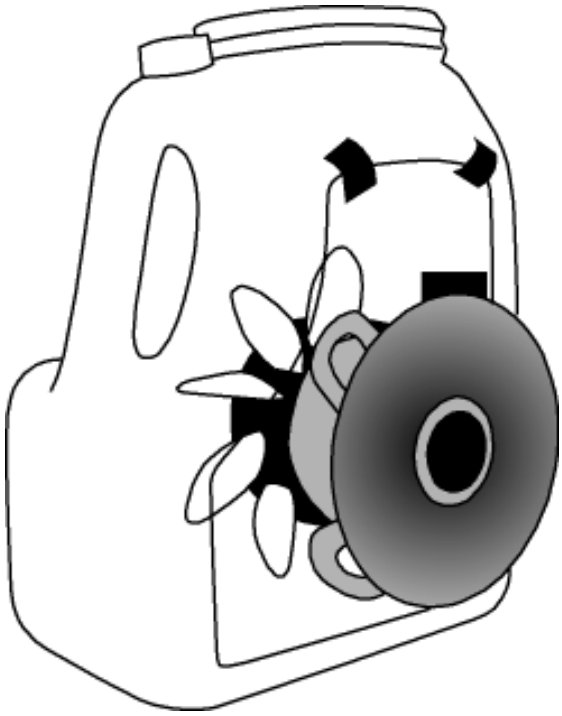
Make Your Own Hydropower

CLASSROOM CURRICULUM



MAKE YOUR OWN HYDROPOWER CLASSROOM CURRICULUM

MAKE YOUR OWN HYDROPOWER will provide students with a hands-on, minds-on practical application of a working hydropower turbine that will generate electricity.

SCIENTIFIC LEARNING GOALS AND OBJECTIVES FOR THIS ACTIVITY

(Goals from Washington State Commission on Student Learning Requirements for Science)

Goals

- Students will understand and apply scientific concepts and principles.
- Students will conduct scientific inquiry.
- Students will communicate scientific understanding.

Objectives

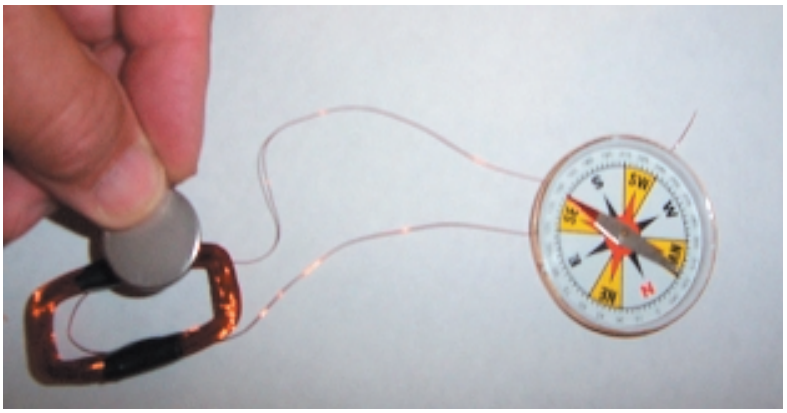
- Students will increase their understanding of water flow as an energy source.
- Students will demonstrate their understanding of the required parts of a hydropower turbine.
- Students will increase their conceptual understanding of energy production through construction of a model hydropower turbine.
- Students will increase their mechanical and conceptual skills through construction and operation of a model hydropower turbine.

ELECTRO-MAGNETIC FIELDS: MAKING ELECTRICITY

Materials: Compass, Coil, Magnet and Multimeter

Student investigation of effect on compass/multimeter as magnet moves through coil.

1. Using sand paper prepare about 2 inches of each wire extending from the coil, sanding the protective varnish coating the wire.
   a. Place the coil on the table with the wires extending away from the coil.
   b. Place the compass on the bare ends of the two coil wires.
2. Have students move the magnet over the center of the coil then back and forth through the center of the coil at different angles to the coil, while the extended (bared with sandpaper) rest under the compass.
   a. What did they observe?
   b. What action did the compass indicate?



3. Repeat alternating magnet surface and side-to-side motions over and through the coil.
   a. Did you observe any differences?
   b. Can you make the compass needle move in a circle and/or reverse action?
   c. Do the observations help explain actions of the compass differentiating between the magnet and the coil?
4. Connect the coil wires to the multimeter, turn the multimeter on and select AC volts on the multimeter. Repeat previous actions with the magnet and coil.
   a. What did you observe on the multimeter read-out?
   b. When you compare the action of the compass and the multimeter, what is your explanation of the magnet passing through or over the coil?
   c. How are electron actions demonstrated in this activity?

MAKE YOUR OWN HYDROPOWER • MAIN ACTIVITY

Activity Time: 120-180 minutes (2-3 class periods)

Activity Processes:

1. Set-up 3 groups designating the assigned construction activity for each group. For each kit, assign a group of 6 to 9 students.

2. Go through the instructions with all groups and have **students complete journals as they progress through the activity**.

   GROUP 1: Construct and install turbine.

   GROUP 2: Construct the stator and install on turbine shaft.

   GROUP 3: Construct the rotor and install on turbine shaft.

   TOGETHER: Test the hydro generator with the multimeter.

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MAKE YOUR OWN HYDROPOWER • STUDENT JOURNAL

Name _____

Team Name _____ Date _____

What is the source of energy for this hydropower turbine?

What evidence can you cite that describes your energy source?

What part of your model enables it to produce electricity for work? Explain.

What kinds of work could be accomplished with this part of the model?

Energy needs to be transformed during the action of this model. What part(s) of the model are responsible for transformation of the energy?

How is the energy transformed by this model? Explain and cite evidence.

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STUDENT JOURNAL (CONTINUED)

How much energy is produced? Cite evidence.

Explain your understanding of how energy transformation by a hydropower turbine is accomplished.

How does this model's energy transformation compare with a hydropower turbine at a dam?

What are the variables in this hydro-generating system that you could change to get more electricity and efficiency from this model?

In what locations in the United State or other parts of the world would hydro-generation be a good choice for clean energy? Why is it referred to as clean energy?

What practical problems would you encounter in setting up and running a hydro-generating system in a new area?