

Hydrogen In Your Future–A Web Quest

Student Objective

The student:

- will be able to explain hydrogen's past history
- will be able to explain the current use of hydrogen
- will be able to explain the advantages and disadvantages of using hydrogen as a fuel source
- will be able to explain how hydrogen could be used in the future
- will be able to explain current and proposed future hydrogen production
- will be able to explain the societal impact of hydrogen use

Key Words:

Hydrogen Economy

Time:

15 minutes to explain assignment
3-4 hours homework time (Students without home computer access will need 3-4 hours computer lab time)
½ class period for students to work in groups
1 class period for debate

Materials:

- computer with internet access

Procedure

1. If this is the class' first Web Quest, briefly explain to the students how it works
2. Tell the students that there will be a class debate on the material.
3. Divide the students into working groups of 4-5 students per group. Encourage them to work together to perform thorough research.
4. Write the starting page for the Web Quest on the board:
http://energywhiz.com/games_and_activities/webquests.php
The page may also be accessed through the front page of the Energy Whiz web site (**<http://energywhiz.com>**), by clicking on the "Games and Activities" section.
5. After the students have had a few days to work on their individual research, have the students meet in their groups to discuss their findings and prepare their answers.

Procedure–after group research

1. You may want to collect the student's research for assessment prior to the debate/discussion, returning their notes to them for class participation.
2. Explain the debate scenario to the class:

“In this debate, you are a resident of a town in Florida located next to NASA and the Kennedy Space Center. As you know, hydrogen is one of the fuels that was used in the space shuttle program. In fact, every shuttle launch required 50 tanker trucks of hydrogen (over 300,000 pounds) to travel 600 miles from where it is produced near New Orleans to Kennedy Space Center. This was a massive transportation job that cost hundreds of thousands of dollars for every launch. Currently, NASA, the Air Force and private contractors are working on a new generation of spacecraft, and NASA is seeking to develop new technology to produce the hydrogen much closer to the launch pad – in your town! Of course, this has stirred up much controversy in the town, so the mayor and town council have called a meeting so everyone may air their opinions.”

3. Assign roles to the students. Some suggested roles are:
 - mayor
 - city council members
 - reporters
 - NASA representative/PR person
 - scientists
 - NASA technicians
 - truck drivers
 - consumers who are environmentally aware
 - consumers who are against raising taxes
 - town members who want to limit industrial growth
 - neighbors to the proposed site
 - a native wildlife expert
 - developers/contractors
4. Remind the students that they should conduct themselves in an appropriate, professional manner (i.e. no name calling or personal derogatory comments).

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| | | | .1 | .2 | .3 | .4 | .5 | .6 | .7 |
|---|------------|-----------|----|----|----|----|----|----|----|
| Energy | Standard 1 | SC.B.1.3- | X | X | | | | | |
| | Standard 2 | SC.B.2.3- | X | X | | | | | |
| Processes that Shape the Earth | Standard 1 | SC.D.1.3- | | | | | | | |
| | Standard 2 | SC.D.2.3- | X | X | | | | | |
| How Living Things Interact With Their Environment | Standard 1 | SC.G.1.3- | | | | | | | |
| | Standard 2 | SC.G.2.3- | X | | | X | | | |
| Nature of Science | Standard 1 | SC.H.1.3- | X | | | | | | |
| | Standard 2 | SC.H.2.3- | | | | | | | |
| | Standard 3 | SC.H.3.3- | | | | X | | | |
| Language Arts Benchmarks: LA.C.3.3.2, LA.C.3.3.3 | | | | | | | | | |

Benchmark SC.B.1.3.1 - The student identifies forms of energy and explains that they can be measured and compared.

Grade Level Expectations

The student:

Sixth

- understands that energy can be converted from one form to another

Seventh

- knows examples of uses of energy in the home and ways to measure its use

Eighth

- knows examples of natural and man-made systems in which energy is transferred from one form to another.

Benchmark SC.B.1.3.2 - The student knows that energy cannot be created or destroyed, but only changed from one form to another.

