

'Green' Classes Flourish in Schools

Schools Design Lessons Around Alternate Energy

By Sean Cavanagh

Solar-powered cars have barely begun to inch out of test laboratories onto the difficult road to commercial viability.

But miniature versions of that technology are already being churned out at Whitmore Lake High School.

Students at the Michigan school have designed shoebox-size cars, made of foam board, toothpicks, and solar panels, as part of a new class called Green Tech. It's just one of the many courses focused on renewable and alternative energy that are taking hold across the country as educators seek to channel students' concerns about the environment and conservation into classroom lessons.

Some schools are creating elective science courses on alternative energy, or expanding lessons on that topic within existing science courses. Others have launched applied-science or career-oriented classes, or those that focus mostly on technology, as is the case at Whitmore Lake, located in a 1,200-student district a half-hour west of Detroit.

The Green Tech class has drawn some of the school's top students, as well as struggling learners, said Jen Taylor, who teaches the class. Some teenagers are intrigued by renewable technology; others are convinced it will become more important to society, and employers, in the years ahead.

"It's really exciting to students, even those I never would have thought would be into it," Ms. Taylor said. For some, "it's a realization that this [area] is where there's going to be a job," she said. "I hope I'm preparing some of them for a line of work."

Jake Kerrigan, 16, said he was drawn in because of his overall interest in science and a curiosity about alternative power. He signed

up for the elective around the time that gas prices in Michigan had soared to well over \$3 a gallon. He has heard leaders in his state—the iconic heart of the United States' struggling auto industry—talk about the need to invest in alternative energy. He believes them.

Green Tech offered the chance to look at "the direction we're heading in the world," the junior said, "and how we're going to transition from our wasteful way of life."

Sun, Wind, and T. Boone

The Green Tech class introduces students to the mechanics and economics of renewable technologies, including solar, wind, geothermal, and hydrogen fuel-cells. Hands-on activities are an integral part of those lessons. Mr. Kerrigan's favorite task was the construction of models of solar-powered cars. That assignment ended with an all-class race in the school parking lot.

Working in groups, Mr. Kerrigan and his classmates spent four periods working on the car, which was about 9 inches long and 7 inches high. They used materials such as cardboard and straw, and small wheels, axles, and gears. Mr. Kerrigan and his team mounted a small solar panel on their car's roof, experimenting with its angle so it would capture maximum light—a design issue they had studied in class. They used real solar panels that the school purchased from Solar World, a Colorado-based company.

Students in Green Tech also study carbon dioxide emissions and each technology's potential to reduce greenhouse gases that contribute to climate change. They've examined energy proposals such as the "Pickens Plan," oil magnate T. Boone Pickens' proposal to



Whitmore Lake teacher Jen Taylor helps students with their hydrogen fuel cell race car design.

expand greatly U.S. wind-power production and the use of natural gas to wean the country off foreign oil.

Whitmore Lake's students are absorbing energy lessons in other ways, too. Their school has received recognition from the U.S. Green Building Council for its environmentally sound features, which include a geothermal heating system with 47 miles of underground tubing. Ms. Taylor talks about the school's efficient features in her classes. Other teachers around the country, some of whom work in solar-powered schools, do the same.

Ms. Taylor created her class with help from Creative Learning Systems, a Longmont, Colo.-based company that helps schools design lessons. The company emphasizes hands-on activities and the in-class integration of science, technology, engineering, and math, or STEM, topics. Creative Learning Systems piloted lessons plans at Whitmore Lake that it hopes to market to other schools, said Matt Dickstein, its Chief Executive Officer.

In Search of Curriculum

Like many educators, however, Ms. Taylor has also been forced to track down many renewable-energy resources on her own, mostly because no single set of materials meets her needs. She has drawn from a number of Web sites, including that of the National Energy Education Development Project, at www.need.org. That organization, located in Manassas, Va., devises curriculum on energy issues and supports teaching of those topics.

One likely reason teachers are searching for classroom resources on renewable energy is that the topic has not yet made it into many state academic standards, said Jo Ellen Roseman of the American Association for the Advancement of Science, in Washington.

State standards, which guide teaching and tests, tend to set expectations for students to learn basic principles of energy. But guidelines about conservation and renewable energy are much less common, she said. Ms. Roseman helped write science standards at the AAAS that have served as models for many states. She now directs the AAAS' Project 2061, an effort to improve science education and literacy.

In districts and schools where renewable-energy courses have taken hold, their popularity can be attributed not only to public concerns about climate change and the environment, but to a conviction that the number of "clean energy" jobs will increase, said Karen Heys, the senior director of education at the National Environmental Education Foundation, a Washington organization that promotes environmental awareness in schools and society.

"It's one of the few growth industries right now," Ms. Heys said.

As evidence, she pointed to a 2008 survey of 1,300 employers conducted by her organization. Sixty-five percent of respondents said they valued job applicants' knowledge about "environment and sustainability," and 78 percent said they believe it will increase as a hiring factor in the future.

Her organization has seen the number of visitors to its Web site seeking energy-related curricular materials rise sharply. In addition, when the organization made energy issues the theme of its annual National Environmental Education Week in 2007, it saw the number of its "partner" organizations—schools and other groups that agree to help promote environmental awareness—spike to more than 1,400, from 330 the previous year, Ms. Heys said.

Political Winds?

Despite rising interest in "green" curriculum, it is not unusual for teachers covering energy topics to draw criticism from students and parents who accuse them of promoting an environmentally oriented political agenda.

Ms. Taylor has heard those objections. When she first began teaching Green Tech, she heard students refer to it as "the hippie class" or the "tree-hugger class." One of her students, she said, was adamant that global warming was a hoax, despite strong scientific evidence that it is occurring and that humans are contributing to it.

She says she tries to address those concerns by focusing on the science and the broader financial and economic realities of alternative energy. Renewable technologies, for example, are more expensive than fossil fuels in many applications despite renewables' environmental benefits.

That teaching strategy makes sense, said Ms. Roseman of the AAAS. Renewable-energy technology may be "on the edge of science," in the sense that it is changing quickly, she said. But educators still can have engaging and scientifically accurate discussions of those technologies, their benefits, and limitations, she said.

"Acknowledge what scientists know, and what they don't know," Ms. Roseman advises teachers.

The chance to study fast-emerging technologies—and the opportunity to try building one of them from scratch—was an easy sell to Jake Kerrigan at Whitmore Lake High School.

His team's construction of a solar-powered car brought thrills and frustrations. While some of their classmates constructed box-shaped vehicles, Mr. Kerrigan's team set out to build a relatively sleek model, with an "I" shape, which would operate on rear-wheel power.

"Lighter, longer, skinnier," was how he described it.

One absolute necessity was to make sure the wheels were straight, for efficiency's sake. They also had to overcome a major engineering glitch with the wiring. If it was too far from the solar panel to the wheels, they discovered, the car wouldn't have enough power.

Until the day of the race, the car wasn't working. But with a few final adjustments, it took off, powering forward at "about a jogging pace," said Mr. Kerrigan. That was fast enough to claim first place.

"Everything just came together," its co-creator said.

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