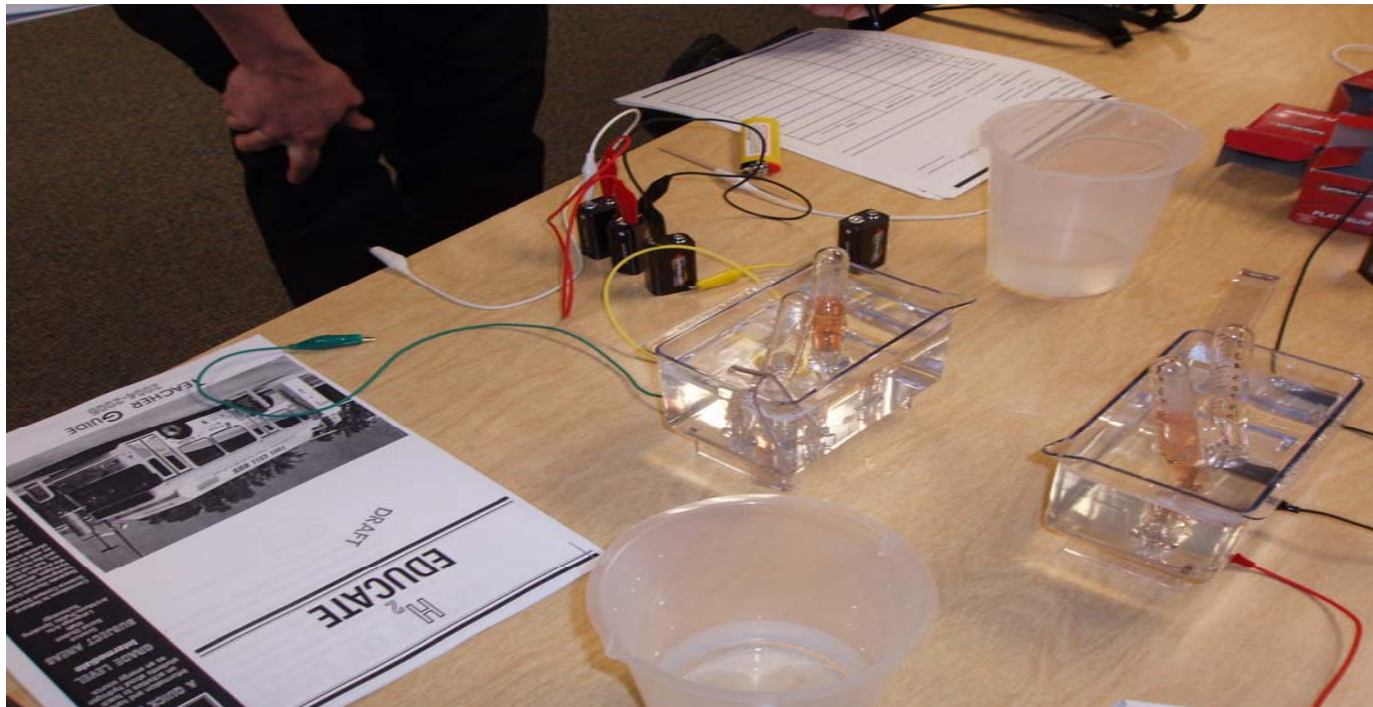


2005 DOE Hydrogen Program

H₂ Educate!

Hydrogen Education for Middle Schools



National Energy Education Development

Mary Spruill, Program Director, May 26, 2005

Project ID #

This presentation does not contain any proprietary or confidential information

ED6

H₂ Educate Overview

Middle School Training and Materials

Timeline and Budget

- Project Started: April 2004
- Project Completion: April 2009
- 60% complete with revised scope

- Total project funding
 - \$900,000 (Program Zeroed)
 - \$600,000 (Matching Funds)
- FY04 \$300,000
- FY05 - 0 -



Special Thanks to our Partners

- U.S. Department of Energy
Hydrogen, Fuel Cells, Infrastructure and
Technologies Program
- Sentech, Inc.
- U.S. Fuel Cell Council
- National Hydrogen Association
- Los Alamos National Laboratory
- NYSERDA
- Fuel Cell Store



H₂ Educate 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.



