EDUCATION

Congressional Hearings Link Science Education to Jobs

Today, virtually every job requires more than a basic level of science and technology competence. In the past, it was expected that workers know basic mathematics operations and understand the measurement system. Now the expectations and the job skills are higher, including word processing, spread sheets, and, in some cases, highly specialized information technology functions. Yet too few students graduate with advanced skills, threatening their ability to find employment and the future of the economy.

"We must continuously and diligently nurture future generations in order to provide them the opportunity to contribute and prosper in the technology-based world of tomorrow," said Representative Vernon Ehlers (R–MI), a AAAS Fellow, at a hearing on 17 March held by the House Science Committee. It was the first of a series of hearings on improving science education from preschool through high school as well as for the public. Over the year, the committee will examine the increasing need for math and science education and what reforms can be implemented to ensure that American students have the skills needed to become competent employees and contributing citizens.

"To enter the workforce in jobs ranging from an office worker to an aerospace engineer, technical competence and problem-solving skills—the fruits of a solid foundation in math and science—are essential to exercising our roles effectively," Ehlers said.

Several recent assessments point to the need for improved science and math education. According to the Third International Mathematics and Science Study, released by the National Science Foundation and the National Center for Education Statistics in 1998, U.S. high school seniors outperformed only two (Cyprus and South Africa) of the 21 participating countries in math and science.

In its own Science Policy Report, the committee noted that the growth of the national economy is driven by continuous technological innovation. If this trend is to continue, the report concluded, the United States must educate its students well to produce a talented and versatile workforce. For example, the recent surge in the technology industry has created a demand for more workers with information technology and engineering skills.

Yet such a demand is hard to meet because workers lack the education and skills needed. "An acute skills shortage in every part of the country threatens the foundation of American competitiveness," said Amy Kaslow, a senior fellow at the Council on Competitiveness and a panelist at the hearing. "Too many new graduates, would-be workers, and existing employees cannot read or do simple math, two essentials for adapting to new tasks and meeting market demands." Companies typically "reject the vast majority of job applicants—upward of 80 percent—because they fail to meet the most rudimentary standards," Kaslow said.

Many U.S. companies have turned to hiring foreign workers who do have the education. Last year, legislation raised the ceiling for the number of H1-B visas to permit entry of additional highly skilled workers needed especially by the computer and information technology industries. "Companies have been finding it extremely difficult to identify, recruit, and place the number of employees that they need, who possess the requisite mix of skills, and are available for the job growth expected in those industries," said Shirley Malcom, director, Education and Human Resources, AAAS, who also testified at the hearing.

John Harrison, co-founder of Ecutel, a small technology firm in Alexandria, Virginia, told the committee that his company depends on sophisticated engineers to help make its software product, a tool to roam the Internet. Yet finding those engineers is not easy. "We received 630 résumés in our first few months, and of those we considered qualified, none were U.S. citizens," Harrison said. The company had to spend $80,000 on immigration legal fees to hire its workers. "If we can't figure out a way to make it easier for small technology firms to maintain a qualified engineering staff at a reasonable cost, then innovation suffers and so does our economy."

The U.S. education system has not been able to produce enough graduates with the necessary skills. "The jobs for college- and graduate-trained computer scientists and engineers have increased faster than our rate of production of these workers despite the strong demand being seen in computer and information technology fields for some while," Malcom said. She noted that earned bachelor's degrees in engineering actually dropped from 66,947 in 1989 to 63,066 in 1996 and bachelor's degrees in computer science dropped from 30,963 in 1989 to 24,405 in 1996.

"We must educate all students to much higher levels in science, mathematics, and technology," Malcom said. "We must urge school districts toward rigorous standards that can support our national need for a next millennium workforce and citizenry." She called for developing a consensus around standards and core learning in science and math, training a highly qualified teaching workforce, and sharing science with the public.

"Kids come in with an interest in math and science, but need encouragement to continue," Malcom said.

TRAINING

Taking Standards to the Classroom

In Cedar Rapids, Iowa, a group of teachers, university officials, and business representatives was formed to select curriculum materials for local schools. The group participated in workshops where they learned to evaluate textbooks and other curriculum materials for how well they align with nationally recognized science and mathematics education standards. What they learned in these workshops led them to postpone text-

book selection, perform a more thorough evaluation of materials, and eventually make the right choices.

The Cedar Rapids group participated in the Professional Development Programs, a service provided by Project 2061, the science education initiative of AAAS. The Professional Development Programs are helping educators select their curriculum materials and improve their teaching skills based on national standards in science and mathematics education. More and more states are adopting educational standards and these programs help bring those standards into the classroom so that students can achieve science literacy goals. Launched in 1998, the Professional Development Programs are providing workshops, seminars, and consulting services to schools and organizations around the world.

