THE NEW ENGLAND COUNCIL

Spotlight on the Issues:

SCIENCE, TECHNOLOGY, ENGINEERING AND MATH EDUCATION

A periodic snapshot on issues important to the region's economic development agenda. *Spring 2006*

History teaches us that new technologies are an important economic driver in New England. And key to that continued success are individuals with the talent to develop those technologies.

Skilled workers are an important part of the innovation community. But producing enough graduates in science, technology, engineering and math (STEM) to meet the demand for skilled workers has become a national challenge. While a shortage of scientists and engineers is looming in the future, the number of American students entering these fields continues to dwindle. Having enough graduates with skills in these areas is critically important to the nation's ability to remain competitive in the global economy. This is particularly true in New England, where the region's leadership in the innovation sector depends on the availability of a highly-skilled and talented workforce.

The number of engineering degrees awarded in the U.S. is down 20 percent since 1985. If current trends continue, by 2010 more than 90 percent of all scientists and engineers in the world will be living in Asia. The National Science Board notes that South Korea — with one-sixth of the U.S. population — already graduates as many engineers as the U.S.

A 2004 survey by the Computer Research Association found that since 2002, the number of newly-declared computer science undergraduates has dropped 33 percent and computer science masters degree candidates has dropped 25 percent.

Jack Wilson, President, University of Massachusetts, and Annmarie Levins, Associate General Counsel, Microsoft Corp.

There is also a persistent under-representation of women and minority communities in science, math, and other technical fields. According to the Information Technology Association of America, the number of women employed in technical fields has actually declined from 41 percent in 1996, to 32 percent in 2004. African Americans make up only 10 percent of the IT workforce, and Hispanic Americans only 6.4 percent.

These trends present a concern for the business community.

"We hire large numbers of scientists, engineers and technically-trained people. We depend on having a steady pipeline of graduates in technical fields who are able to come on board and drive innovation," said Annmarie Levins, Associate General Counsel, Microsoft Corporation, member of The New England Council's Board of Directors and chair of its Technology Committee.

Microsoft has several programs directed at mitigating some of the challenges in the STEM area. Its "Partners in Learning" program helps to develop teachers and innovative curriculum. Its "Unlimited Potential Program" is dedicated to improving opportunities for the development of technology skills outside of the formal school system, e.g., through community technology centers. "The Partners in Learning and Unlimited Potential programs are fundamental to our business mission and a core part of our citizenship efforts," Levins said.

Levins said in order to succeed in building a stronger STEM pipeline, new initiatives must approach the issue at early grade levels. "We have to start out in grade school. If kids aren't already excited about math and science by the time they get to high school, we have probably lost them. And they need to work hard in math and science in high school if they are going to study in these fields in college. The drop-out rate in math and science among entering college students is very high, because so many of these students are poorly prepared and cannot do the work," Levins commented.

Support is needed from both the public and private sectors, she said. "Government and business should take a leadership role. We think there needs to be a partnership," Levins said. "We must invest in teachers, in curriculum, in our communities and in diversity."

EMC is the world leader in products, services, and solutions for information storage and management that helps organizations extract the maximum value from their information, at the lowest total cost, across every point in the information lifecycle. The company is involved in a variety of initiatives nationally and locally to improve K-12 math and science education.

EMC Chairman, President and CEO Joseph Tucci was recently appointed by President Bush to the President's Council of Advisors on Science and Technology. He has also served as chairman of the Business Roundtable's Education Task Force which last year released a major report, "Tapping America's Potential: The Education for Innovation Initiative," presented to the Administration and Congress.

In addition to sponsoring several major conferences on math and science education, EMC has been a sponsor of numerous initiatives throughout Massachusetts, supporting students and educational opportunities in math and science.

This July, EMC will host a Teacher-to-Teacher Initiative workshop designed to strengthen skills and teaching resources of 125 K-12 math and science teachers in the greater Boston area. The company is partnering with the U.S. Department of Education and TechNet New England to provide teacher professional development training and new curricula. U.S. Secretary of Education Margaret Spellings will participate in this first-in-New England event.

