

## Course of action: Leaders push math and science education to boost high-tech industry

By Andrew J. Manuse / Daily News Staff

Sunday, October 2, 2005

Ken Toso and Tom Casey said they were both interested in math and science in high school. They both had family members in mechanical and engineering jobs who inspired them to pursue similar careers.

Toso and Casey both started with mechanical engineering degrees in college, and Casey worked for several years in that field, but both eventually veered down biomedical engineering paths that led them to their current positions.

Now, Toso and Casey are research and development directors for two different businesses at Boston Scientific Corp.'s Endo surgery Group in Marlborough.

Toso said the "opportunity is huge" for their line of work.

The Natick-based medical device company's spokesman, Eric Olsen, said research and development and manufacturing engineers are in demand at Boston Scientific. The trouble has been finding people who have the right experience to fit into a specific role, Olsen said.

Today, public and private leaders are focusing on promoting math and science education paths that would lead to in-demand careers in the high-tech industry, such as Toso and Casey's.

Toso said his work overseeing 12 people and about eight projects that relate to women's health is "challenging" and even "hard at times," but, he said, it is also rewarding.

One of Toso's projects involves a device that stops excessive bleeding in older women by "zapping" the inner lining of their uterus. It provides an alternative for women with this problem, who otherwise would have to have their uterus removed.

Among other research, Casey works on devices that are implanted inside cancer patients so they don't have to be "pricked with needles" every time they have chemotherapy. The devices allow for faster, more comfortable and more effective treatment, he said. His challenge is making sure the life-saving devices aren't rejected by the human body once implanted, he said.

Getting to his current position was also challenging, Casey said, but well worth the effort.

"Technical fields, specifically in the medical (arena) ... are very rewarding," said Casey. "Particularly when you're dealing with devices that improve the outcomes of patients.±... I can't overemphasize the pride in seeing a device you've worked on help someone, especially someone you know."

According to Jim Stanton, director of the Technology Initiative at the nonprofit Metro South/West Regional Employment Board in Framingham, people like Toso and Casey can be invaluable for younger students.

Bay State middle school and high school students "need to be aware of, interested in and motivated to" pursue a career that involves a background education in science, technology, engineering and mathematics, or a STEM career, Stanton said.

Stanton, with the help of Dave Cedrone, director of a state-level teaching and technology initiative, developed a model for predicting the future need for STEM positions in the Massachusetts work force using nationwide statistics generated by the National Science Board in 2004.

The regional employment board under Stanton's direction, published a report with their findings, called "A Strategy for Addressing the STEM Workforce Pipeline Challenge."

Currently, the report says, the state is sending 4,000 high school seniors into STEM-related undergrad degree programs, but only half of those students end up with STEM degrees.

If the nation's economy grows at 1 percent a year for the next five years, Massachusetts will be short 38,000 workers with STEM-degrees in 2010, the report projects.

The shortage is the result of two large factors, the report says. High-tech and biotech companies have relied on highly educated immigrants to fill many of these positions, but many of these people stopped coming to the United States after the 2001 terrorist attacks on New York and Washington.

Other nations, such as Canada, Australia and Great Britain, have ramped up their efforts to attract these workers and the nations they had been coming from, largely China and India, have been retaining many of these people for their own emerging economies. Additionally, immigration law became tighter after the attacks, which has prevented some of the potential workers from getting in.

Secondly, baby boomers in STEM-related careers will begin retiring in droves later this decade. In 2010, 7.1 percent of the STEM work force will retire, the report projects.

The report suggests five ways to fill the 38,000 STEM-worker gap:

- A public/private initiative to keep baby boomers in the work force longer.
- Substantial retraining efforts at community colleges to get people who are laid off from dying industries into STEM-related careers.
- Passing laws to allow more foreign nationals to come in and work in the high-tech industry.
- Colleges offering STEM majors retaining more students in those programs.
- Increase the number of kindergarten through 12th graders who will eventually pursue STEM degrees by 300 percent.

According to Stanton, the last method is the most important, and one where the High School STEM Internship Collaborative he oversees is focusing much of its efforts.

Internships at companies, such as Boston Scientific and Intel Corp., which has a chip-making plant in Hudson, are the primary strategy the organization is promoting, using grant money from the state and other funding sources.

The High School STEM Internship Collaborative, which is being led by the Metro South/West Regional Employment Board, also involves the Boston Private Industry Council and several of the state's other regional employment boards.

The MetroWest area chambers of commerce and about 30 individual businesses, including Intel, are involved with the program.

Boston Scientific has its own co-op and internship programs and also works with high schools to provide mentors and shadowing opportunities, according to the company's spokesman, Eric Olsen.

Intel spends \$100 million a year training youth, volunteering at schools and helping teachers learn how to better motivate and educate their students, according to Rob Richardson, education manager for Intel's East Coast operations.

