

Four Critical Letters

Indiana Needs More STEM Workers

By Charlee Beasor

One word – jobs – gets everyone’s attention in this post-Great Recession economy. It was the most prevalent term uttered in the campaign season, with candidates claiming their “job creation plan” would be best.

While we wait and see whether the election winners will be able to fulfill their promises, state and national data suggests an increasingly apparent solution. The strategy: Encourage more science, technology, engineering and math (also known as STEM) teachers, programs, degrees and graduates across the country, and specifically in Indiana.

STEM jobs include those related to computers (programmers, technicians), mathematical sciences, physical sciences, engineering and biological/agricultural/environmental life sciences, to name a few.

These fields are in high demand – with no indication of slowing down. The 2011 *STEM* report from the Georgetown Center on Education and the Workforce (CEW) found that these jobs are second only to health care as the fastest growing occupational category in the economy.

Another source, the Bureau of Labor Statistics (BLS), revealed data that shows an anticipated growth of 22% in STEM occupations through 2014.

STEM-related career fields are continuing to expand but employers, such as Columbus-based Cummins, are having trouble finding potential employees with the necessary skills.

Missing the boat

But there are some rather sobering facts about Indiana’s current STEM landscape and where we are headed in the next decade.

The CEW report points to STEM positions constituting 4% of all Hoosier jobs by 2018. That total of 115,560 STEM jobs is a 9% increase over 2008. Another important note: nine out of 10 of those careers will require postsecondary education and training.

Right now, we’re just not graduating enough students with STEM degrees to meet the current demand, let alone that extra 9% of future Hoosier jobs.

Of the state’s public higher education institutions, Purdue produces the most STEM graduates as a percentage of overall degrees. In 2011, the school awarded 35% of its degrees in STEM fields. Ivy Tech Community College was next with just over 15% in STEM and Vincennes University followed with 13%, according to Indiana Commission for Higher Education data.

These numbers don’t tell the whole story, asserts Mark Gerstle, vice president of community relations for Columbus-based Cummins. A focus on high school graduation rates and early childhood education to get students interested in math and science would increase degree attainment, he says.

“The issue in the great state of Indiana is not higher education. It’s the fact that we have horrific dropout rates and horrific achievement rates in math and science,” he states. “We have fantastic higher ed. ... We have to focus all of our efforts on getting everyone to graduate from high school and as many as humanly possible in STEM.”

Cummins is in a community dominated by advanced manufacturing and health care industries. Gerstle pinpoints education as the “No. 1 through 10 issues” for the company. Regional leaders focus on those students who are dropping out of high school or not going on to higher education.

“We work a lot with the community on this. We want as many of our own Hoosiers to come to work for us as humanly possible,” he declares. “We have a dropout rate in Indiana of



20%. ... If we had a situation where 100% of high school kids actually graduated in the state of Indiana and 50% were interested in STEM, we'd never talk about this again."

Local, national issue

In its long-range economic development plan for the state, *Indiana Vision 2025*, the Indiana Chamber of Commerce has outlined a goal: "Increase the proportion of Indiana residents with postsecondary credentials in STEM-related fields to 'Top 5' status internationally."

But Indiana is just barely above the national average in the percentage of STEM degrees as overall degrees (26% in 2008-2009 data), according to the United States Education Dashboard. The national average is 24%.

That highlights a broader dilemma, according to Rob Smith, president of the Lilly Foundation.

"We're not just competing with our surrounding states; we're competing for jobs and economic growth and activity with people around the world. The fact that we are slipping in science and math should be disconcerting to Indiana and the United States," he expresses. Smith is also senior director of corporate branding and public relations for Eli Lilly & Company, the 10th largest pharmaceutical company in the world.

"We've focused more efforts around K-12 education and STEM more broadly because as we think about our ongoing sustainability as a company, we need access to a deep pool of scientific talent – the next generation of great biologists and chemists, statisticians and engineers," he articulates. "But beyond that, we also need to operate in places that have increasing levels of scientific literacy."

