATIONS**

**A Summary of The Iowa Academy of Science Symposium at  
Luther College, Decorah, Iowa, April 22, 1983**

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There is a recognized state and national crisis in securing and maintaining "qualified" science teachers. To date the majority of effort has been expended toward identifying and redefining the problems with few attempts made to resolve them.

The purpose of this symposium was to spend minimal time seeking to inform participants of the problems and then to present some recommendations for resolving them. Each of the presentors was uniquely to address this, to date, intractable problem. The following paper presents a summary of the presentations made by those individuals.

## **Science and Math Teachers: A National Survey of Supply and Demand**

*Trevor Howe: Director  
Education Placement, Iowa State University*

### **The Problem In Iowa**

Total enrollments in Iowa public schools, K-12, have declined. Total enrollments have declined by 130,116 students in ten years. The projected enrollments are expected to drop 31,444 students in the next five years. Obviously the implication is a reduction in the number of teaching positions at both the elementary and secondary levels over the next several years. However, current data indicate that the science and math teacher supply is decreasing more rapidly than student enrollment.

Major findings of the Iowa investigation:

1. Over the 12-year period (1970-81), the supply of secondary math and science teachers who have been certificated has declined 84 percent and 47 percent respectively (Table 1).
2. Competition in hiring from business and industry, especially in 1977, 1978 and 1979 has dramatically changed the job market. Prospective math and science teacher education candidates are being attracted by higher paying jobs in business. Teachers with one to five years of experience are also leaving for higher salaries in the business sector.

**Table 1**  
 Comparison of the Number of Fall  
 Vacancies in Mathematics and Science in the  
 Public Schools of Iowa with the Number of  
 Bachelor Degree Graduates Certificated to  
 Teach from the Twenty-seven Iowa Institutions for  
 the Years Indicated

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
<b>MATH</b>												
Vacancies	—	—	196	214	217	189	221	185	189	165	177	102
Graduates	234	218	228	207	166	104	95	75	60	46	49	38
<b>SCIENCE</b>												
Vacancies	—	—	172	261	248	176	217	176	156	159	110	67
Graduates	269	255	190	212	192	185	187	190	155	117	100	128
— data not available												

3. There are critical shortages of teachers in the areas of mathematics and science. In the science area, there are shortages in earth science, physics, and chemistry.
4. Long-range consequences of continued critical shortages on the total education system can be extremely serious. Many math and science courses are being taught by less qualified teachers with minimal preparation. This threatens the quality of instruction in these subjects. Many schools will be forced to drop some mathematics and science offerings because of staff shortages.

The prospects for an easy or immediate solution to the mathematics and science teacher shortage in Iowa seems unlikely and will probably worsen in the next few years. In years when the economy remains stable, the competition from business and industry for the service of people with these skills remains high.

### The Problem Nationally

A three-year national study by Howe and Gerlovich (1983) indicated a progressively worsening condition in the available supply of physics, chemistry and mathematics teachers. In that study, each state science consultant was asked to secure data covering the state's supply of science and math teachers and rank that supply based on a 5 point Likert scale (1 = surplus, 5 = critical shortage). In 1980 the national average rating for physics teachers was 4.15. By 1982 it had increased to 4.43. In chemistry, the mean rose from 3.71 to 4.16 for the same period. In mathematics the mean rose from 3.92 to 4.37.

## Recommendations

The following recommendations were proposed by Dr. Howe to address the above science teachers supply/demand problem (Howe & Gerlovich, 1983).

1. Schools should hire only certified teachers with approval to teach mathematics and science in grades 7-12.
2. Temporary teaching approvals should be eliminated.
3. Certification standards should be enforced.
4. Elementary teachers should be prepared to teach mathematics and science appropriate to those grade levels.
5. Inservice programs should be initiated to upgrade teachers.
6. Scholarships and/or loan incentives should be made available to encourage qualified students to enter science and mathematics teaching.
7. Areas identified as having critical shortages of teachers (i.e. mathematics and science) should be given special salary considerations.
8. Representative advisory committees should be established to avert future crises in mathematics and science teaching.
9. Local school districts should require at least two years of mathematics and two years of science (life and physical sciences, including technology and computer applications) during grades 9-12.

## Analysis of the Problems in Science Education and Recommendations for Resolution

*George Burnet*  
*Commission on Precollege Education in*  
*Mathematics, Science, and Technology*

### The Problem

The quality of precollege mathematics and science education in our schools and the implications for all sectors of American society have been articulated in the Commission on Precollege Education in Mathematics, Science, and Technology's report, *Today's Problems, Tomorrow's Crises* (1982) and in numerous other reports, articles, publications and public fora. Since July 1982 the Commission has been collecting information and suggested solutions from a broad base of institutions, organizations, and expert observers.