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The Fate of School Science

The erosion in precollege teaching of mathematics and science has become a matter of national concern. The National Academies of Sciences and Engineering and the AAAS held major meetings on the topic in mid-May; the National Science Board has created a Commission on Precollege Education in Mathematics, Science and Technology.

A great deal is being done already. The North Carolina School of Science and Mathematics, in Durham, is a residential public high school open at no cost to students who are qualified. Florida and California, which led the nation in relaxing high school graduation requirements in the 1960's, have reversed those policies; California, for example, intends to require a minimum of 3 years of mathematics and 2 years of science, and more from the college-bound. With corporate help, the Houston school district is providing a $2000 annual supplement to the salaries of teachers certified in specialties such as science and mathematics.

But salutary as these efforts are, we are in trouble. Half of the mathematics and science teachers hired last year were certified provisionally or on an emergency basis. Thirty-eight states report a shortage of mathematics and science teachers. While the proportion of students scoring 700 or above on the Scholastic Aptitude Test has stayed about the same in the past decade, the proportion scoring at low levels—about 300—has risen.

The danger is not in failing to train the gifted who wish to be scientists and engineers; they still seem to receive the requisite education and opportunities. Rather, it is in raising a generation of Americans who lack the education to participate in a technological age; in failing to assure the scientific literacy of Americans, whatever their future vocation. "Literacy" here does not mean that all students should be able to draw the structure of DNA. They should, however, have a basic understanding of the world of technology in which they will live and in which a rising proportion will make their living. They should understand what computers actually do and what their limits are. The world of the present decade will use a new language: robotics, CAD, CAM, integrated circuits, and the like. Those who do not understand that language are in for a difficult time.

Federal officials at the Academies' convocation saw the need for "partnership" efforts with states and local authorities and with industry, asserting that education in the American system remains a local enterprise. State and local officials accepted their central role, but wondered where to find the money to compete with the higher salaries offered by industry and to equip schools with modern and effective curricular materials.

Whatever the perspective, there was concern about how science, mathematics, and technology are taught. "People are being taught that they are too dumb to understand science," Carl Sagan said. Too many textbooks emphasize the student's ability to memorize, to remember facts, to regurgitate information rather than to think.

Science teaching may have become too abstract. It may have become astronomy without the stars, botany without the flowers, geology without the mountains and valleys. We may be teaching abstractions to students who do not understand the physical ties. One can understand why half of all high school graduates have taken no mathematics or science beyond the tenth grade.

There were repeated calls at the convocation for a reexamination of how and what we teach our children: the "how" formed by the rapid advances made in the cognitive sciences in understanding how children learn, and the "what" by the enormous transformation of the sciences—the emergence of so many new fundamental concepts—in the past two decades.

We need, in short, to reaffirm the commitment that Jerrold Zacharias asked of us more than 20 years ago: "A permanent, sustained commitment of the American scientific community to enlarge its presence in the American classroom."—FRANK PRESS, *President, National Academy of Sciences, Washington, D.C. 20418*