I-STEM RESOURCE NETWORK

Finding science kids

Partners collaborate to improve science and math literacy; encourage students to go figure.

On Nov. 12 more than 500 job seekers—dressed for success and with résumés in hand—streamed into the Purdue University Calumet gymnasium for interviews with 25 representatives of area businesses and higher education institutions. No one left the gym with a firm job offer, but everyone gained a glimpse of the future. The "applicants" were students from middle and high schools; the event was a simulated job fair; the purpose was to introduce youth to in-demand careers related to science, technology, engineering and mathematics. In short, the STEM disciplines. Employers discussed their future workforce needs, and campus personnel plotted academic paths that would lead to the highly desirable positions.

Participants got the message. With the Indiana Department of Workforce Development projecting 46,000 new jobs related to the life sciences by 2014 and the Education Commission of the States confirming that 80 percent of the fastest-growing occupations depend on science and math skills, STEM classes took on new relevance. Chemistry mattered. Algebra counted.

"To obtain those jobs, students must start preparing now," says Dan Luncsford, coordinator of I-STEM Northwest, part of Indiana's STEM Resource Network and host of the event. "The sooner they start preparing, the better off they and the economy of our region will be."

The I-STEM Resource Network was formed in 2006 to improve K-12 STEM education and provide support for teachers interested in discovering new ways to accelerate student achievement. "It's tougher to engage youth today," says Jeff Nowak, a former science teacher at Columbus East High School who now directs the Northeast Indiana STEM Education Resource Center at Indiana University-Purdue University Fort Wayne (IPFW). "We live in a fast-paced, high-tech, visual society. Students are used to movies and video games that excite the senses. Many of the old teaching strategies no longer work."

The need for the network became apparent after Indiana ratcheted up its high-school graduation requirements to improve math and science literacy. BioCrossroads, a public-private intiative of the Central Indiana Corporate Partnership (CICP) that promotes business development through the growth of the life sciences, convened a task force to discuss STEM education. The task force applauded the state's intent but questioned school districts' capacity to comply with the rigorous standards.

"We couldn't understand how behavior or outcomes were going to be different unless there was some attempt to provide resources to help districts meet the challenges," says Anne Shane, vice president of BioCrossroads. Funded

in part by a $3.4 million Lilly Endowment grant to the CICP Foundation, the network is based at Purdue University with 10 regional hubs—I-STEM Northwest and I-STEM Northeast among them—located on campuses throughout Indiana. Network participation isn't limited to educators; it also includes government, industry and community stakeholders.

As diverse as these collaborators are, they share a common vision: They want to position Indiana as a national leader in STEM education.

BioCrossroads board member Dan Peterson agrees. He is vice president of industry and government affairs for the Bloomington-based Cook Group, one of the world's leading health-care device manufacturers. He believes that "the biggest issue that could limit our industry's ability to grow in this state will not be a limitation of technology or science but the ability to build an adequately sized and educated workforce. The network is a critical component in building this capacity."

Beyond the basics

"**Many high-school teachers know** their content areas but may not have the pedagogy skills to bring about inquiry-based learning," says Brandon Sorge, director of operations for the network. "On the other hand, many elementary-school teachers have the pedagogy skills but lack adequate training in teaching math."

To fill gaps and update skills, the network provides a range of professional development opportunities. For example, teachers of middle-level mathematics can enroll in any of four graduate math courses offered at colleges around the state. The network offers the classes tuition-free and allocates funds so teachers can buy materials.

Of the more than 300 teachers who have enrolled in the classes, many are experienced educators who are looking for ways to reach a new generation of learners. "If teaching were an exact science with one right way to do it, we'd all do it that way and everything would be fine," says Bill Reed, past president of the Indiana Council of Teachers of Mathematics and a veteran of 26 years in the classroom. "But we're talking about teaching a changing clientele within a changing society that has changing demographics. There are so many variables."