Implementation

- 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.



Ask and Evaluate

- In a "hydrogen economy," hydrogen is used to power our cars, homes, and businesses.
- Hydrogen can be made from abundant and diverse resources found right here in the United States.
- Fuel cells use hydrogen to create electricity -- the only byproducts are water and heat (no pollutants or other emissions).
- Fuel cells can power almost anything, from laptops to cars to homes.
- Just like gasoline and other fuels, hydrogen can be used safely.



Survey - National and State Standards

- e. Electrical circuits provide a means of transferring electrical energy.
- f. In most chemical and nuclear reactions, energy is transferred into or out of a system. Heat, light, mechanical motion, or electricity might all be involved in such transfers.
- g. The sun is the major source of energy for changes on the earth's surface. The sun loses energy by emitting light. A tiny fraction of that light reaches earth, transferring energy from the sun to the earth. The sun's energy arrives as light with a range of wavelengths.

INTERMEDIATE STANDARD-E: SCIENCE AND TECHNOLOGY

2. Understandings about Science and Technology

- a. Scientific inquiry and technological design have similarities and differences. Scientists propose explanations about the natural world, and engineers propose solutions relating to human problems, needs, and aspirations.
- c. Technological solutions are temporary and have side effects. Technologies cost, carry risks, and have benefits.
- f. Perfectly designed solutions do not exist. All technological solutions have trade-offs, such as safety, cost, efficiency, and appearance. Risk is part of living in a highly technological world. Reducing risk often results in new technology.

