

Bringing Science to Life in A Living Classroom

Knox County teachers and students pursue educational field trips that boost watershed awareness and promote preservation.

By Laurie Varma

THE WATER RESOURCES RESEARCH Center (WRRC) at the University of Tennessee (UT) encourages teachers to venture outside the confines of their classroom laboratories to a much more expansive and relevant one—their local watersheds.

Through the local implementation of a national environmental education program—Adopt-A-Watershed—middle and high school science teachers from seven Knox County schools are trained to use their adopted watersheds as living laboratories. In the process, they learn how to engage students in hands-on activities that make science concepts relevant and meaningful. They also learn how to involve students in service-learning projects that show the students how they can make a difference in their communities.

Nature as Teacher

For example, a geology teacher may tailor class lessons to focus on soil composition and rock types within the school's watershed. A biology teacher may use the watershed habitat to teach students about plant, macroinvertebrate, and amphibian species. Both teachers might then encourage their students to take what they've learned and use it to plan a joint local environmental improvement project.

Adopt-A-Watershed is a national nonprofit program, supported in part by the U.S. Environmental Protection Agency. It seeks to infuse K-12 science education with hands-on watershed activities and environmental service. The program teaches kids to apply science concepts to their watersheds, to monitor



and restore watershed health, and to appreciate the importance of all elements of the watershed ecosystem. Tennessee is one of 18 states that host local programs; Knoxville and the Quad Cities—Kingsport, Bristol, Johnson City, and Elizabethton—are Tennessee's only sites.

The national program provides a range of curriculum units that teachers use to introduce students to watershed-related concepts. Through classroom and outdoor activities, the students learn about the plants and animals living in their watershed and how they might be used as indicators of environmental health. They also learn about the environmental impacts of urban growth and the meaning of a "sustainable society."

Learning through Service

The curriculum units also guide the students through creative activities that ulti-

mately lead them to a more in-depth understanding of the interconnectedness between themselves and plants, wildlife, fish, ecosystems, soils, geology, and cultures. The curriculum units also recommend conducting community action projects that help students influence the health of their watershed while increasing their fellow community members' awareness and knowledge about their watersheds.

WRRC manages the Knox County program with its Water Quality Forum partners, including Ijams Nature Center, the Tennessee Valley Authority (TVA), and the Tennessee Department of Environment and Conservation.

Productive Partnerships

The Knox County school system purchases equipment for each school and helps fund the training workshops. CAC AmeriCorps Water Quality team members help teachers implement the Adopt-A-Watershed program by helping them select and conduct curriculum-related activities. They also assist teachers and students by helping them collect social, biological, and physical data on their watersheds and by helping them conduct environmental sampling and data analyses. Based on the results of these analyses, AmeriCorps members then assist students in identifying problems in their watersheds and conducting service learning projects aimed at solving them.

"Service-learning projects are one of the most important aspects of participation in the Adopt-A-Watershed program," says Tim Gangaware, WRRC's associate director. "By getting out and improving watersheds, students learn about their place in the community and become empowered by seeing that they can actually take part in positive change."

Ruth Anne Hanahan agrees. Hanahan, a WRRC research assistant, coordinates Adopt-A-Watershed activities among other forum members and the county school science coordinator and co-manages the program with Gangaware.

"A key goal of the Adopt-A-Watershed program is to help kids develop a sense of stewardship toward their communities and the environment that will stay with them all their lives," she says. "Participation throughout their middle and high school years can help students understand

that water and other natural resources are assets to be cared for.”

Initiated by WRRC in response to TVA’s efforts to establish a community-driven, watershed-based stewardship program, the Knox County Adopt-A-Watershed program has grown from participation of six Knox County schools and six teachers in the 1997-98 school year to 13 teachers from seven schools in the current school year. Teachers and students from Powell, South Doyle, and Halls middle schools and Farragut, Fulton, South Doyle, and West high schools are currently participating in the program.

Day on the Creek

At yearly workshops, participating teachers obtain updated and relevant scientific information, gain access to new teaching techniques, and acquire skills for planning community action projects. At a four-day training workshop conducted this past summer by WRRC and its Water Quality Forum

partners, Forum members taught teachers how to map a watershed; introduced them to the connection between land use and water pollution, wind shield surveys, and such new resources as watershed-related Internet sites; and showed them how to analyze test data. During a field day in a Knoxville park, teachers were introduced to the aquatic insect population, learned how to take water samples to test for contaminants and oxygen levels, and practiced methods for measuring stream flow.

WRRC recruited additional teachers this year to form teams of two to three teachers at each participating school to work together on Adopt-A-Watershed activities.

“We’re also supporting Ijams Nature Center’s recycling and reuse Earthflag program for kindergarten and elementary students, and we’re hoping to add math and English teachers to our current group of science teachers,” says Gangaware. “The range of teachers

we’re training and students we’re able to reach is growing rapidly. We’re very encouraged.”

In the future, WRRC would like to see the program expand beyond Knox County to serve as one source of data for the Tennessee watershed monitoring program. Students all over Tennessee could use their knowledge of local watersheds to create a network of stream-monitoring and community-improvement activities.

WRRC also wants to increase community involvement by introducing activities into community-based programs. Adopt-A-Watershed students could serve as leaders at afterschool programs, and program coordinators could be trained along with school teachers. ●

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departments, and manufacturing facilities of nearly 300 publicly owned U.S. companies.

The surveys focused on topics such as companies’ TQM practices; integration of TQM principles into the environmental management function; steps taken to improve environmental performance and the effectiveness of companies’ voluntary initiatives; and aspects of companies’ environmental, financial, and operational performance.

To assess companies’ environmental performance, Clelland and Douglas

Just Say Yes

Once their project is complete, the researchers will publish a report for WMREL, which they hope will help decision makers in the private and public sectors better understand the nature and level of effectiveness of voluntary environmental management initiatives. They also hope their research will help shed light on the traditional tension between regulators and businesses, leading to more harmonious relationships.

Early survey feedback suggests that while most firms see voluntary initiatives as generally cost-efficient and environ-

ment voluntary initiatives.”

Clelland also points out that companies would like to see regulations lifted in exchange for successful voluntary initiatives.

“Their feeling is that nearly all of their interactions with regulators are negative,” Clelland says. “Companies want to start getting rewards for doing things that are above and beyond what is required.”

Clelland believes that a system that rewards companies for successes through programs like TQEM could lead to dramatic changes in the relationship among industry, regulators, and the environment.

“TQEM captures the upstream and downstream ecological problems of the entire manufacturing system and opportunities for improvement,” he says. “Large companies could exercise their eco-leverage so that smaller firms would have to improve their environmental performance. The whole system as we know it could be changed.” ●

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have gathered information on the number of notices of environmental violations, waste and product-use impact reduction, and frequency of environmental accidents. Indicators such as growth in profits and market share have helped the researchers assess financial performance; operational performance is assessed using indicators such as speed of delivery, reject rates, and product reliability.

mentally beneficial, they believe that compelling incentives—whether financial, reputational, or regulatory—for these initiatives is lacking.

Says Clelland, “If companies do not get significant cost benefits, if they are not getting much publicity outside of their own public relations efforts, and if they are questioning whether they get any benefits from regulatory oversight, then there are few incentives to imple-

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