

Wind Power Challenge

Objective: Using Fab@School Maker Studio, students will design a prototype of a pinwheel to simulate how wind is captured to produce energy. Students will then redesign it to explore how form affects function.

Grade Span

K-12 with differentiation

Big Idea

Solving problems requires action.

Program



www.fabmakerstudio.com

Driving Question

How does wind power work?

Deliverables

A 2D to 3D prototype of a pinwheel that will be used to simulate how wind is captured to produce energy.

Resources

- [Energy 101: Wind Power](#)
- [How a Wind Turbine Works](#)
- [How Does Wind Power Work?](#)
- [Power Up Game](#)
- [Save the World Game](#)

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Many people rely on sources like coal, oil, and natural gas for energy (also known as fossil fuels). The problem is fossil fuels are a non-renewable energy source. Once these sources are depleted, how will we get energy? Let's explore alternative energy or renewable resources, as one solution. Wind power is one example of a renewable resource that can be used to create energy. How does wind power work?

Materials

- Fab@School Maker Studio
- Paper/Cardstock
- Pencils/Pens/Markers/ Crayons
- Stapler
- Masking tape
- Straight pin or thumbtack
- Small electric motor
- Alligator clip leads
- 1.5 volt light bulb
- Light bulb holder
- Strong fan

Aligned Standards NGSS

- [K-PS2-2](#)
- [K-2-ETS1-1](#)
- [K-2-ETS1-2](#)
- [4-PS3-1](#)
- [4-PS3-2](#)
- [4-PS3-4](#)
- [5-PS3-1](#)
- [MS-PS3](#)
- [MS-ETS1-4](#)
- [HS-PS3](#)

CCSS

- [CCRA-SL-5](#)

Massachusetts STE

- [PS3 Energy](#)
- [ETS1. Engineering Design](#)

Massachusetts DLCS

- [3-5.CT.e.2](#)
- [6-8.CT.e.2](#)
- [9-12.DTC.a](#)

Challenge

Can you harness the wind? Encourage your students to explore wind power as an alternative energy source. To get started, show Energy Now's [Energy 101: Wind Power video](#). Break your students into small groups to begin their exploration and research. Through the following experiment, student will prototype pinwheels and wind turbines before adding a generator to capture power. Let's get started inquiring, exploring, and using systems thinking to solve real-life problems.

Workshops

Experiment with Wind Power

Source: www.hometrainingtools.com/a/wind-energy-science-newsletter

Part 1 - Pinwheel

1. For the initial pinwheel prototype, students may use the pinwheel template located in Fab@School Maker Studio. Select **Ready-Made Projects, 2D Stuff**, and select **Pinwheel**.
2. Fabricate the pinwheel using a Silhouette digital cutter.
3. To assemble the pinwheel, fold the corners into the center and staple the layers together leaving room in the center. When all four 'blades' are folded in, push a thumbtack through the center. Attach the pinwheel to a pencil eraser.
4. Holding the pinwheel in front of a fan, watch it spin. The wind current is catching the curved part of the blades, causing them to move.
5. Encourage students to refine their design. How does changing the pinwheel - adding blades, increasing/ decreasing size of the pinwheel- affect the spin?



Fab@School Maker Studio Tips

Magnetize: If you want shapes to automatically snap and create fold lines when you drag them together, turn on the **Magnetize** tool on the left toolbar. To learn more about the tool, have students watch the [Fab@School Maker Studio Shapes Tutorial video](#).

Resizing Shapes: When creating nets or art patterns, it's easiest to resize shapes before you snap them together. If you resize a shape that's already snapped to another, you will need to drag the shape away and resnap it to maintain the fold line. To learn more about shapes, have students watch the [Fab@School Maker Studio Shapes Tutorial video](#).

Edit Points: Customize shapes and lines by editing their control points with the white **Edit Point** arrow on the top toolbar. To learn more about edit points, have students watch the [Fab@School Maker Studio Line Tool Tutorial video](#).

Cut Fold Tab: Use the **Cut Fold Tab** tool on the left toolbar to change lines and shape edges into cuts, folds, or tabs. To learn more about cut fold tabs, have students watch the [Fab@School Maker Studio Cut Fold Tab Tool Tutorial video](#).

Math Tools: Try using math tools like the **Grid**, **Ruler**, and **Protractor** on the left toolbar to measure elements of your design. You can also display the dimensions of a selected object by opening **Settings** on the top toolbar, and selecting **Show Dimensions** in the **General** tab.

Part 2 - Generator

Now let's turn the pinwheel into a wind turbine and harness some energy!

1. Remove the pinwheel from the pencil. Add a few strips of masking tape to the back of the pinwheel before punching the shaft of the motor through the center. Once in place, use a small cap, cork, or clay to hold the pinwheel in place.
2. Use the alligator clip leads to connect the motor's wires to the light bulb holder.
3. Using a fan or hair dryer, turn the blades of the pinwheel to watch what happens. Does the bulb light up? If you look closely, the filament should begin to glow. The brightness of the bulb will depend on how much voltage your turbine is producing, which can change with the size of the pinwheel and the strength of the fan.
4. Have your students refine their design of the pinwheel. By changing the size or amount of the blades, can they generate more energy?

What Happened

Home Science Tools explains, that when you attached the motor to the pinwheel and put it in front of the fan, you transformed the motor into a **generator**. This converts mechanical force (the spinning of the pinwheel) to electricity. It does this with the help of a magnet inside the motor. When you connected the wires of the motor to the light bulb, you made a complete electrical circuit, allowing the electricity to flow from the motor through the bulb and back again. For more ideas on wind power, visit www.HomeScienceTools.com.