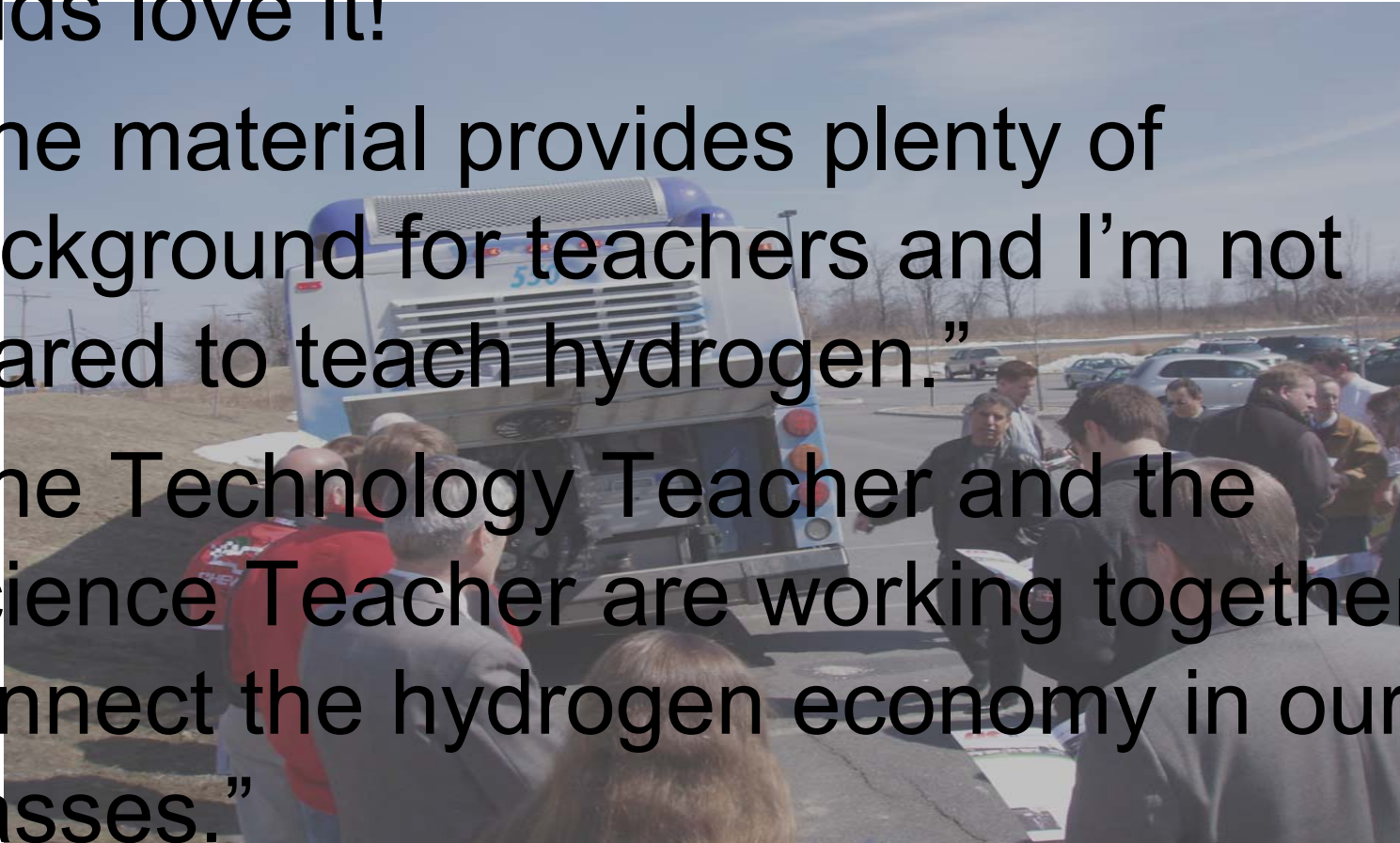
Progress/Results

- In 50% of the time estimated, the team created the middle school H₂ Educate learning module. It has completed external DOE technical review and is at DOE for final approval.
- **Collaboration keeps project economically efficient. All partners had the same end goal: Provide as many modules as possible to the middle school community. To date, demand exceeds supply due to available resources.**
- Pilot programs completed. Results incorporated into the final draft of materials.
- Training programs piloted in New York State.