Grade Level Expectations

The student:

Sixth

- understands that energy can be changed in form

Benchmark SC.B.2.3.1 - The student knows that most events in the universe involve some form of energy transfer and that these changes almost always increase the total disorder of the system and its surroundings, reducing the amount of useful energy.

Grade Level Expectations

The student:

Eighth

- understands that as energy is transferred from one system to another there is a reduction in the amount of useful energy
- knows that energy transfer is not efficient.

Benchmark SC.B.2.3.2 - The student knows that most of the energy used today is derived from burning stored energy collected by organisms millions of years ago

Grade Level Expectations

The student:

Seventh

- knows that fossil fuels are found in the Earth, they are nonrenewable, and the advantages and disadvantages of their use

Eighth

- understands how fossil fuels are formed in the Earth, why they are nonrenewable, and the advantages and disadvantages of their use.

Benchmark SC.D.2.3.1 - The student understands that quality of life is relevant to personal experience.

Grade Level Expectations

The student:

Sixth

- knows that a change in the environment affects the quality of life in different ways for different organisms.

Eighth

- understands that quality of life is relevant to personal experience.

Benchmark SC.D.2.3.2 - The student knows the positive and negative consequences of human action on the Earth's systems.

Grade Level Expectations

The student:

Sixth

- knows positive and negative consequences of human action on the Earth's systems

Seventh

- knows roles of various public and private environmental agencies

Eighth

- knows that legislation can be adopted to protect the Earth from detrimental human

activities.

Benchmark SC.G.2.3.1 - The student knows that some resources are renewable and others are nonrenewable.

Grade Level Expectations

The student:

Sixth

- knows renewable and nonrenewable energy sources

Seventh

- understands the importance of informed use of natural resources

Eighth

- knows that some resources are renewable and others are nonrenewable.

Benchmark SC.G.2.3.4 - The student understands that humans are part of an ecosystem and their activities may deliberately or inadvertently alter the equilibrium in ecosystems.

Grade Level Expectations

The student:

Sixth

- understands that humans are a part of an ecosystem and their activities may deliberately or inadvertently alter the equilibrium in the ecosystem

Seventh

- knows ways that human activities may deliberately or inadvertently alter the equilibrium in the ecosystem

Eighth

- extends and refines knowledge of ways that human activities may deliberately or inadvertently alter the equilibrium in the ecosystem.

Benchmark SC.H.1.3.1 - The student knows that scientific knowledge is subject to modification as new information challenges prevailing theories and as a new theory leads to looking at old observations in a new way.

Grade Level Expectations

The student:

Sixth

- understands that new technology may lead to new discoveries.

Benchmark SC.H.3.3.4 - The student knows that technological design should require taking into account constraints such as natural laws, the properties of the materials used, and economic, political, social, ethical, and aesthetic values..

Grade Level Expectations

The student:

Sixth

- knows some ways that scientific discoveries create new technologies that affect society

Seventh

- knows that the designs used for technological improvements should consider the values of society

Eighth

- knows that technological design should require taking into account constraints such as natural laws, the properties of the materials used, and economic, political, social, ethical, and aesthetic values.

Benchmark LA.C.3.3.2 - The student asks questions and makes comments and observations that reflect understanding and application of content, processes, and experiences.

Grade Level Expectations

The student:

Sixth

- participates in classroom discussions using effective speaking strategies
- participates as a contributor and occasionally acts as a leader in a group discussion

Seventh

- participates in classroom discussions using effective speaking strategies

Eighth

- participates in classroom discussions using effective speaking strategies.

Benchmark LA.C.3.3.3 - The student speaks for various occasions, audiences, and purposes, including conversations, discussions, projects, and informational, persuasive, or technical presentations.

Grade Level Expectations

The student:

Sixth

- identifies the occasion, audience, and purpose for speaking

Seventh

- identifies the occasion, audience, and purpose for speaking

Eighth

- identifies the occasion, audience, and purpose for speaking.

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Hydrogen Economy - A "hydrogen economy" is an economy in which the primary source of stored energy is hydrogen. This may be gaseous, cryogenic liquid, or bound to other materials as hydrides. This is contrasted to the current world fossil fuel economy, which exploits geologic stores of coal, petroleum, or methane (natural gas).