Time Frame:	Standards:
45 minutes 6th Grade	**6.S.1.2.3** Use models to explain or demonstrate a concept **6. S.1.8.1** Read, give, and execute technical instructions. **6.S.5.2.1** Describe how science and technology are part of our society

Objectives:

The students will see that electricity can be used to separate hydrogen and oxygen in water and will explore the possibilities and advantages of hydrogen as a fuel.

Background Information:

No one will disagree that the transportation industry is one of the largest energy consumers in existence. Today, over 95 percent of transportation fuels used are petroleum based and, unfortunately, the demand far outweighs the supply. Additionally, more than half of the oil used every day is imported, and, just like domestic supplies, foreign supplies are finite. Additional concerns about oil are the political, economic, environmental, and security factors involved. Decreasing dependence on petroleum will strengthen our economy, improve our air quality, and enhance our quality of life.

Alternative fuels, such as natural gas, propane, and electricity, have been used for many years to power vehicles. With new technology, many research and development experts are calling hydrogen the "fuel of the future." Hydrogen is a flammable gas that can power cars, buses, and even airplanes. It produces virtually no pollutants. It is the most abundant element in the universe. The problem is that hydrogen is rarely found in its uncombined form on Earth.

Materials:

- 9-volt batteries
- Plastic spoons
- 8 inch copper wires
- Clear plastic cups
- Baking soda
- Pencils, sharpened on both ends

Procedure:

1. Discuss the background information with the students. Then introduce the experiment. The students will use electrical energy from a battery to break apart water molecules into hydrogen and oxygen, allowing the hydrogen to be used as a fuel.

2. Have the students work in groups of two or three. Pass out the materials for the experiment, one set to each group.

3. Fill the plastic cup 1/2 full of water and stir in half a spoonful of baking soda.

4. Wrap the copper wire around the negative (-) terminal of the battery. Then hold one point of the pencil against the positive (+) battery terminal and submerge the other end of the pencil and the wire in the soda water.

5. Observe. What do you see at the wet ends of the wire and the pencil? Hydrogen gas is formed at the wire and the oxygen at the pencil. Note that more bubbles of hydrogen can be seen than of oxygen. (Remember that the formula for water is H2). Why

Extra:

Have the students research various car manufactures to learn what alternative fuel vehicles they are producing and if any of them are fuel cell vehicles. (If possible, you might invite a local dealership to bring a fuel cell vehicle to your school and talk to your students about this new technology.

Assessment:

Discuss how an efficient hydrogen-powered vehicle would solve some of our current energy problems.

Additional Content:

N/A

References:

National Energy Foundation-Resources for Educators
Energy Fun-Integrated Learning Activities-Primary
3676 California Ave. Suite A117
Salt Lake City, Utah 84104
801-908-5800
info@nef1.org