Radical Reform for Science Education

A group of scientists and educators has called for sweeping reforms in all aspects of elementary and high school education with the aim of creating a "scientifically literate" populace. Their report, "Science for All Americans," is part of a long-term project launched 4 years ago by the AAAS.

Recommendations are particularly directed at improving education for females and members of minority groups, both of whom fall behind white males in participation and levels of achievement in science and math.

The report is probably unique for its genre in that it is virtually devoid of any statistics. It thus practices what it preaches: the central message is that instruction in science, mathematics, and technology should downplay the learning of large numbers of facts in favor of emphasizing important concepts, themes common to all the sciences, and clear thinking. In other words, quality versus quantity.

The report is the culmination of Phase I of Project 2061 (named after the date of the next visit of Halley's comet), initiated and directed by F. James Rutherford, chief education officer of the AAAS. The report, by a committee chaired by William O. Baker, retired board chairman of Bell Labs, and Margaret L. A. MacVickar, dean of undergraduate education at the Massachusetts Institute of Technology, envisages a total reorganization of precollege education in science in the next 15 years, undertaken with collaboration from industry, government, higher education, and scientific societies.

At a press conference held on 23 February, speakers sounded the usual alarms about America's declining industrial competitiveness and the low international standing of American students. "We need literally a wartime response to the crisis in science education," said Representative Doug Walgren (D–PA), of the House Space, Science and Technology Committee. The country needs a "more skilled and adaptable workforce than ever before at all levels from the factory floor to the top level of management," said David Hamburg, president of the Carnegie Corporation, which contributed to the study. "We'll have to think for a living."

Baker said the country will no longer be able to rely on the gifted and talented to "see us through." In contrast to Japan, where 10% of students have IQ scores above 133, "we can't scrape up more than 1%" of students scoring at that level. Eric Bloch, director of the National Science Foundation (NSF), observed that 85% of the 25 million entering the workforce in the next decade will be women, minorities, and new immigrants.

The purpose of the project is broader than improving industrial competitiveness. According to MacVickar, its "primary goal is to empower individual citizens to feel intellectually comfortable in the world they're going to be living in."

According to the report, Project 2061 differs from traditional approaches in two ways. One is that "boundaries between traditional subject matter categories are softened and connections are emphasized. Transformations of energy, for example, occur in physical, biological, and technological systems, and evolutionary change appears in stars, organisms, and societies."

The second difference is that "the amount of detail that students are expected to retain is considerably less" than in traditional courses, and "ideas and thinking skills are emphasized at the expense of specialized vocabulary and memorized procedures." For example, one can learn that DNA molecules contain instructions for cells to assemble proteins without memorizing what DNA stands for. By the same token, much more emphasis is placed on learning to operate calculators and computers and on understanding information presented in various formats, rather than on learning to make mental calculations.

The report contains separate chapters on the basic concepts that all students should learn in physics, math, technology, biology, "the human organism," "human society" (cultural, political, economic, and social systems), and "the designed world" (major technological systems and their interactions with the environment and society). There are also sections on the scientific approach, the history of science, values and attitudes in science, and "common themes" pervading all areas of science.

With regard to the downplaying of factual knowledge, Rutherford was asked at the press conference how this squared with the fact that countries like Japan put much more emphasis than does the United States on memorization. He acknowledged there was some risk—"I think if we put some of these reforms in, we'll look worse for a while." But he said in the long run "we'll be way ahead."

Phase II of the project will involve the development of a variety of curriculum models by six teams that are being established in school districts in California, Georgia, Texas, Wisconsin, and an urban area in the East (yet to be determined). Specific recommendations will also be developed on educational research, the uses of educational technologies, the organization of schooling, state and local education policies, and the improvement of teachers and teaching.

The first two phases of the project are being funded by $10 million from a variety of sources including the NSF, Carnegie Corporation, IBM, and the Mellon Foundation. After 4 years of Phase II, a 10-year phase of implementation of the reforms is anticipated. ■ CONSTANCE HOLDEN

Animal Rightists Claim Bomb Blast

London

Two animal rights groups in Britain have claimed responsibility for a bomb that caused severe damage to the administration block at the University of Bristol. The activitists said that the high-explosive device was intended to be a protest against research using animals being carried out at the university's medical and veterinary schools.

Although militant animal rights groups have, in recent years, admitted responsibility for a number of incendiary devices planted in stores in London and elsewhere, the Bristol University blast is the first time that high explosives have been used in such incidents.

There were no casualties in the explosion, which took place in the early hours of the morning of 23 February. However, the bomb caused severe damage to a bar and dining area used by university teaching and research staff, as well as to the university's computer.

Twelve hours prior to the blast, a warning had been received from a telephone caller claiming to belong to a previously unknown group, the Animal Abused Society. The building was searched, but nothing was found. Another caller later claimed that the bomb had been placed by the Animal Liberation Front, which is already thought to have been responsible for many of the incendiary devices.

After visiting the scene of the explosion, the British Secretary of State for Education and Science, Kenneth Baker, described it as "an act of terrorism." He added that universities might have to impose stricter security controls as a result of the attack.

■ DAVID DICKSON