



Make Your Own Water Turbine

OBJECTIVES: 1. To create a water turbine out of household items.
2. To demonstrate the power of water to do work.

OVERVIEW:

Students will create their own water turbine to demonstrate the use of water as a renewable energy source.

STANDARDS ADDRESSED:

NGSS 3-PS2-2: Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

NGSS 4-PS3-4: Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

NGSS 4-ESS3-1: Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

CCSS MP2: Reason abstractly and quantitatively.

CCSS MP5: Use appropriate tools strategically.

MATERIALS (PER GROUP, MAY BE DONE AS A CLASS):

- Empty 2-liter bottle, clean with label removed
- Scissors or craft knife
- Single-edged razor blade
- Wine cork
- Barbecue or bamboo skewer
- Nail
- Length of string
- Weight such as a magnet or washer

ACTIVITY STEPS:

(A video of this process can be found at https://www.youtube.com/watch?v=x8xow_R0YRI)

1. Cut the 2-liter bottle into three parts. Cut the top off where it becomes straight with the rest of the bottle, then cut so the middle piece is about 4" tall.
2. Cut the middle section of the bottle into eight equally sized pieces to create blades for the turbine.
3. Cut a V-shaped hole in one side of the bottom section.
4. Using a single-edged razor blade, cut eight equally spaced slits into the cork.
5. Push the blades into the slits you just created. Be sure the blades are all bending the same direction.
6. Push a hole through the center of the cork with the skewer. Remove the skewer.
7. Pierce two sides of the bottom part of the bottle with the nail. The holes should be parallel to the side with the V through the center, about 1" below the top of the bottom section.
8. Put the skewer through one of the holes, then add the cork with the blades, then put the skewer through the other side of the bottle.
9. Tie a length of string to one side of the skewer, and attach a weight.
10. Pour water over the top of your turbine. Best done outside with a garden hose if possible.
11. First predict, then observe if the power of the turbine can lift the weight. If the experiment goes as planned, the string will wind up and the weight will be lifted.

ASSESSMENT:

1. Through a discussion or written assignment, determine the students' understanding of these points:
 - a. What pattern did you observe by doing this experiment? (The water turning the turbine caused the weight to be lifted. If water continues to be poured, the weight will continue to rise until there is no more string.)
 - b. What difference would you suggest to this turbine? Is there a way to make it work better or more efficiently?
 - c. Were you surprised by the result? Why or why not?
 - d. What practical uses for a water turbine can you think of? (The most common use is grinding grain to make flour.)

EXTENSION (OPTIONAL):

1. Students can explore other designs of turbines.
2. Students can research other renewable energy sources.