(More on next page)

•Improving STEM Education

(From Page One)

Jack M. Wilson, President of the University of Massachusetts, and member of the Council's Board of Directors, says: "Addressing the STEM challenge is a critical issue of competitiveness, not just for Massachusetts and New England but for the entire nation. We in higher education – particularly at a public university such as UMASS – have a special responsibility and role to play in addressing this issue."

All five UMASS campuses are already active on this issue – through the Boston Science Partnership at UMASS Boston, the STEM Collaborative at Lowell, the Commonwealth IT Initiative at Amherst, the Mathematics Education Initiative at Dartmouth, the Pipeline Collaborative at Worcester, and a new masters in science education through UMASS Online.

However, according to Wilson, this is not sufficient: "In spite of these outstanding individual projects, we are committed to doing more and better in the future. As a state and region, we need more strategic, better-coordinated and more collaborative efforts among government, business and higher education to get this job done. And, I want it to be known that Massachusetts and New England can count on UMASS as a full and committed strategic partner in such efforts regarding STEM in the future."

BAE Systems, an international defense and aerospace systems company located in New Hampshire, has taken a proactive approach to develop and inspire the next generation of workers.

"One of the most significant issues we face today in the defense industry is the lack of new engineers to replace the rapidly diminishing pool of engineers who are retiring. Fewer of our young people are choosing engineering as a profession, and even fewer opt for careers in the aerospace and defense fields," said Jeffrey Rose, Manager of Legislative Affairs, BAE Systems.

BAE is partnering with higher education on curriculum development with such institutions as University of New Hampshire, Dartmouth College, New Hampshire Technology Community College, Rivier College, MIT and the University of Illinois.

"One of the focal pieces of this commitment is BAE Systems' sponsorship of the FIRST Robotics program, including sponsoring a dozen area teams as well as the Granite State Regional Competition," he said, adding that BAE also sponsors the Women in Technology program.

Raytheon, a leader in defense and government electronics, space, information technology, technical services and business and special mission aircraft, last fall launched "MathMovesU," designed to develop messages and programs to get middle school students interested in math and science.

With MathMovesU, Raytheon has partnered with several celebrities to develop a series of messages about how math plays a role in "cool" careers.

Raytheon also launched a $1 million grant program which will fund classroom help for teachers, provide grants to schools and teachers in support of math education, and scholarships to students. Teachers can also access curriculum resources from MATHCOUNTS, a program which promotes excellence in math. Raytheon supports other math and science organizations including FIRST Robotics, FIRST Lego, and Future Scientists and Engineers of America, and strategically partners with colleges like Tuskegee University to develop a pipeline of engineering talent.

Exchange City, with sites in New Hampshire and Rhode Island, is a nationally-known experiential education program. Exchange City combines a 30-hour classroom curriculum for students in the fifth through ninth grades with a day-long visit to the "city" where they take on jobs and learn about business. In a companion program called EarthWorks, middle school students receive hands-on education in science. Both programs are also focused on career exploration.

"There is so much math and science education involved in the Exchange City and EarthWorks programs which are seen as an effective means of recovering some of the slippage that people are experiencing in math and science education," said Executive Director Philip Ross.

Between the two sites, Ross said they hope to reach a level of participation of 60,000 students per year and 120,000 students from the region when all four centers are operational.

In 2004, the Museum of Science in Boston formed the National Center for Technological Literacy – to enhance technological literacy in K-12 and bring technological education into science centers and museums across the country. "Our goal is to have at least one museum or informal educational institution in each state participate by the year 2015 and to have engineering introduced into the K-12 curriculum in all states by 2015," said Ioannis Miaoulis, President and Director of the Museum of Science.

The Center provides advocacy and support, works with the state departments of education to introduce engineering into the curriculum and develops educational materials and textbooks. Some 12,000 elementary students nationwide are also using their textbooks.

Clearly members of The New England Council have identified improving STEM education as critically important to the region's economy. The Council has been highlighting this issue with members of Congress in the hopes of securing greater federal funding and encouraging greater coordination between the public and private sectors to improve STEM education.

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