Reed has completed two of the graduate courses offered by the I-STEM Resource Network at Ball State University, is enrolled in a third, and plans to take the fourth. "I pick up new ways to say the same things and to reach more students," he says. "My goal, whenever I take a class, is to come away with two or three things that I can integrate into my classroom right away. So far, every class I've taken with I-STEM has done that."

Besides the obvious benefits of the training, Reed says he values the opportunity to interact with peers from other schools who teach at different grade levels. "It's a chance for elementary-school teachers to talk with middle-school teachers and for middle-school teachers to talk with high-school teachers. As a high-school algebra teacher, I can say to a middle-school teacher, 'OK, here's what I need for students to learn in middle school so I can take them further in high school and better prepare them for college work.'"

"Science kids" from Northeast Indiana converged on IPFW for a regional Indiana Science Olympiad competition. Manchester High School boys (*opposite, top*) participated in the "Egg-O-Naut" (design, construct and launch rockets to stay aloft and carry a raw egg—Grade A large—without breaking). Manchester girls (*opposite, bottom*) took on the "Elevated Bridge" (design, build and test the lightest bridge to carry a maximum load). Other contestants (*above*) tried to figure out fossils (identify, describe and classify various specimens) or demonstrate chemistry laboratory skills (*next page*). Students from Columbia City High School took first place in this contest; Manchester was second. Seven other regionals and one wild-card contest determined which schools went to the state competition. Science Olympiad is fun, instructive, and recognizes the talents of teens who excel in areas encompassed by the "information economy."

Building a better robot

In erecting the Resource Network's infrastructure, Sorge and his colleagues traveled throughout the state to familiarize themselves with existing STEM-related programs that they could promote on the network's interactive Web site. For example, each year hundreds of Hoosier students, ages 9-14, build and program robots as part of a statewide Lego League competition. The contest culminates at IPFW where this year 48 teams exhibited their engineering, computer-programming and problem-solving skills.

"It's one of the biggest events on campus," says Nowak, director of I-STEM at IPFW and tournament judge.

With funding from I-STEM, Nowak planned a regional Science Olympiad that invited high-school teams to compete in 23 science, engineering and technology events that transcend traditional academic coursework. Students tackled real-world problems related to forensics, health science and transportation.

Like the Lego League competition, Science Olympiad is a national program with the potential to grow in importance, participation and relevance. "We're laying the foundation for many years of expansion," says Nowak.

Upgrading STEM curriculum

Now in its second year of operation, the I-STEM Resource Network has taken on two major projects designed to help students succeed in the STEM disciplines.

The first, an algebra-readiness initiative, was developed in partnership with the Indiana Department of Education and began with a one-day conference led by three national experts. These experts then trained 26 Indiana educators to conduct similar workshops around the state. "In one summer we had more than 300 people involved," says Sorge. "Participants included teachers, principals and district administrators. We're now looking at ways to expand the program."

The second activity under way is crafting a strategic plan for science-education reform, a task that Sorge describes as "massive." A grant from the Eli Lilly and Company Foundation supports the engagement of the Smithsonian Institution's National Science Resources Center to lead the strategic-planning process. To help ensure that the future curriculum will meet the anticipated needs of the economy, participants in the planning process include the governor's office, the Department of Education, BioCrossroads, the Indiana Chamber of Commerce and Eli Lilly and Co.

Seeing the big picture

Although it is too early to evaluate definitively I-STEM's progress toward accomplishing its ambitious vision, early indicators are positive. Workshops are well attended, the Web site attracts sizable traffic, and the number of participating partners is increasing. As promising as these signs are, I-STEM's leaders—true to the science that they promote—plan a rigorous assessment of the initiative's impact.

According to John C. Lechleiter, chairman and CEO of Eli Lilly and Co., "Improving K-12 science and math education is the path to economic vitality for Indiana. High-school graduates who are well prepared for advanced math and science courses in college are more likely to develop the capacities that life sciences and other technologically focused companies require in their employees. A workforce that is proficient in these skills will help create more job and business opportunities, which will lead to more prosperity and wealth creation in Indiana."