

## Elementary Students Tackling Windmills

By Erik W. Robelen

Bioengineering. Mechanical engineering. Environmental engineering. Aerospace engineering.

Not exactly standard fare in elementary school, but several million children have been exposed to such fields through the fast-growing Engineering Is Elementary program since it was launched in 2004 by the Museum of Science in Boston. Its overarching goal is to “foster engineering and technological literacy among all elementary-aged children.”

Students design windmills, water filters, knee braces, and parachutes. They learn to think like an engineer and to tackle problems the way engineers do. Along the way, they explore relevant concepts in science and other disciplines.

EIE curricular units are being used by about 45,000 teachers nationwide this year, more than triple the figure five years ago.

Delaware is offering it to all public elementary schools, with support from the state’s federal Race to the Top grant, said Christine M. Cunningham, the program’s founder and director.

Some school systems, including the Lakota district in Ohio, use it in all their elementary schools.

Jennifer L. Haynes, a 2nd grade teacher at Woodland Elementary School in Liberty Township, Ohio, part of the Lakota district, got started last fall with the windmill unit.

Students use concepts related to air and weather as they learn how windmills convert wind into energy. As part of the unit, they construct and test sails made of different materials and shapes to catch the wind. Then, they design, create, test, and improve their own windmills.

Ms. Haynes appreciates the way the EIE program gets her students to think through problems, especially when a device they design doesn’t work as expected the first time.

“They have to stop and think and ask: ‘I wonder what it was that I used that didn’t work?’” she said. “They really do learn perseverance. ... In that mistake, they will learn something else that will make it better.”

Faye Harp, a curriculum specialist for the 17,000-student Lakota district, sees many benefits for children.

“They are utilizing science concepts they’re learning about, but also building those 21st-century skills: thinking critically, problem-solving, communication, collaboration,” she said.

### ‘Go Wild and Have Fun’

Teachers typically implement one or two units each school year, said Ms. Cunningham. A given unit typically takes one or two weeks to complete, with roughly 45 to 50 minutes per day spent on it, she said. There are 20 units in all.

“Each unit is designed to integrate with a topic commonly taught in elementary science,” she said. Those include ecosystems, energy, the human body, magnetism, and electricity.

In addition, EIE staff, in collaboration with classroom teachers, recently developed math lessons for each unit and have mapped them against the Common Core State Standards.

The Museum of Science also developed a high school engineering course, Engineering the Future. And it’s planning to publicly roll out an after-school program for the middle grades later this year, called Engineering Everywhere.

The Minneapolis district uses the elementary program systemwide, targeting grades 3-5. It chose units that “reinforced and extended concepts we already address in science,” said Joseph F. Alfano, the 32,000-student district’s K-5 coordinator for STEM, or science, technology, engineering, and mathematics.

A bonus with the program, he said, is that as teachers come to understand the “instructional pathway” for engineering design, they discover engineering-design opportunities of their own that fit with the district’s math and science curriculum.

“It’s super hands-on,” said Amber Ringwelski, a 4th grade teacher at Pillsbury Community School in Minneapolis, of the EIE curriculum. “Students are really solving problems.”

She recently taught a unit in which students explore the properties of magnets and design a maglev transportation system. (Maglev trains are levitated by magnets.)

“The kids love it,” she said of the program. “They’re used to us saying, step-by-step, this is what you’re supposed to do. But it’s not about that. It’s about them designing, to go wild and have fun.”

The big takeaway for kids, she said, is about the engineering-design process: “Asking a question, imagining all the possibilities, designing something, creating something, and then going back and making it better.”

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