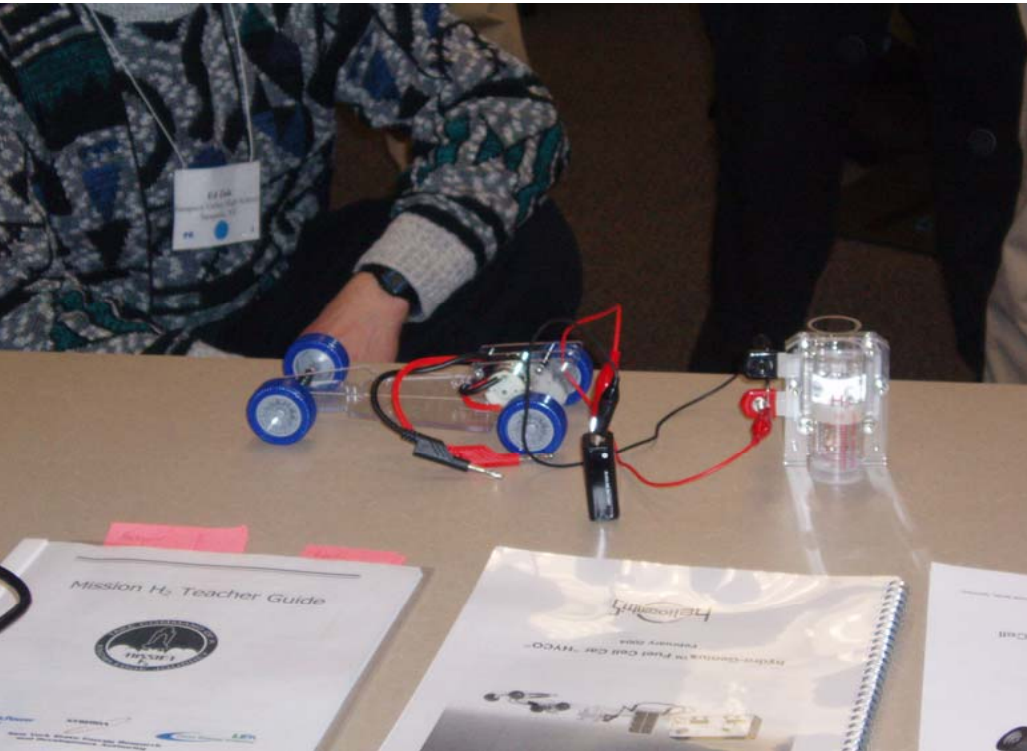


Accomplishments/Progress

- “Kids love it!”
- “The material provides plenty of background for teachers and I’m not scared to teach hydrogen.”
- “The Technology Teacher and the Science Teacher are working together to connect the hydrogen economy in our classes.”
- “Finally! Hands-on hydrogen!”



H₂ Educate



At work....



Measure Success

CATEGORY	4	3	2	1
Scientific Concepts	Written explanation illustrates an accurate and thorough understanding of scientific concepts underlying the simulation.	Written explanation illustrates an accurate understanding of most scientific concepts underlying the simulation.	Written explanation illustrates a limited understanding of scientific concepts underlying the simulation.	Written explanation illustrates inaccurate understanding of scientific concepts underlying the simulation.
Drawings/Diagrams	Clear, accurate diagrams are included and make the simulation easier to understand. Diagrams are labeled neatly and accurately.	Diagrams are included and are labeled neatly and accurately.	Diagrams are included and are labeled.	Needed diagrams are missing OR are missing important labels.
Summary	Summary describes the skills learned, the information learned and some future applications to real life situations.	Summary describes the information learned and a possible application to a real life situation.	Summary describes the information learned.	No summary is written.
Procedures	Procedures are listed in clear steps. Each step is numbered and is a complete sentence.	Procedures are listed in a logical order, but steps are not numbered and/or are not in complete sentences.	Procedures are listed but are not in a logical order or are difficult to follow.	Procedures do not accurately list the steps of the experiment.

Gather data on school usage

Collect quantitative and qualitative data to improve, re-assess, and expand programs

Provide educators the assessment tools needed to review student performance

Report reach of project

Report anecdotal student responses to programs



Challenges and Opportunities

- Demand too great for available resources
- Moving ahead in spite of zero budget for future programming
- A great deal of hydrogen “chatter” keeps educators from finding valuable resources



Coming Soon

After DOE approval:

- Work with other hydrogen partners to maximize reach of programs and materials – i.e. working 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.
- Launch H₂ educate website for materials, links and additional information.
- Deliver maximum number of hands-on resources to classrooms leveraging resources to do so.



Innovative Outreach

- Addition of hydrogen information and activities to the EIA Kid's Page www.eia.doe.gov/kids (210,000 users per month)
- H₂ Educate Teacher and Student Guides
- 6 pilot workshops in New York State supported by NYSERDA
- Sessions at the National Science Teachers Association – Dallas, TX – April 2005
- 75 students participated in NEED's H₂ Educate DOE/EIA Take Your Kid to Work Day – April 2005
- Materials provided to other hydrogen outreach efforts – Bonneville Power Authority, NREL
- \$150,000 of hydrogen education grant money given to California teachers as part of NEED's partnership with BP in the A+ for Energy Program.
- 1,200 teachers will train on the materials in July 2005.

Have a Question or Want to Participate?

- Contact Mary Spruill at NEED at mspruill@need.org or 800-875-5029.
- Upon approval from U.S. DOE the materials will be available at www.need.org/hydrogen.

