

New STEM Schools Target Underrepresented Groups

By **Erik W. Robelen**

Raleigh, N.C.

Few Americans may know about the Grand Challenges for Engineering—from making solar energy affordable to ensuring access to clean water—but the students at **a new school** on the campus of North Carolina State University are getting to know them firsthand.

The set of 21st-century challenges, devised by the National Academy of Engineering, serves as a frame and inspiration for the curriculum at this school, one of a relatively small but rapidly growing number of STEM-focused schools cropping up across the country.

At a time of heightened national attention to improving education in the fields of science, technology, engineering, and mathematics, the development of such schools has gained momentum as a strategy to boost knowledge and interest in the subjects.

While STEM schools historically have tended to target the top math and science students in a state or district, the new wave appears to have a broader reach, with many of the schools aimed especially at serving groups underrepresented in the STEM fields, such as African-American, Hispanic, female, and low-income students.

Just this academic year, new STEM schools have opened in a number of states, including Arizona, New York, North Carolina, and Tennessee.

The school at N.C. State, a partnership between the university, the 147,000-student Wake County district, and the nonprofit North Carolina New Schools Project, stresses project-based learning and the integration of topics across content areas.

In its first year, the school identified five of the 14 Grand Challenges for Engineering as the connective curricular tissue.

“By doing a thematic approach, I think you can hook the kids,” said Principal Rob Matheson. “The kids can get into solving challenges. ... They’re really global issues, like access to clean water.”

At a ribbon-cutting ceremony last month, Lt. Gov. Walter H. Dalton, a Democrat, made clear that the school has ambitions beyond its walls. “You’re going to be an anchor school,” he said. “You’re going to be a model for others.”

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'A Term of Art'

Creating STEM-focused schools is not a new idea. Some of the oldest campuses with a math and science emphasis date back decades, such as Stuyvesant High School and the Bronx High School of Science in New York City. The Illinois Mathematics and Science Academy is celebrating its 25th anniversary.

Experts say these highly selective schools play an important role in nurturing top talent, but that a vital national challenge—and an economic imperative—is casting a far wider net to develop talent that might otherwise not be tapped.

"There is a large interest and achievement gap ... in STEM," said the President's Council of Advisors on Science and Technology in a [report](#) last year that called for 1,000 new STEM-focused schools over a decade. "The underrepresentation of minority groups and women in STEM denies science and engineering the rich diversity of perspectives and inspiration that drive those fields."

There is not necessarily an agreed-upon definition for a STEM school.

" 'STEM school' is a new term of art," said Karl T. Rectanus, the leader of the NC STEM Community Collaborative, a public-private partnership in Raleigh that promotes effective STEM education.

"There are schools that define it very differently," said Barbara Means, a researcher at SRI International who studies STEM schools.

Some, she said, simply bring a more intensive approach to a traditional curriculum, beefing up the offerings and requirements in science, math, and related subjects. Others emphasize project-based learning and integrating ideas across disciplines. Still others may focus on a particular occupational theme, such as biotechnology.

Ms. Means and others warn, however, that some schools may add the label without making real changes.

"A commonality is there needs to be more STEM learning opportunities than in a conventional school," Ms. Means said. "There needs to be a richer set of resources and a requirement that goes beyond the minimum in math and science."

Although there's no official count of STEM schools, an SRI report identified 315 such public high schools as of the 2007-08 academic year.

Some states, including North Carolina, are making the growth of STEM schools a key part of their strategy to improve math and science education and better prepare students for the workforce.

In its successful bid for a federal Race to the Top grant, the [state outlined plans](#) to establish four STEM "anchor schools" to provide exemplary curriculum, serve as sites for leadership academies and teacher professional development, and be "test beds for innovation."

June Atkinson, the state superintendent, tied the effort to economic development and ensuring the state can compete globally.



Morgan Anthony, 14, inspects a topographic map at a STEM high school in Raleigh, N.C.
—Sara D. Davis for Education Week

“Many of the careers our students will have will need a good foundation in math and science and technology,” she said.

The STEM school at N.C. State University has just 55 students, all 9th graders, but will add another grade each year. It’s also an early-college high school, with a five-year program allowing students to earn both a high school diploma and two years of college credit.

To apply to the Wake-N.C. State University STEM Early College High School, students must write two essays—one describing a STEM-related experience—and supply three recommendations, said Principal Matheson. Grades and standardized-test scores are also reviewed. Any Wake County student may apply, he said, but the goal is not to recruit top math and science students.

