

IX.6 H₂ Educate! - Hydrogen Education for Middle Schools

Mary E. Spruill
Program Director
The National Energy Education Development (NEED)
Project
8408 Kao Circle
Manassas, VA 20110
Phone: (703) 257-1117; Fax: (703) 257-0037
E-mail: mspruill@need.org
Website: www.need.org

DOE Technology Development Manager:
Christy Cooper
Phone: (202) 586-1885; Fax: (202) 586-9811
E-mail: Christy.Cooper@ee.doe.gov

DOE Project Officer: Jill Gruber
Phone: (303) 275-4961; Fax: (303) 275-4753
E-mail: Jill.Gruber@go.doe.gov

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Introduction

The National Energy Education Development (NEED) Project brings its 25-year history in energy education, curriculum development, teacher training, and networking efforts to H₂ Educate for middle school curriculum development, teacher training, and the expansion of hydrogen understanding and knowledge in classrooms throughout the country. NEED, with Sentech, Inc. of Bethesda, Maryland as a key partner, launched a bold effort to exceed the U.S. Department of Energy's expectations for a hydrogen education project in 2004 and have exceeded development calendar and outreach targets.

H₂ Educate and the activities undertaken as part of this project are the result of a collaborative effort among teachers, students, advisors, technical specialists, federal employees and professional educators. This effort brings together resources from NEED and its national partners and the U.S. Department of Energy, to capitalize on success, resources, networking opportunities, and curriculum development and delivery capabilities. Key elements of this project are NEED's 45-state network, a strong relationship with the National Association of State Energy Officials, and an annual budget capable of doubling the resources provided by this cooperative agreement. Making up this network are a conservatively estimated 45,000 classrooms touched by NEED materials and training each year.

The materials developed include hands-on kits and classroom guides for middle schools. These include printed hydrogen energy resource portfolios and associated hands-on activity kits, as well as supplemental online resources and research materials for parents, students and teachers. NEED's existing energy education materials are correlated to the National Science Education Standards and to over twenty state standards, and all curriculum offerings created as part of this project are similarly correlated to all appropriate national and state standards. Teachers receive curriculum units and hands-on hydrogen, fuel cell and electrolysis kits. Materials created by the project help students and teachers understand the vision of a hydrogen economy and the future of hydrogen fuels nationally and worldwide.

The basic curricular materials are to be supplemented with enrichment activities targeted to students interested in pursuing a deeper understanding of hydrogen and fuel cell technologies.

Objectives

- Collaborate to develop, design, and deliver a first-class, comprehensive middle school hydrogen education program that includes training, classroom materials, technical and best-practices exchange, and evaluation.
- Design a program to link hydrogen science and technology and the concept of a hydrogen economy to the classroom.

Technical Barriers

This project addresses the following barriers from the Education section (3.8.4.1) of the Hydrogen, Fuel Cells, and Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan:

- (A) Lack of Awareness
- (C) Institutional Barriers and Access to Audiences
- (D) Regional Differences

Curriculum materials without ample training opportunities will go unused. This project provides for the direct training of teachers at hydrogen-specific programs for the duration of the project. Those educators will often act as secondary presenters, providing training programs in their localities. Many training programs offer educators the opportunity for close interaction with hydrogen experts and, where possible, hydrogen facilities. NEED's 600+ training programs each year include 2-hour sessions on hydrogen and the H₂ Educate curriculum materials. The special hydrogen training workshops provide an in-depth look at hydrogen for teachers interested in going the extra step and delving deeper into the subject matter. For 2005 and 2006, NEED's national five-day training conferences include a focus area on hydrogen and provide teachers with field trips to hydrogen facilities when possible. Thanks to a partnership with BP's A+ for Energy Program in Texas and California, the more than 400 teachers receiving A+ for Energy grants also receive three-day training programs that include 2 hours of H₂ Educate training.

By the end of the second program year, over 3,000 teachers will have the tools to teach H₂ Educate in their classrooms.

A critical challenge to this project is that the current demand for the middle school hydrogen education materials outpaces the supply of available resources. NEED is working on 3rd party sponsorship of materials and training programs to keep pace with demand. Using its corporate and energy agency networks, NEED will provide resources developed for this project to schools with U.S. Department of Energy funding and other funding when possible.

NEED and SENTECH have a long history of providing high-quality content and curriculum materials to a variety of agencies, organizations and schools. NEED serves as the primary lead for this project and employs the full reach of its network to deploy a comprehensive, objective hydrogen education curriculum program representing a commitment to student learning, to energy education, and to the future of a hydrogen economy.

Approach

NEED has adopted the following approach, which has proven successful in its other energy education efforts, to accomplish the goals of the H₂ Educate project:

- Ask and Evaluate: "What do you want to know about hydrogen, and what would your students want to know?"
- Survey: Consider the national and state education standards and develop the program to meet classroom needs.
- Create: Have educators create the program and secure technical support to assist and trouble-shoot.
- Deploy: Tap educators to pilot, field test, and deliver to their peers on a local, regional, state, and national scope.

Accomplishments

In 50% of the time estimated, the team created the middle school H₂ Educate learning module. In spite of resource constraints, the project is 90% complete with its revised scope. The project is scalable and can be deployed incrementally with additional resources.

Collaboration keeps the project economically efficient. All partners had the same end goal: Provide as many modules as possible to the middle school community. NEED and all partners are working to provide additional financial resources for the project.

Programs have been completed in New York State; Albuquerque, New Mexico; Grand Rapids, Michigan; Raleigh, North Carolina; Orlando, Florida; Orange, Sacramento, San Joaquin, Long Beach, Palm Springs, Anaheim, San Diego, and San Francisco, California; Austin, Houston, and San Antonio, Texas; and Chicago, Illinois.

Planned programs in the coming six months include Lansing, Michigan; Denver, Colorado; Chicago, Illinois; Boston, Massachusetts; Columbus and Cincinnati, Ohio; and Seattle, Washington. H₂ Educate will be incorporated into two NEED training conferences in Anchorage and Fairbanks, Alaska.

Additional Outreach

- Addition of hydrogen information and activities to the DOE Energy Information Administration (EIA) Kid's Page, www.eia.doe.gov/kids (350,000 users per month).
- H₂ Educate Teacher and Student Guides.
- Six workshops in New York State supported by the New York State Energy Research and Development Authority (NYSERDA), and more planned for 2006.
- Sessions at the National Science Teachers Association – Anaheim, CA – April 2006.
- 75 students participated in NEED's H₂ Educate DOE/EIA Take Your Kid to Work Day – April 2006.
- Materials provided to other hydrogen outreach efforts – Bonneville Power Authority, National Renewable Energy Laboratory.
- \$180,000 of hydrogen education grant money given to California teachers as part of NEED's partnership with BP in the A+ for Energy Program.

Future Directions

- The first H₂ Educate sessions will be hosted at NEED's 9 National Energy Conferences for Educators in July and August 2006.
- Work with other hydrogen partners to maximize reach of programs and materials – i.e., work with infrastructure grantees to provide educational resources.
- Continue incorporation of materials and programming into NEED's existing training initiatives.
- Annually update materials with new data and provide major changes to educational community.
- Addition of H₂ Educate website for materials, links and additional information.
- Leverage resources to deliver maximum number of hands-on resources to classrooms.