Hands-On Learning

Clay Center students study renewable energy firsthand using data-monitoring software.

By Mark Millar

Not since the 1970s has the study of energy sources been more relevant to daily life and the questions young students begin to ask. As news filters around them, heralding oil shortages and high winter heating bills, they are increasingly aware of the fragility of our nation's energy infrastructure and the economic and security implications. More than ever, students understand the critical implications of our nation's energy choices.

One school that has made addressing these issues in the curriculum a priority is Dexter and Southfield Schools in Brookline, Mass. Founded as Dexter School in 1926, this alma mater of John F. Kennedy was built on a philosophy of progressive, first-class education. The Clay Center for Science and Technology, constructed in 2002, is the latest step in the school's evolution. The five-story building has advanced computer and science labs, an astronomical observatory and a solar energy roof deck. The study of energy from renewable sources was a goal at Clay from its inception, according to Bob Phinney, science and technology coordinator at Dexter.

Wind-Solar System Does Double Duty

As a result of that commitment, a major feature of the center is its collection of data-gathering sensors and transducers used to monitor the weather, atmospheric conditions and electricity output from wind and solar power. The system consists of an integrated wind and solar power-generating system designed foremost as an educational resource and secondarily as a source of nonpolluting, renewable energy for the Dexter and Southfield campus.

Administrators at Clay Center recognized the educational potential of these monitoring systems as they planned the Center, and sought out a system that would allow students hands-on experience with this equipment. After evaluating several educational software products, they chose the Solar Learning Lab data-monitoring system from Heliotronics Inc. of Hingham, Mass. The system comprises data acquisition electronics, Sun Viewer interactive monitoring software and SunViewer.net Web-based data display.

"We use the Heliotronics software with our own classes when their curriculum includes weather or alternative energy. We have used it with outside school groups when we have held workshops for them," says Phinney. "Many people use the link SunViewer.net on our website to view and graph near-real-time data from the solar and wind system."

Students typically begin with a visit to the Clay Center roof deck to see the hybrid wind-solar photovoltaic (PV) system firsthand. After returning to the lab, each student accesses the monitoring software, installed on the school's network. Students can examine real-time data from the sensors, discovering, for example, how much carbon dioxide emissions have been reduced through the renewable energy generated.

Teachers at the school find Sun Viewer's graphing features particularly useful. A group of students may, for example, choose two days — one sunny and one cloudy — and using the graphing features, study how the energy output varies with the intensity of the incident light. They might extend this study of real-time and stored data by considering what factors affect efficiency of the PV panels. Data can even be exported from Sun Viewer into a spreadsheet such as Microsoft Excel to be manipulated more extensively.

Data Analysis Spurs Critical Thinking

As with most uses of technology in the classroom, little research exists on the effects of student computer use on standardized test results. However, the strength of well-designed educational software lies in its ability to encourage critical thinking

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The integrated wind-solar-power-generating system was designed as both an educational resource and a source of nonpolluting energy for the Dexter and Southfield campus.

and engagement with content. Data-manipulation tools used in a setting like the Clay Center are good examples of such educational technology.

Phinney is confident that Clay's Sun View system has strengthened the science program at Dexter and Southfield.

"The pictures, connectivity illustrations, real-time numbers and examples of avoided emissions all help the students' understanding" of renewable energy's potential, says Phinney. "The more hands-on experiences we can provide, the more the students understand. Most students learn best by doing rather than looking or listening. Software like this helps make that happen."

To view monitoring data from the Clay Center's solar photovoltaic system, access www.claycenter.org/solar/solar.html. Look for innovative strategies for "Teaching RE" in every other issue of *SOLAR TODAY*. ●

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Choosing Data-Monitoring Software

Collecting system data should be but the start of the student's journey. Good data-monitoring software will encourage students to ask critical questions and draw conclusions. When evaluating data monitoring systems for educational purposes, be sure to ask some key questions.

- Are the data easy for students to access?
- Is the relationship between the data and what it represents clear?
- Is the software flexible and the range of data broad?
- Does the software enable students to manipulate the data?
- Are there opportunities for the students to draw conclusions from patterns of data?
- Can the data produced be used across disciplines, e.g., science, math, social studies?
- Is the software supported with teaching guides, resources and activities?