ENERGY IN A BOTTLE

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Learn about energy with a focus on hydroelectric power.

Grade Levels: 2-3
Time: 60 minutes

INTRODUCTION:

Energy is the ability to cause change in another material; we usually think of energy as the ability to do useful work. There are several forms of energy: heat, light, kinetic (motion), electrical, sound, chemical and nuclear. We use energy every day. Plants convert light (solar) energy into food through photosynthesis. We convert chemical energy from food into a form our bodies can use. When we turn on a light we use electrical energy.

Electrical energy can be generated from renewable or non-renewable sources. Non-renewable resources (e.g., oil, coal and natural gas) are limited and, because of the time needed to produce them, we cannot recreate them in our human lifetimes. Renewable resources, on the other hand, can be used and replenished in a shorter amount of time. Renewable resources include water, sun, wind and geothermal sources.

This lesson will help the students learn about the power of falling water. From ancient times until today, people have used the power of falling water to run machines in a simple form by having water turn wheels. Examples include water-wheel-driven grinding mills for grains or water-wheel-operated sawmills. Today we harness the power of water more frequently to spin turbines, which in turn are connected to electrical generators. These coils of copper spin around a magnet, converting the motion energy into an electrical current. We often rely on dams to store water and to help create a greater "fall" for the water to generate electricity. Since falling water is the initial source of energy, we call this hydroelectric power.

LESSON STANDARDS:

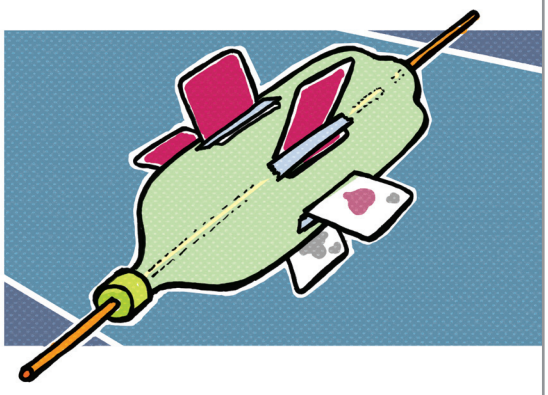
- Learn several forms of energy, such as motion and electricity. 2-3 PS3A
- Record observations and evidence to develop explanations. 2-3 INQF

MATERIALS:

- One 2-liter bottle per group with a hole drilled in the lid and the bottom to fit a wooden dowel
- One wooden dowel per group
- Playing cards
- Scissors
- Scotch tape
- Three 2-liter bottles filled with water per group (or you can use a sink for running water)
- One ea 55-quart (or larger) plastic container

INSTRUCTIONS:

1. Give each group a 2-liter bottle with holes drilled, a wooden dowel and six playing cards.
2. Ask the class how they can move the bottle without using their hands. Explain that they are to use the power of water.



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3. Let each group come up with a design for fins using their playing cards. Mark one of the cards for counting. Have them make a hypothesis as to how the bottle will react to the water. For example: "Having wide fins will make my bottle go faster."
4. If possible, have the students go outside to test their designs.
5. Have the students put the dowel through their 2-liter bottle. Place the dowel over the plastic container.
6. Have the students pour the water over the bottle slowly. Have them count how many times the bottle spins after they have stopped pouring the water.
7. Record results on their worksheet.
8. Repeat twice at different speeds.

Did you know?

- The dam with the greatest capacity in the United States is the Grand Coulee hydroelectric power plant on the Columbia River in Washington State.
- In the United States, Washington generates more hydroelectric power than any other state.
- In the United States, 96% of the renewable energy produced is hydroelectric. Other sources are wind, solar and geothermal.

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STUDENT WORKSHEET:

Water is powerful. It has been used since ancient times to do work. You will create your own water wheel with your group. Your goal is to design fins that will allow the water wheel to continue to spin after the water has stopped.

Hypothesis: _____

_____

_____

_____

Record how many times your bottle spins after the water stops. Record 4 other groups' results.

Speed of water	Fast	Medium	Slow
Your group's design			
Group 1			
Group 2			
Group 3			
Group 4			

Draw your design:

Describe your design:

_____

_____

_____

_____

_____

_____

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STUDENT WORKSHEET: Page 2

Draw group 1:

Describe group 1:

_____

_____

_____

_____

Draw group 2:

Describe group 2:

_____

_____

_____

_____

Draw group 3:

Describe group 3:

_____

_____

_____

_____

Draw group 4:

Describe group 4:

_____

_____

_____

_____

Which group had the most spins when the water was poured:

Slowly? _____

Medium? _____

Fast? _____

How accurate was your hypothesis?

_____

_____

_____

Why do you think you were wrong or right?

_____

_____

_____

_____

Was there a difference in the spins when the water was poured from a different height?

_____

_____

_____

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