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INSIDE

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Experiment in education

States create special schools in hopes of putting students on path to careers in math, science

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Two years ago, the Ohio General Assembly placed a big bet on the future of the state's children with STEM education. The idea behind the education reform plan was to bring in new partners to help design schools that stress "STEM" subjects: science, technology, engineering and math.

In 2007, the legislature passed and the governor signed HB 119, which dedicated more than $200 million in the biennial budget for a STEM education initiative. The funding was divided into several areas: establishing STEM schools (grades 6-12) and Programs of Excellence (grades K-8); scholarships for students to attend Ohio colleges and universities; professional development for teachers; and increasing the supply of STEM/foreign language secondary teachers.

"If we want to have high-paying jobs for more people in this state, it's a simple equation," says Sen. Jon Husted, one of the primary supporters of HB 119.

"We have to be better educated," says the Republican from Kettering. "The skills most in demand are STEM skills."

Strengthening those skills, in fact, has been the focus of a number of initiatives throughout the region. A handful of Midwestern states — including Illinois, Kansas and Ohio — already have or are launching STEM schools.

Ohio STEM Learning Network

David Burns, director of sustainability for the Ohio STEM Learning Network — a partner with the Ohio Department of Education — says the state has five STEM hub sites that serve low-income and minority students. They are in Akron, Cincinnati, Cleveland, Columbus and Dayton. So far, only Columbus and Cleveland have their schools up and running. A second school in Columbus and schools in Cincinnati and Dayton are scheduled to open this fall.

In order to establish a STEM school, the site must have three elements: interest from public schools, involvement of a college or university, and a business or industry committed to working on the project. The hub brings all the partners together, each of which are heavily involved in setting up how the school will operate. State funding helps establish the school, along with donations from foundations and private partners, while the Learning Network provides resources and shares best practices.

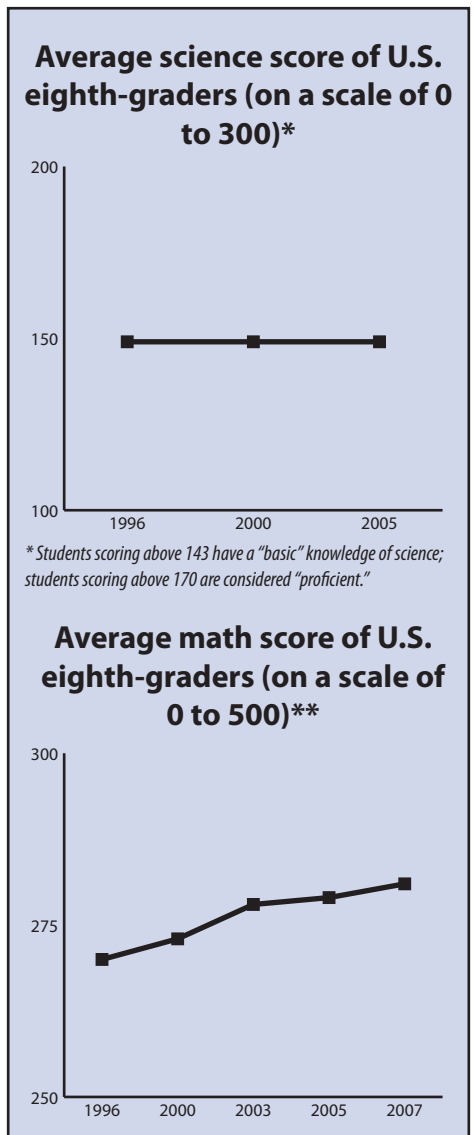
"We're asking the business partner to be an active, engaged player in the game," Burns says, "not somebody who's donating something."

STEM schools are urged to talk about education as an economic development issue, an idea business leaders have embraced.

"It's one of the most important tools for economic growth in this state," says Sean Yoder, executive director of the Ohio Business Alliance for Higher Education and the Economy. "If we're not able to grow and develop and attract talent, then we know we're not going to be able to compete in the 21st century."

Preparing for college success

Ohio's first STEM school was the Metro Early College High School in Columbus, which began accepting students in the



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Ninth-graders at the Metro Early College High School in Columbus test the strength of their toothpick bridges in physics class. At Metro, as well as at other STEM schools in Ohio, classes are highly hands-on and teach vital concepts using projects. Students at Metro also have helped area industries come up with solutions to business problems they face every day.

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STEM schools aim to train tomorrow's scientists, engineers and researchers

fall of 2006. It is a partnership between Columbus-based Battelle — the world's largest independent research and development firm — and The Ohio State University; it receives funding from the Bill and Melinda Gates Foundation. The school has almost 300 students enrolled, 43 percent of whom are eligible for free or reduced-price meals.

"If a student exits high school with Algebra 2 as the last math class they took, [he or she is] at that time remedial in college," says Marcy Raymond, principal of the Metro School. "In the STEM field, they're expecting [the student to be] calculus-ready. The high school barrier keeps kids from being able to access college. They have to pay more to take remedial work to be where they should have been if they were in the STEM environment. We're trying to remove barriers to choosing engineering, to choosing chemistry."

Sen. Jon Husted

Ohio's latest STEM school is the MC² STEM High School in Cleveland, which is located on a General Electric campus. The school started in August 2008 with a class of 93 ninth-graders, all of whom are eligible for free or reduced-price meals. Each year, the school will add one more grade level. GE employees serve as mentors for the students, who can also complete internships at the plant.

At both the Cleveland and Columbus schools, students complete classes not when they spend a certain amount of time in the classroom, but when they can demonstrate they've learned the skills. For some students, one class may take 16 weeks; for others, it may take 20. Students at both schools also can take college classes while still in high school and earn credits that will transfer to any college or university in the state. At the Metro School, students can graduate with up to 90 college credits.

