



Drexel-SDP GK-12 LESSON

- Lesson Title and Identifier:

Title: Water Wheels: Getting Power from my H₂O

Identifier: 5.2

- Module: Environment
- Grade Level: 6th
- Subject Area (Unit): Environment
- Concept:

Students will study different forms of energy sources and how their design can affect their effectiveness. This activity can be used to augment a number of lessons, particularly those on landforms, water ecosystems, physics, and engineering design. Students should become familiar with the following terms. They may need to use an online resource, such as wikipedia.org for some of the words.

Fossil Fuels
Hydroelectric energy
Nuclear energy
Wind power
Wave power
Geothermal power
Tidal power
Biomass
Hydrogen fuel
Vegetable oil
Solar power
Water wheel

- Objectives:

Students will learn and understand how we can convert energy from alternative energy sources into useable energy and explore two hydraulic systems and determine which implementation can harness the most amount of energy given the exact same wheel.

- Keywords: Energy, Power, Water Wheel, Alternative Energy

- PA Academic Standards:

Science 3.1.7 Unifying Themes

Math

3.2.7 Inquiry and Design
2.3 Measurement and Estimation
2.9 Geometry

- Setting/Group Size: 30 students
- Duration/Time Required: 2-3 class periods
- Materials List (include safety equipment if applicable) Popsicle sticks (50)

Glue/Glue gun

Beaker

Hose

Water

Axis (Chopstick)

Wheel holder

String

Weight

Foam

Tub on an incline

- Context

In researching the vocabulary terms, the students will be exposed to many different science and engineering principles. It is important that students have a general understanding of how energy is converted and the pros and cons of each type of alternative energy. The following Pre-Lab Reading pages can be printed and either read together or as homework, prior to the experiment.

- Methods and Procedure:

Have the students research the vocabulary words. Where are there examples of these technologies found? How effective are they?

Since many of the technologies are based on rotating a wheel/turbine with a fluid, we will demonstrate the concept of harnessing our environment as well as the impact of design on our effectiveness.

Making the “River”

- The “river will consist of a tub on an incline and a hose. Water will run through the hose to simulate the force of the river. In the first system, the undershot waterwheel, the hose will be placed under the water. Please see Figure 1. In the second system, the overshot waterwheel, the hose will be placed over the waterwheel. Please see Figure 2.

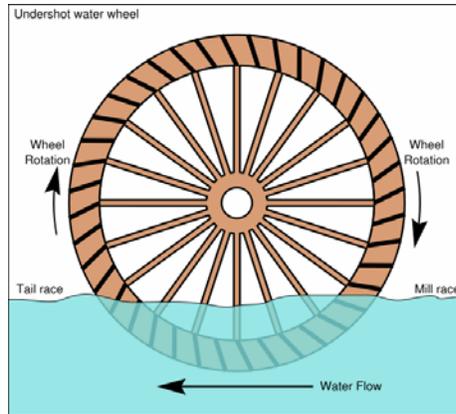


Figure 1. Undershot water wheel.

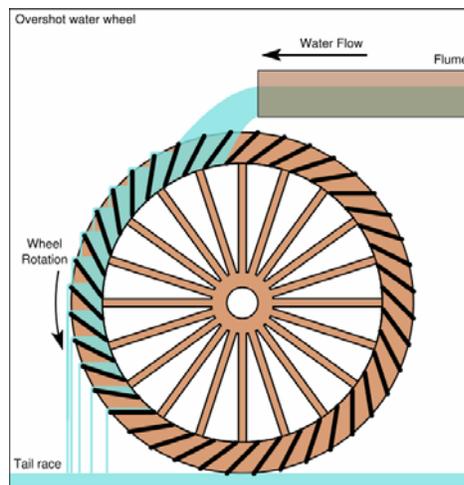


Figure 2 Overshot water wheel

Making the Waterwheel

- Step 1: Cut out a circle from the foam.
- Step 2: Push the chopstick through the center of the foam piece to serve as the axis
- Step 3: Along the edge of the foam, insert 2 popsicle or chopsticks at an angle.
- Step 4: Add tape between the sticks to serve as a blade.

Testing the Waterwheel

To demonstrate how the implementation of a system affects the effectiveness of a system, students will use their water wheel to set up both an undershot and overshot system.

- Each system will run under two different conditions. Students will make observations about each system.
- Students will counts the number of revolutions the axis takes within 15 secs.
- Undershot waterwheel:
 - Depth 1: _____
 - Depth 2: _____
- Overshot waterwheel
 - Height 1: _____
 - Height 2: _____

	Test 1	Test 2	Test 3	Average
Undershot 1				
Undershot 2				
Overshot 1				
Overshot 2				

Analysis:

Question 1: Were you able to get consistent results? What might have affected your readings?

Question 2: Which trial worked the best? Did it require any additional work from you during the installation process?

- Assessment

You will be evaluated on a scale from 0 to 4 on:

 Participation In-Class Task Completion – When Assigned Analysis

- Authors

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