THE LAST WORD

by Sen. Gary Hart

HIGH TECHNOLOGY'S STAKE IN EDUCATION

The American economy is undergoing a fundamental transformation. At a breathtaking pace, high technology is becoming the seminal force in the growth of our economy, and the strength and international competitiveness of our high technology industries will, to a large extent, determine our economic future. Yet disturbing trends in our education system threaten the future of our high-tech industries. For these industries, especially, need large numbers of scientists, engineers, and industrial workers with good basic science backgrounds. However, much of our education system is in disarray. The quality of science and mathematics education in elementary and secondary schools has deteriorated. And while, generally, our universities are excellent, not enough incentives are provided to encourage enough of our best students to pursue careers in science and mathematics at the graduate level. It is important that we take steps to remedy these problems.

Assuring that we have a well educated populace and an adequate supply of scientists and engineers is a responsibility that our nation cannot neglect. It begins with early education in local schools and culminates in our universities. Families—as well as local, state, and federal governments—are involved in the process. And, in certain areas, our efforts to maintain a good education system have been remarkably successful. The quality of our universities is admired by the world. The recent development of the biotechnology industry is a tribute to the excellence of the academic biological science which is the foundation of this industry.

Yet at the elementary and secondary levels, the American education system is threatened by "a rising tide of mediocrity." Science and mathematics education, in particular, have suffered. Indeed, the decline in the achievement of public high-school students threatens our ability to send enough qualified students to colleges. Over one half of all high school students in the United States take no math or science beyond the tenth grade. At the same time, many of the qualified math and science teachers are leaving the profession for better pay and opportunities elsewhere. So, according to a recent National Science Teachers Association survey, many of those now teaching mathematics and science are not certified to do so.

While our education system is in crisis, our international competitors are devoting far more attention to preparing their own high school students—especially in science and mathematics. Soviet high-school students, for example, must complete two years of calculus, five years of physics, four years of chemistry, and four years of biology. Japanese students, as well, must take several courses in science and math to graduate from high school. We, too, must assure that our students graduate with a basic understanding of physics, chemistry, and biology.

How? To start with, we must encourage students to take more science and math courses. At the same time, we must make sure that female and minority students participate fully in these courses from the earliest grades on. Women and minority professionals are under-represented in science, mathematics, and engineering. We must remedy this. At the same time, we must improve our curricula. The federal government must provide incentives to local districts and state agencies to upgrade their science and math programs. Colleges and universities, as well, should be encouraged to provide services to teachers and to elementary and secondary school students. And, we must thoroughly and continually assess the quality of our programs and how successfully students are learning.

At the college and university level, there are several less critical problems in our system, which we must nevertheless resolve. For example, while we have many of the best graduate programs in the world, students often choose to enter professions where financial rewards are greater or more immediate. During the last decade, graduate school enrollments have been declining. According to one Office of Technology Assessment study, the number of Ph.D.s graduating in chemical engineering declined by nearly 25 percent in the decade between 1970 and 1980.

While such declines have not occured in all fields, it is important to remember that commercialization of many new technologies—biotechnology is an ideal example—depends on expertise from a variety of disciplines. A shortage of professionals in one field important to the industry may adversely affect the rate of commercialization—and the future—of the industry itself. Now, for example, a shortage of Ph.D.-level bioprocess engineers is attracting university faculty to industry. Not only are companies having to spend a great deal of time meeting staffing needs in this area, but academic departments are being depleted of faculty.

We must, rather, encourage students to seek careers in research and development by continuing government's commitment to funding research. And, we must not undermine student aid and loan programs. At the same time, we must encourage industry to support academic programs of which it is the beneficiary.

Good basic science and math education, though, is important to more than just those who will spend their entire careers working in high-technology industries. Our economy is changing, becoming more flexible. Those entering some of our traditional sectors are being displaced. Many will need to retrain to enter new industries. Workers who have had a sound mathematics and science education will find it easier to retrain and acquire the skills needed in these new industries.

Finally, a good science education for everyone in both high school and college will raise the level of public debate on science and technology. Those involved with the commercialization of biotechnology are especially aware of how public concerns can influence the future of their industry. In our democracy, where the public makes vital decisions on development of new fields, it is crucial that citizens be well prepared to make such decisions. A scientifically literate public—a public which understands science and the tasks of scientists—will be better able to make the judgments entrusted to it by this democracy.

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