The company paid \$69,000 last year to Massachusetts schools for allowing Intel employees to come into classrooms and explain what they do, he said. Gov. **Mitt Romney** just launched a campaign he calls the "education imperative" and introduced education reforms in the state Legislature that would fund similar efforts.

"I've heard from employers that they need more engineers with math and science skills, and we're not doing enough to prepare students for those employees," Romney said last week in an interview with Daily News editors.

"We've got to raise the bar if we are to remain the economic leader in the world. As the state that leads education, we've got to raise the bar here."

Romney's bill would award teaching certificates to 1,000 "highly qualified" people who are currently working in the high-tech industry and pass math and science teaching tests. He would award \$5,000 bonuses to these teachers at the end of the school year if they meet certain standards.

Among other proposals, the governor also wants to start specialized math and science classes as early as seventh grade, give one laptop to every middle school and high school student in the state, encourage high school students to take college level math and science courses and create a Web site that shows students what jobs are in demand, how much they pay and what education and training students need to get those jobs.

According to Heidi Perlman, a spokeswoman for the Massachusetts Department of Education, the governor's proposal goes along with what's happening in today's economy.

"More jobs are in the biotech and engineering fields than ever before, and we want our students to compete for those jobs," said Perlman.

Some state initiatives have already passed that would lead to this end, she said. The Board of Education voted to make science a requirement for graduation starting with the class of 2010, and science will become part of the state's MCAS testing system in 2008.

Gerry Moss, a biology teacher at Framingham High School who used to work in the biotech industry, said emphasizing the importance of math and science is "absolutely beneficial" to students, and "if making science a part of the MCAS test does this, then it's a good idea."

Moss, who has a poster in his classroom about "What you can do with your biotechnology skills," said relating what children learn in the classroom with how it can be applied in the real world is of utmost importance.

He admitted that working for Perkin Elmer Life Sciences in Boston and other biotech companies has given him a different perspective he can bring into the classroom, but said other science teachers can invite speakers into the classroom to provide that same perspective.

"I always relate my business experience where it makes sense and where it will drive a point home," said Moss. "I don't stand up and proselytize to kids, but I try to create an environment where they learn the basics of biotechnology, and how that information is used in the real world.±... If that creates an interest in biotech as a career, then that's a plus."

Moss's class, called Biotechnology, which is an elective at Framingham High School, includes sections on introductions to DNA structure, genetic engineering, forensics and finishes with a segment on the drug discovery process.

Melissa Cordella, a senior who took Moss' class last year, said the last assignment she did related to the drug discovery process put everything she learned in the class together.

In the project, Cordella said she and other students looked at a hypothetical gene in the jungle that might cure cancer and went through the steps that a real scientist would go through to create a drug using the gene that could be sold.

Cordella said the class discussed tests they would do on the gene, how to deal with animal rights activists who would protest testing on animals, how they would create a viable drug, and how they would test it on humans.

"We prepared a power-point presentation at the end as if we were going to sell (the drug)," said Cordella. "We talked about money issues, to make sure it wasn't too expensive so a lot of people could afford it, but also so we could make a profit (on the drug)." Cordella said the class "really got me interested" in biotechnology.

Now she plans to go into a research career or nursing because of it. She said Moss helped her after class by asking her why she wanted to do certain things, and made her think about what she would really enjoy in a career. She said Moss also helped her think about where to go to college and what courses to take.

Cordella said she's considering Case Western in Ohio and Boston College, among other schools.

Marnie Ritchie, a junior who's currently in the class, said she liked how Moss didn't "coerce a student to think a certain way." Ritchie, who wants to study English literature in college, said she took the biotechnology class to get a sense of bioethics.

Dmitriy Kozlov, another junior in the class, said "the way Moss teaches made me interested in biology and made me want to pursue a biotech career."

Kozlov said he wanted to study forensics in college and his ultimate goal was to be a doctor or a biotech research scientist.

Bill Rigney, science coordinator for grades six through 12 at Marlborough Public Schools, said the school's curriculum was driven by the Massachusetts Department of Education's science framework. The sciences have been very popular in Marlborough, Rigney said, but the school has had a shortage of highly qualified teachers. Because the school only has one highly qualified physics teacher, he said, "we can't allow as many kids to enroll in physics as we'd like."

Rigney said Intel has been very supportive of Marlborough's science, math and technology programs and the school has received four grants for computer technology. Allowing high schoolers to take classes at local colleges could be one solution, he said.

According to Maureen Dunne, an economist at the MetroWest Economic Research Center at Framingham State College, it's critical to plan ahead and educating students in math and science is important, but only part of the equation.

"We have to prepare our high schoolers, college students and retrain our workers at the same time," said Dunne. "It's an economic juggling act, keeping all these balls simultaneously in the air. We're competing with nations that are ready to do this."

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