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Real-World Experiences

Forget the beach. Summer 'externships' are showing math and science teachers just how much their subjects really count in the workplace.

By Rhea R. Borja

Santa Clara, Calif.

When Allen Goodman goes to work these days, it's not to his job as a computer science teacher at a suburban public school northeast of San Francisco. Instead, the energetic 60-year-old gets into his 2003 Toyota Camry at dawn and steers it 50 miles south down bustling freeways to Silicon Valley, to the glass-enclosed buildings of the technology giant Intel Corp.

Here, in a building so big that letters and numbers are painted on columns to help employees find their cubicles, Mr. Goodman is spending his summer on projects like a marketing survey of universities in Russia, Israel, and elsewhere around the globe.

Business Savvy: Computer science teacher Allen Goodman, foreground, shows the results of a marketing survey he conducted to Russ Schafer, the director of marketing and technology management at the Intel Corp.
—Photo by Erin Lubin for Education Week

"I'm always looking to stretch my boundaries," he said, his Brooklyn accent belying his California tan. "I wanted to get as far away from my school routine as possible, so that when I return to school, I'm fresh."

Mr. Goodman is one of 191 San Francisco Bay Area mathematics and science teachers working at local technology, scientific-research, or financial companies and universities this summer to better grasp the skills and knowledge their students will need in an increasingly global workplace.

Coming from teaching jobs stretching from kindergarten through community college, they are fellows in an eight-week "externship" program run by the Industry Initiatives for Science and Math Education, a nonprofit group based here in Santa Clara.

SEE ALSO
Read the accompanying story, "Out and About: Extern Programs at a Glance."

More than two decades old, IISME is the biggest and oldest of at least a dozen U.S. programs that offer summer externships to teachers in universities, nonprofit organizations, and corporations, some of them Fortune 500 companies. Besides Intel, the group has placed teachers this summer in dozens of workplaces, including the National Semiconductor Corp., also based in Santa Clara; Sunnyvale-based Lockheed Martin Corp.; and Stanford University in nearby Palo Alto.

Such professional-development opportunities are slowly becoming more popular, experts say, as concern mounts nationally over the state of math and science education. Programs that give educators real-world experience and deepen their subject-matter knowledge are being seen by education policymakers and multinational companies as one way to better equip U.S. students to compete with those in fast-rising countries such as China and India.

"The U.S. is in a much different position now in competitiveness," said Julie E. Dunkle, the U.S. education project manager at Intel Corp. "If we don't wake up and do something quickly, we will be a very different nation."

"[The companies] felt that there was this untapped resource in their employees, ... and it could go towards education," said Kaye Storm, the special-projects director and the former executive director of IISME, who has been with the organization since its inception.

IISME's summer-fellowship program started out with 40 teachers and 12 companies. The group's growth picked up in 2001, when it began partnering with the influential Silicon Valley Leadership Group, an association of executives of 200 high-tech and biotechnology companies and universities, Ms. Storm said. The executives helped IISME connect and partner with other area businesses willing to offer externships, helping boost the number of companies involved to its current 57.

"[They] gave us entrée to executives that would have taken us forever to get by ourselves," Ms. Storm said.

IISME's annual budget now stands at $2.4 million, with $1.7 million going toward teachers' summer salaries and benefits. The organization gets its funding from area companies and foundations, such as the Thousand Oaks-based Amgen Foundation, the Santa Clara-based Intel Foundation, and the Genentech Foundation for Biomedical Sciences, in South San Francisco. The summer externs earn up to $7,400 in the program.

Intel Corp. is employing 21 teachers this summer in a variety of departments. Many of the teachers have a business background, which helps them integrate into the highly structured Intel culture, and more quickly get up to speed on their summer projects, said Russ Schafer, the marketing and technology-management director for Intel Research, and Mr. Goodman's boss.

A consortium of Bay Area companies partnered with the University of California, Berkeley, to create IISME in 1985, soon after the seminal 1983 report *A Nation at Risk* decrying the state of public education.

Mr. Goodman now teaches at Hercules Middle/High School in Hercules, Calif. But before restarting his teaching career in 1999, he was a publishing executive for 25 years. Instead of a crowded classroom, his office at Bantam Doubleday Dell in midtown Manhattan overlooked Times Square. He traveled around the country—"I was the Johnny Appleseed of books"—while conducting meetings and otherwise calling the shots. His business background made him a natural fit for Intel, Mr. Schafer said.

Tom McQueen, a market-analysis manager at Intel Research and Mr. Goodman's mentor, put it this way: "We need people to take the ball, and run with it."

In the early 1990s, IISME helped get other teacher-externship programs off the ground under a grant from the National Science Foundation. But of those roughly 25 programs, only several are still operating, Ms. Storm said.

Many programs flat-lined after the 2001 dot-com collapse, as funding from government agencies dwindled, industry buy-in slackened, and local economies weakened, she said. While IISME no longer keeps track of the number of teacher-externship programs nationwide, new programs have sprouted and started to take root in the past few years.

In Massachusetts, for example, the Boston-based nonprofit Leadership Initiatives for Teaching and Technology offers a 13-month program combining graduate coursework with work experience in local companies. In Delaware, teachers spend three days at businesses and nonprofit groups. And in San Diego, science teachers spend four weeks learning about and working in biotech companies.

Research on the effectiveness of teacher externships is limited.

