moxi at home

Water Wheels.

Investigate the transformation of energy from moving water into power.

MOXI Exhibit Connection	Whitewater
Age	9+
Time	30+ min
Category	Motion, Engineering

Educational Value

Based on Next Generation Science Standards (NGSS)

Grade	Standard
3-5	3-5-ETS1-1 4-PS3-4
6+	MS-ETS1-4

*May include opportunities to employ the following Science and Engineering Practices:

- Asking questions
- Defining problems
- Designing solutions
- Obtaining, evaluating, and communicating information

↖ *For Educators*

Design Challenge

Design a water wheel that uses the energy of moving water to power something useful.

Materials

Below are some ideas for supplies, but be creative! What else could you use for each of the categories below? Your home is a creative tool chest waiting to be discovered!

Axle	*Blades*	*Structure*	*Tools*
• *Straw* • *Pencil* • *Wooden skewer* • *Plastic bottle*	• *Recycled plastic* ◇ *Spoons* ◇ *Cups* ◇ *Bottles* • *Clay* • *Lego bricks*	• *String* • *Paper clips* • *Cork* • *Wikki Stix* • *Binder clips* • *Clothespins*	• *Bin or bowl* • *Scissors* • *Tape* • *Pitcher* • *Funnel*

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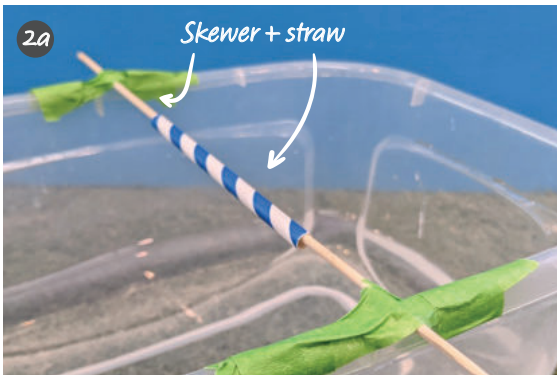
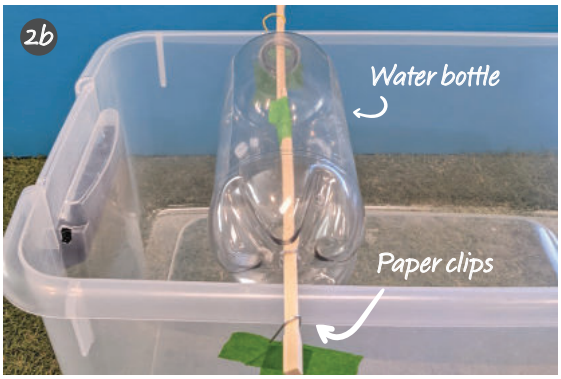
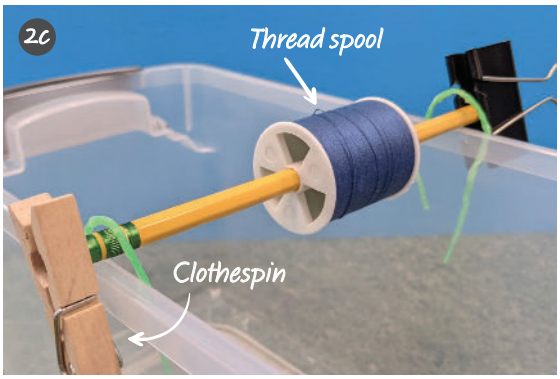
Instructions

1. **Set Up a Workspace:** Find an area where you can test (and get wet). You will be pouring water onto your design to test it. How will you catch the water so it can be reused? A bowl or tub is a good starting point.

2. **Put Together an Axle:** An axle is a straight rod or stick that goes through the center of a wheel. It needs to be able to spin in place over the bowl, without rolling away. There are lots of creative options to explore. Here are a few ideas that you can tinker with:



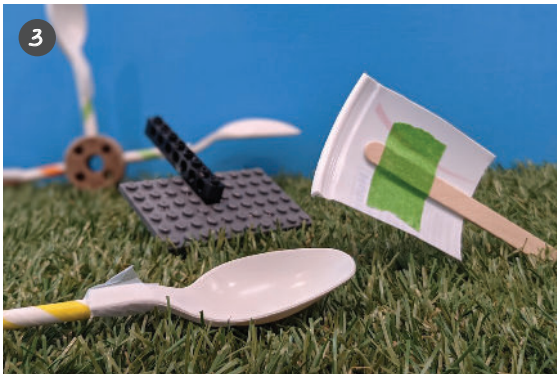




Make and compare flat blades and curved blades.

How can you determine which design works better?

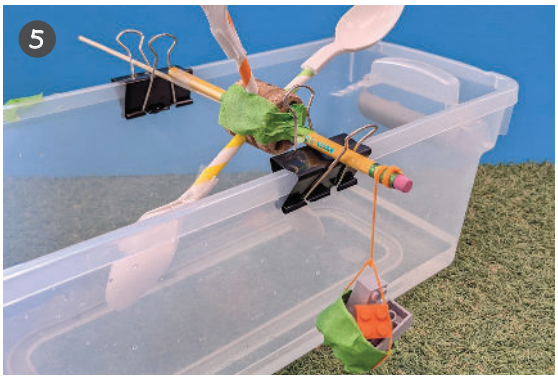
3. **Build Blades:** For your water wheel to spin, it needs something that the water can push against. The flat parts that stick out from a water wheel are called "blades." The blades are like paddles or buckets that get in the way of the water. Attach the blades to the axle. Depending on your blade design, you might need to add extra support to your wheel.



Instructions (continued)

4. **Test Your Water Wheel:** Make it rotate! Pour water carefully over the blades. Try changing where you pour the water. Tinker with the placement and spacing of the blades so that the wheel spins smoothly. You might need to add or remove blades. How can you improve your design?

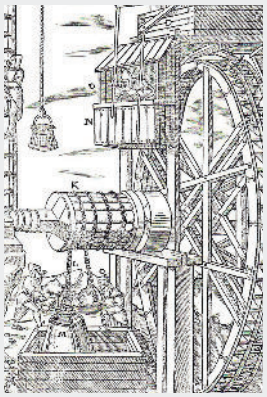
5. **Harness Your Hydropower!** When your water wheel is working, you can turn the rotation into power. A way to see this power in action is to lift a weight. Tie one end of a string to the axle and the other end to a weight or little basket. As the water wheel spins, it wraps the string around the axle and hoists the weight upwards.



Activity Extensions

Why stop here?
Keep the MOXI fun going!

invent In the past, water wheels were used to turn heavy grinders that turned grain into flour. What could you use your new power-generating machine for? It could turn a gear that moves a sculpture, or ring a bell, or even turn a small DC motor to create electricity!



imagine Convert your machine from a hydropower machine to a wind-powered one. Wind turbines use some of the same mechanisms as water wheels. How can you change your design to better harness the power of the wind?

Did you know? Water can be used to create electricity.

Water wheels are not as common as they used to be, but the same principle of using water to turn a machine can still be found in modern hydroelectric dams. Hydroelectric dams use machines called turbines to convert the kinetic energy of moving water into mechanical energy. The spinning turbines connect to generators that convert the energy into electrical power. However, dams can create ecological problems, like blocking fish from swimming upstream. Future engineers will need to work hard to help solve these problems so that we can benefit from the clean energy that water provides.

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