“Our target groups are underserved, underrepresented [populations],” said Mr. Matheson.

About 70 percent of students are minorities (mostly African-American), half are girls, and 43 percent will be the first in their family to attend college, he said. Forty-five percent are eligible for a free or reduced-price lunch.

Students attend a daily seminar, plus three, 90-minute courses: a hybrid earth sciences and engineering class; Integrated Mathematics 1; and Humanities 1, a hybrid of English and world geography.

Clean Water

Mr. Matheson stressed that the school’s theme of the **Grand Challenges for Engineering** isn’t simply about learning in the STEM disciplines. Students explore other aspects, such as the economic, political, and ethical dimensions.

The teachers say they are enthusiastic about the emphasis on STEM and the Grand Challenges.

“There are ways for every discipline to fit into the STEM focus,” said Tammy L. King, who co-teaches Humanities 1.

In August, the students in that class were reading *Lord of the Flies*. As a class project, students were tasked with writing survival guides that deal with strategies for coping with life when stranded on such an island, such as how to govern themselves, how to build shelters, and how to ensure access to food and clean water.

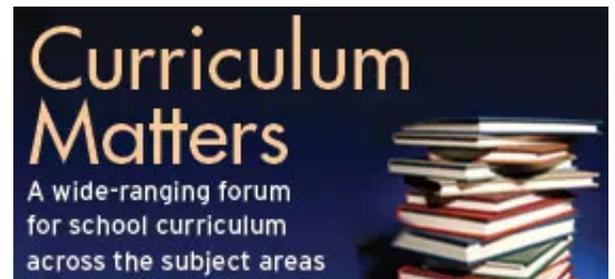
In the school’s science/engineering class, students were learning about fresh water issues, such as how to treat drinking water. On a recent day, they also were constructing topographical maps of an island.

“We’re all thinking about that ‘access to clean water’ Grand Challenge and trying to make everything mesh,” said Evelyn Baldwin, the co-teacher of the science/engineering class.

Another STEM high school just opened on the campus of the University of North Carolina at Greensboro. An additional 19 schools, with support from the North Carolina New Schools Project, are this year taking on a new STEM focus.

Ohio—with financial help from Battelle and the Seattle-based Bill & Melinda Gates Foundation—has supported the development of 10 STEM schools, part of the **Ohio STEM Learning Network**.

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“The idea was to create a STEM high school in each region [of Ohio],” said Eric D. Fingerhut, a vice president at Battelle, a research and development organization based in Columbus, Ohio, that manages the network. “Each school would serve a dual function: educating students in their own right, but then serving as a platform or hub that is generating the type of energy around improved STEM education that can spin out into the public schools ... and be a catalyst for innovation.”

Admission is nonselective at the schools, with an emphasis on serving underrepresented and high-need populations.

‘Favorite Things’

Texas has a growing alliance of like-minded schools, the **Texas Science, Technology, Engineering, and Mathematics network**, or T-STEM. It now counts 59 member schools, including nine new ones this fall.

The effort is a collaboration among philanthropies and state entities, including the Texas Education Agency, the governor’s office, as well as the public-private Texas High School Project.

Among the key features of T-STEM schools are small size, project-based learning, an integrated curriculum, and serving underrepresented students.

A recent SRI study found that in the 2008-09 year, T-STEM schools’ students scored “slightly higher” than matched comparison school peers on the state’s 9th grade math exam, as well as 10th grade math and science tests.

“We actually have relatively little evidence around the effectiveness of STEM schools” overall, said Ms. Means, the SRI researcher. She described the Texas data as “showing some beginning positive effects in terms of test scores.”

Ms. Means is leading a new research project, with funding from the National Science Foundation, to explore the feasibility of conducting a long-term, national study of “inclusive” STEM schools that target underrepresented populations. A key question, she said, is whether students at those schools retain interest in STEM fields and pursue college work and careers in them.

At the Wake-N.C. State STEM school, it’s too soon to tell what the 9th graders will end up doing, but some already have their eye on STEM careers. One said he wants to be an aerospace engineer, another a computer engineer.

“I’m really into science and math and technology,” said a third, 9th grader Vernon Ingram.

“One of my favorite things is engineering,” said freshman Richard Putney. “I probably want to be in robotics or an audio engineer.”

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