Smith cites the 2009 Organisation for Economic Co-operation and Development (OECD) data ranking students in the United States at 14th in reading, 17th in science and 25th in mathematics (out of 34 OECD countries).

That's distressing for American companies that need a workforce proficient in math and science.

"We need to be acting with a greater sense of urgency to enhance our performance in science and math. It's not just about graduating more technicians. Are we able to graduate enough people that have proficiency in science and math but yet can have an innovative mindset," Smith asks. "I think that's where the U.S. can gain a competitive advantage over time, by continuing to foster innovation."



Eli Lilly & Company hosted a STEM summit in October for community and business leaders to focus on increasing STEM education across the state.

Skills gap – again

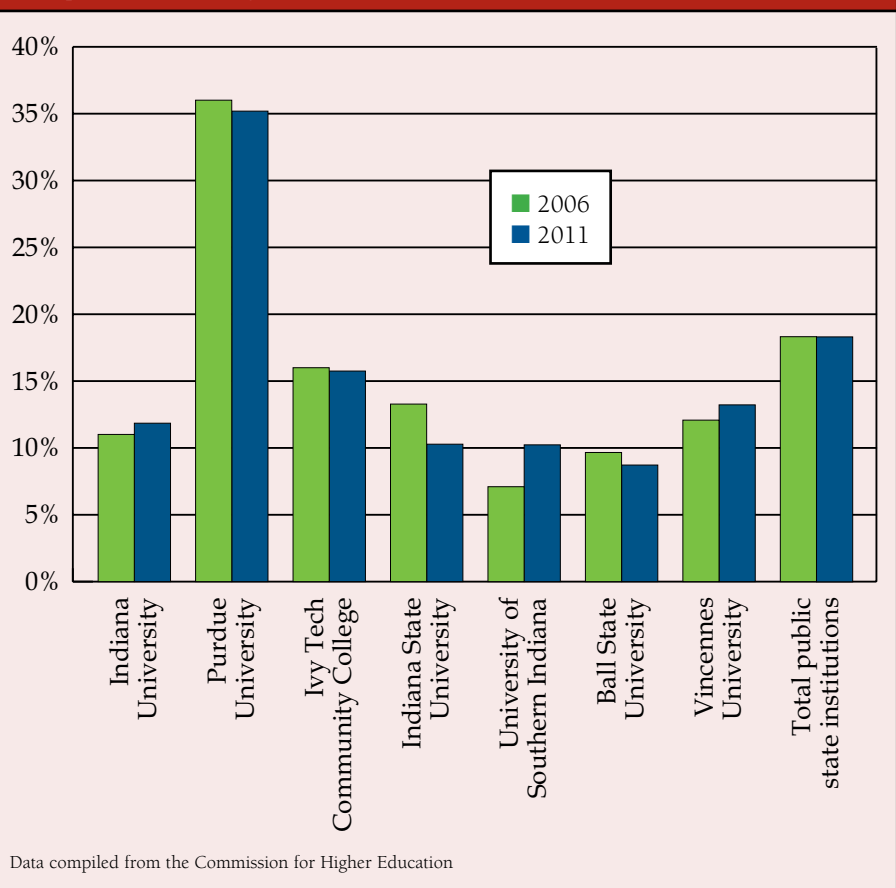
With Indiana's burgeoning biosciences and technology industries, it would make sense that there are STEM-related jobs available here – and there are – but the industries and companies with hiring needs are sometimes coming up empty-handed in the search for qualified workers.

One example is in Warsaw – dubbed "The Orthopedics Capital of the World."

"Orthopedics is one of those industries that you read about that has open positions that go unfilled because of the lack of qualified candidates," asserts OrthoWorx Executive

STEM Degrees at Indiana Public Institutions

(as a percent of total degrees awarded)





Students in the STEM Academy at Washington Elementary School in Warsaw are taught subjects using project-based learning. Lakes and streams – Kosciusko County has more than 100 natural lakes – are the emphasis in the first year.

Director Brad Bishop. OrthoWorx is a community-based initiative working to ensure the Warsaw region continues to be the orthopedic world leader.

A July Deloitte report underscores this as a national challenge: Across the country, 600,000 advanced manufacturing jobs are going unfilled.