Innovation through education

Esther Wong, president and CEO of the Laboratory School for Science & Technology in Naperville, Ill., says STEM schools and the idea of bringing industries into the educational picture are vital to the health of the region.

"Any kind of innovation that's going to come out of the various industries is going to involve technology," Wong says. "That means food, agriculture, fresh water, alternative energy. How are the innovations going to come out? Who's going to do them? We need to look at education, and not from just the traditional perspective."

Husted stresses that changes and improvements to the K-12 system will take time. Although Ohio is headed in the right direction, it will take patience and persistence to see the educational and economic benefits of STEM education.

"It's about changing the culture of education," he says. "It's about changing the culture of how we think about the economy. Then we have something that can be meaningful and sustainable."

Illinois school has decades of success

When Illinois Math and Science Academy (IMSA) President Max McGee took a group of students on a recent trip to Singapore, he was well aware of that country's reputation for having top-notch math and science education.

So he was thrilled when the IMSA students held their own in conversations with some of the most distinguished scientists in the world.

McGee chalks up the students' abilities to the academic approach at IMSA, a residential program for academically talented students in grades 10 through 12. The school has been producing scientists, mathematicians and engineers for more than two decades. Created by the legislature in 1985, the academy currently educates 650 students in a rigorous hands-on, STEM-focused curriculum. Admission is highly competitive.

The state-supported school does not charge tuition, room or board, but does levy activity fees on a sliding scale, making the cost similar to attending a traditional public high school, McGee says.

But the school isn't part of the state's K-12 education system — it's part of the state's higher education system, which McGee says is key to achieving the school's mission.

"Because we are under higher education, we can hire certified teachers, but also a lot of teachers who have been experts in their field — real physicists, engineers and biologists … literally people who are at the top of their professions and have an enormous amount of expertise they can bring to our students," McGee says.

The other advantage is that the school can adopt class schedules more in line with those offered at universities. On Wednesdays, for example, juniors and seniors conduct independent research with mentors at off-campus laboratories and universities.

Paramount to the school's philosophy, too, is developing individuals who will make lasting contributions to society. McGee cites the example of one graduate who went on to be a physician in inner-city Chicago and led a medical relief team in the Amazon rainforest.

He adds that many people assume the IMSA's highly talented graduates leave Illinois for academic powerhouses such as MIT or Cal Tech. But in fact, about half of them go on to attend in-state universities — a key factor in keeping graduates in Illinois.

And IMSA's mission to promote excellence in science and math education isn't limited to the students on its campus. Each summer, the IMSA staff conducts summer camps throughout the state for students of all ages, in hopes of sparking interest in STEM fields. The school also offers a number of professional development programs for teachers, aimed at training them in hands-on teaching techniques that inspire young minds.

One of McGee's hopes is that other math and science academies will grow and flourish in the Midwest — and eventually form a network.

"There is not a better time for this initiative, and there is no more important time," he says.

Kansas creates STEM school

Policymakers in Kansas have answered McGee's call to action, creating a STEM school based in part on the IMSA model.

This fall, 26 Kansas students will form the first class of the Kansas Academy of Mathematics and Science (KAMS), an academically rigorous program for students interested in math and science.

KAMS was created in 2006 by the Legislature, in response to a growing concern that the state was falling behind in producing engineers and scientists.

Sen. Laura Kelly

"This really was an attempt on the part of the state of Kansas to identify some of our young people who have a particular interest in math and science and give them the opportunity to be challenged at a collegiate level while they are still high-school age," says Sen. Laura Kelly, a Topeka Democrat who supported the bill (HB 139) creating KAMS.

Housed at Fort Hays State University, the two-year residential high school program is available to students after the completion of their sophomore year. Students will receive instruction from university faculty alongside college students, and will graduate with 68 college credits.

The curriculum is focused on math and science courses, with opportunities for research, internships and hands-on experience under the direction of Ph.D. faculty. Students will also be exposed to some of the state's growing industries, such as wind energy and biological and plant sciences.

While Kelly stresses the school isn't a "panacea" for the state's "brain drain" issues, she is confident that the school is one step toward showing students there are opportunities in STEM fields in Kansas.

"We recognize that we need to really reshape our educational structure to meet the demands of today's world," Kelly says.

Percentage of students at or above proficient in math and science, 2005

	Math		Science	
State	4th-graders	8th-graders	4th-graders	8th-graders
Illinois	36%	31%	27%	27%
Indiana	46%	35%	27%	29%
Iowa	43%	35%	*	*
Kansas	51%	40%	*	*
Michigan	37%	29%	30%	35%
Minnesota	51%	43%	33%	39%
Nebraska	38%	35%	*	*
North Dakota	46%	41%	36%	43%
Ohio	46%	35%	35%	35%
South Dakota	41%	39%	35%	41%
Wisconsin	47%	37%	35%	39%
U.S. average	*35%*	*28%*	*27%*	*27%*

* Information not available.

Source: National Assessment of Educational Progress

CSG Midwest report to focus on STEM education

This summer, the Midwestern Legislative Conference will release a report focusing on state efforts to improve math and science education. The report will be unveiled at the MLC Annual Meeting, to be held Aug. 9-12 in Overland Park, Kan.

Sen. Jay Emler

The research for the report is being conducted as part of Kansas Sen. Jay Emler's agenda as chair of the MLC.

The report will focus on state initiatives aimed at strengthening STEM education, such as adjusting graduation requirements, recruiting and retaining qualified teachers, providing training for educators, and creating programs to spark young people's interest in math and science.

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