"We know that high-quality professional development for classroom teachers is one of the key factors in improving students' academic performance," said George Nelson, director, Project 2061. "Without adequate support and professional development, teachers will not change their classroom practices and, as a result, children will not meet national and state standards."

Project 2061 began its work in 1985 to reform science, mathematics, and technology education for K–12 students nationwide. Taking its name from the year that Halley's Comet next approaches Earth, Project 2061 has developed benchmarks for student learning and produced a wide range of tools for educators.

Over the next 3 years, the Professional Development Programs are expected to deliver more than 500 workshops across the country. Start-up funding for the programs was provided by The Pew Charitable Trusts. The Project 2061 staff will also help school districts develop funding from other sources in their communities to sustain their professional development programs over time. The programs are designed to eventually become a self-sustaining enterprise.

The Professional Development Programs are customized to meet the specific needs of states, districts, and schools. The workshops range from 1-day introductory sessions to a multi-year series. A number of schools, universities, and organizations have taken part in the programs, including NASA's Goddard Space Flight Center, the National Aquarium in Baltimore, Maryland, and teachers and administrators in Panama.

"The workshops made us stop and look at national standards," said Carol Cassells, a district science facilitator in Cedar Rapids who participated in the programs. "We were able to incorporate them and put them into our own curriculum as a real keystone. The resources from Project 2061 have been woven into everything we do."

FELLOWSHIPS

Fellow Honored by Air Force

With defense budgets shrinking and more cuts predicted, the military has its eye on business deals. The Air Force, for one, is working with other government branches and the private sector through its dual-use science and technology program. That program was put together with the help of Joan Fuller.

Fuller, a AAAS Defense Policy Science and Engineering Fellow, was recently honored for her work with the Assistant Secretary of the Air Force (Acquisition) Civilian of the Year award for the year 1998. The award recognized Fuller for creating innovative guidelines for the dual-use program that have broken down the barriers between the Department of Defense and the commercial sector. The program is the result of a congressional mandate that encourages the military to do business with private industry.

The 1998–1999 class of AAAS Science and Engineering Fellows.

"I didn't do much," Fuller said. "I just made sure people knew we could share money." As a result of her efforts, the Air Force leveraged $43 million in Air Force dollars to achieve over $150 million in dual-use investments. For example, the Air Force and the Naval Research Lab worked with National Semiconductor Corporation to develop radiation-tolerant electronics for satellites. The military was able to take advantage of the booming commercial satellite business and, in turn, the company was able to tap into government money and scientific expertise. The military committed $1 million to the $9-million project.

Fuller, who has a Ph.D. in chemistry, is one of four 1998–1999 AAAS Defense Policy Fellows working at the Pentagon on issues related to defense policy, technology applications, defense systems analysis, and program oversight and management. AAAS offers a number of other science policy fellowships that deal with Congress, global stewardship, diplomacy, risk policy, environment, and technology policy. Each year about 100 scientists and engineers are placed in legislative and executive branch offices through the AAAS programs. The programs are designed to provide each fellow with a unique public policy learning experience; to bring technical backgrounds and external perspectives to decision-making in the U.S. government; and to demonstrate the value of science and technology in solving important societal problems. Applicants must have a Ph.D. and be U.S. citizens. Federal employees are not eligible.

Through her fellowship, Fuller also served as the Air Force Program Element Monitor for the Basic Research Sciences Program. Her work required her to interact with Congress, the Department of Defense, the Department of Commerce, and industry leaders. "Whenever congressional staffers have questions, they come to us," Fuller said.

Fuller has worked on a number of projects ranging from jet propulsion to high-performance computing centers. "For me, it's a big toy store," Fuller said. The fellowship was a natural choice for Fuller, who had worked in industry and was familiar with basic research. Fuller's research on room temperature molten salts led to a new class of battery electrolytes that are nonflammable and nontoxic.

After her fellowship ends in September, Fuller will work at the National Institute of Standards and Technology, where she will develop a database of molten salts. She will take with her her experience in the Air Force, where she learned how important science is to policy—a lesson reinforced by the fact that she was the first scientist to be a recipient of the Civilian of the Year Award. "I was surprised and flattered," Fuller said. "To have a scientist acknowledged is a great reflection on this office. In the Air Force, science is right up there. Planes don't fly without science."

For information on AAAS Science Policy Fellowship Programs, call 202-326-6700, e-mail science_policy@aaas.org, or visit the fellowship Web site at www.aaas.org/spp.