Nicole Smith, senior economist for the CEW and co-author of *STEM*, points to the shortages in STEM as contributing to that large number, resulting in additional global recruiting in the effort to fill those open jobs.

Diverging interests is key to why many people – particularly women – don’t enter or stay in STEM fields.

“Women happen to be a constituent that diverts in the highest proportions. They cared about having a job that was

suitable to their family responsibilities,” she acknowledges. “The question is not one of competence. The graduation rates in STEM and performance in mathematics by women, they are pretty good, way above men. There are much more important reasons that the women aren’t pursuing STEM majors. Once you realize it’s not competence, it’s something else, you can try to grab them early on.”

Biggest bang for your buck

Other information that doesn’t always get disseminated is that STEM jobs are some of the highest-paying on average. And, in many cases, four-year degrees aren’t the only path to these careers.

The 2010 National Center for Higher Education Management Systems (NCHEMS) report (*Crossing the Starting Line: An Examination of Productivity at Indiana’s Public Colleges and Universities*) revealed that obtaining a certificate in a STEM-related field resulted in median earnings 20% higher than a bachelor’s degree in a non-STEM field (that increases to 40% higher for an associate’s level STEM).

Misperceptions about today’s advanced manufacturing work climate and the time investment to getting a STEM degree might be keeping more students from following STEM career paths.

“We have been so accustomed to singing the (bachelor’s degree) mantra,” Nicole Smith shares. “Not enough time has been spent on the value of other types of credentials. It’s really exclusive only to STEM; for the most part a one-year certificate of engineering can earn more on average than some AA’s (associate’s degrees) and some BA’s (bachelor’s degrees) that are entry-level positions.”

Emphasizing the practicality of studying STEM in school could have a big impact, she offers.

“There are many types of STEM credentials and training that are shorter, cheaper, quicker that can give you family-sustaining wages much more so than the BA’s; so people should do a cost-benefit analysis regarding what type of degree they’re going to pursue,” she adds.

Bishop agrees.

“There’s not a great understanding of how good of jobs these are because they don’t typically require a four-year college degree. But advanced mathematics and specific skills (lead to) jobs that pay above the state and national average. They are attractive,” he notes.

One size doesn’t fit all

There’s no quick solution to these challenges.

Gerstle doesn’t see major change happening until 15 to 20 years in the future. His first solution: funding for early childhood education.

“We think of STEM in the whole context of, ‘How we can improve education

How Not to Become ‘Majorly Unemployed’

For years, leaders have emphasized the importance of a college education for both higher levels of employment and income earning potential.

It turns out that another very good indicator of employment in an economic downturn is a student’s choice of academic major, and those majors related to the STEM (science, technology, engineering and math) fields fare better than most. (Engineering was a particularly notable exception).

According to an August 2012 report from the Indiana Business Research Center (IBRC) at Indiana University, there are some clear trends to be aware of when choosing a college major. *Major Unemployment: How Academic Programs of Study Affect Hoosier Unemployment Patterns* used data from the Indiana Workforce Intelligence System (IWIS) to examine the employment history in 2009-2010 of 178,000 Hoosiers who graduated from state public colleges and universities.

The report found that Hoosiers choosing majors related to architecture, industrial arts/consumer service and engineering had the highest probabilities of becoming unemployed during a severe economic downturn. And architecture graduates had the greatest chance of prolonged unemployment at more than 26 weeks.

But students who sought health care, education and biology/life sciences degrees had the lowest chances of becoming unemployed. Health majors who did become unemployed had the highest probability of short-term unemployment at four weeks or less.

And don’t put more weight on a higher degree, according to the study. The level of degree attained by the student only mattered in the case of education majors (those with a more advanced degree saw a greater chance of short-term unemployment).

Resource: Indiana Business Research Center at www.ibrc.indiana.edu

in Indiana? We don't usually separate them. How do we get everybody in the great state of Indiana to achieve at the highest level possible? Why can't everybody have a shot? Forty-three states have funded early childhood education," he declares.