Working it Out: Teacher Mary Fludin, right, confers with Jodi Williamson, her peer coach from the Industry Initiative for Science and Math Education summer-externship program, at the offices of the Intel Corp. in Santa Clara, Calif. Ms. Fludin is one of 21 teachers in the program who are working at the Silicon Valley technology giant this summer.
—Photo by Erin Lubin for Education Week

In a December 2002 survey conducted for IISME, school principals reported that two-thirds of teachers had improved their content knowledge and better integrated technology into the curriculum after completing summer externships through the program.

Another study, conducted by a team of researchers at Columbia University's College of Physicians and Surgeons and the Feinberg School of Medicine at Northwestern University in Evanston, Ill., found that students of science teachers who had participated in summer externships performed significantly better on tests of science knowledge and reasoning than students of teachers who had not.

Authors of that December 2004 report to the American Society of Cell Biology said teacher externships are acutely needed, and described them as a missing link in the push for more rigorous science instruction in schools.

"You can't teach something you haven't done," the report said. "There are no high school basketball coaches who have never played basketball, but there are tens of thousands of high school science teachers who have never done any hands-on science."

Ms. Storm said externships can also be an important tool to retain midcareer teachers, citing widespread concerns about teacher attrition.

"We need to support current math and science teachers, who could leave at any moment," she said.

In Lockheed Martin's buttoned-down, crew-cut culture, Randy Monroe stands out. It's not just his hair, which is blond and flowing and reaches to the small of his back. Or that he moonlights as lead singer for Hot for Teacher, a popular Van Halen cover band.

Not surprisingly, the earth science teacher at Foothill Middle School in Walnut Creek, Calif., is loud. Boisterous.

Comparing Notes: Teacher Catherine, center, has lunch in the Intel cafeteria with peer coach Jodi Williamson and Mr. Goodman, a fellow summer "extern."
—Photo by Erin Lubin for Education Week

His enthusiasm for science enlivens the office, says his company mentor, Susan J. Morrison, the senior manager for Lockheed Martin's optical-payload-product center. That energy is common among the 22 teacher externs at Lockheed Martin this summer.

"I feel I lucked out," Ms. Morrison said. "The fellows are very energetic, very motivated, and very self-sufficient."

From behind locked doors in his second-story cubicle on the sprawling Lockheed Martin campus, the 41-year old teacher researches manufacturers for various parts of the company's "multiple-kill vehicle" program. Lockheed Martin has partnered with the Washington-based Missile Defense Agency and the U.S Army Space and Missile Defense Command to produce MKVs, defensive missiles that can shoot down offensive ballistic missiles from thousands of miles away.

For Mr. Monroe, who is as much science geek as rock musician, the externship is exposing him to knowledge he may not have gained otherwise. He hopes to use what he's learning in classroom science projects this fall involving infrared, or thermal imaging, cameras.

"I'm like a kid in a candy store," he said.

A few miles north off sun-baked Highway 101, teacher Katy Kuei tracks satellite data measuring the speed, temperature, magnetism, and density of the solar wind from her cubicle in the hushed environs of Lockheed Martin's Advanced Technology Center in Palo Alto.

This is the company's academic, theoretical arm, and the petite, 44-year-old teacher is getting a crash course in space physics. She's categorizing geospace boundaries such as the bow shock and the edge of the Earth's magnetic field, which slow down and deflect the solar wind. She's also learning about radiation belts, solar flares, and geomagnetic storms.

Aiming High: Elementary school science teacher Katy Kuei holds a model of a satellite that she made during her summer externship at Lockheed Martin.
—Photo by Erin Lubin for Education Week

"People go to school for four years to learn this," mused one of her mentors, Karlheinz J. Trattner, who said he hires teachers with a science background, such as Ms. Kuei. She has a bachelor's degree in science with an emphasis in chemistry and physics from Taiwan's Tunghai University, as well as a master's degree in music.

"The learning curve is very steep at the beginning," Mr. Trattner added. "The first three days are tough. But after the initial shock, the [fellows] do quite well."

Exciting stuff for an elementary school science teacher. Ms. Kuei, who teaches all grades at Mission San Jose Elementary School in nearby Fremont, constructed an elaborate paper model of one of the satellites whose data she's tracking. She plans to use it in class this fall. The model takes up most of her desk; it sits near her candy jar and a photo of her son.

She intends to integrate what she's learning this summer into student activities. They include identifying such solar phenomena as sunspots and coronas, building models showing the sun's relation to satellites and Earth, and using satellite data to analyze cloud formations and weather patterns.

"This is pure, pure science," Ms. Kuei said. "There are so many things teachers don't know. This expands my horizons."

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FROM THE ARCHIVES

"Spellings Leads Review of Math, Science Ed. Programs," April 12, 2006.

"Senate Panel Explores Ways to Spur Progress on Math and Science," February 22, 2006.

"Bush Proposes Math and Science Initiatives," February 8, 2006.

"Advocates Urge Bush to Boost Federal Role in Math and Science," January 25, 2006.

"Panel Urges U.S. Push to Raise Math, Science Achievement," October 19, 2005.

For background, previous stories, and Web links, read Professional Development.

RESOURCES ON THE WEB

Read more about the Industry Initiatives for Science and Math Education's summer fellowships for K-14 teachers.

Leadership Initiatives for Teaching and Technology, a professional development program for math and science teachers, was designed to increase student interest in and preparation for post-secondary majors in science, technology, engineering, and math.