Approaching the problem from a business angle makes a solution more attainable, he adds.

"It is unacceptable that any student for any reason drops out of high school in the state of Indiana, so we are going to do everything to stop that. We're going to use business principles: 'Why is it happening?' and we are going to fix it. If that's all we do in the next 15 years – Indiana is No. 1 in the world. It's all doable," he affirms.

For Rob Smith, it comes down to aligning interests and resources.

"There are so many different priorities in education; there's a lot happening. There are resource constraints. When we talk about professional development for teachers, to do it effectively it is expensive and an investment of time," he summarizes. "We can't let those things be excuses. There is too much on the table to make some short-term decisions to impact the long-term trajectory of the state."

Emphasizing teacher effectiveness is an important path, he underlines.

National STEM-promoting organization Change the Equation points to a need for improved teacher preparation in Indiana, particularly in math. It supports creating more pathways into the classroom for STEM college majors or those with STEM backgrounds who are interested in changing careers and moving into teaching.

"We have to provide the right level of resources for professional development for teachers. I think that we need to continue to encourage our colleges and universities that are training the next wave of teachers that they be fully equipped to be effective teachers in the classroom in the scientific discipline – deep subject matter expertise," Rob Smith articulates.

Collaboration – whether statewide or on more of a regional basis – is essential. Eli Lilly and Company hosted an October meeting for interested stakeholders with an in-depth discussion of STEM deficiencies.

"We've had convenings, but oftentimes you get together and talk and share presentations and everybody walks away and does their own thing. We are bound and determined to make sure that doesn't happen with this work," he adds.

One thing is certain: Indiana's economic prosperity is tied to finding an answer to the STEM predicament.

"As a state, we are becoming far less tolerant of accepting poor results and using poverty as an excuse. All children are capable of learning. There are a lot of positive signs for us to move forward to provide a great and relevant education for our young people so they can usher in another century of prosperity for our state and nation," Rob Smith concludes.

INFORMATION LINK

Resources: Brad Bishop, OrthoWorx, at www.orthoworxindiana.com

Mark Gerstle, Cummins, at www.cummins.com

Nicole Smith, Georgetown Center on Education and the Workforce, at cew.georgetown.edu

Rob Smith, Lilly Foundation, at www.lilly.com



STEM success stories are popping up around Indiana, including an expansion of the Energy Academy at Purdue University.

'STEM'sational

Statewide Look Offers Positive Developments

While the magic answer to solving Indiana's STEM deficiency is yet to be found, it's not all doom and gloom. There are bright spots as a look at press releases and education announcements around the state over the past year paint a more promising picture.

Martin County, home to the Naval Surface Warfare Center (NSWC) Crane Division and WestGate @ Crane Technology Park, has achieved almost 400% growth in STEM-related (science, technology, engineering and math) jobs since 2001. July research from Idaho-based Economic Modeling Specialists Intl. listed Martin County as having the fourth highest level of STEM-related jobs in the nation.

To the east is a 10-county region of Southeast Indiana that is home to the EcO15 (Economic Opportunities through Education) initiative. In July, the Lilly Endowment awarded Bartholomew County's Community Education Coalition and Heritage Fund with \$5 million to support EcO15, which works to connect area educational options with its economic needs, specifically jobs in advanced manufacturing and health care. The region expects to add 500 to 700 STEM-related jobs per year for the next 10 years.

Look north to the University of Notre Dame and a partnership that began this summer with the National Math and Science Initiative has allowed nine schools so far (eventually 33 schools over a five-year period) to offer additional Advanced Placement math, science and English courses. The university was awarded \$7 million to focus on closing the achievement gap among minority and female students in STEM fields.

Head east to Fort Wayne and some high school and middle school educators and guidance counselors are learning directly about STEM by becoming industry experts themselves through the Educator Externship program. Educators spend a week in training and take industry knowledge back to the classroom.

And most recently, in late November, Purdue University and Duke Energy announced a partnership to expand a STEM program at Purdue. The Energy Academy offers participants a week of immersive team-based learning using STEM principles to research and communicate energy-related problems. Students and teachers work together on teams.