



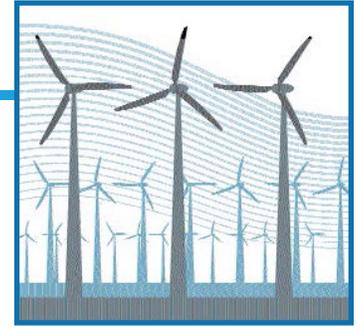
Half a day



Grades
6–8, 9–12

Wind Farm

Design an environmentally friendly wind farm along a coast and near a town.



Instructions

In this activity, students design and use pinwheels as models to create wind turbines. They experiment with variables like position and location as they try to capture the most wind.

ACTIVITY PART 1:

- 1** Construct several pinwheels prior to the activity. Show them to the students, and guide them to figure out how to make their own pinwheels by observing yours. If students need support, refer to the following steps for making pinwheels below.
- 2** Tell students to cut out a 4.5-inch square piece of paper. Fold it into 2 triangles.
- 3** Measure, mark, and cut $2/3$ of the way along each fold.
- 4** Bring every other point into the center and stick a pin through all 4 points. The head of the pin forms the hub of the pinwheel. Turn the pinwheel over and make sure the pin is poking through the exact center.
- 5** Roll the pin around in little circles to make the hole slightly larger, so that the pinwheel spins freely. Or, to decrease friction, separate the pinwheel from the eraser with a bead or two.
- 6** Stick the pin into the eraser end of the pencil. Ask students to blow on their pinwheels, starting at the hub and then gradually changing the orientation of the pinwheel. Encourage students to notice that there's an optimal position for capturing the most wind.

Materials

PER GROUP:

- Playdough or modeling clay
- Small electric fan and extension cord
- Yardstick or meter stick
- Marking pen
- Masking tape
- Textbooks
- Long roll of paper on which to draw a coastline

PER STUDENT:

- 2–4 sheets of lightweight paper
- Ruler
- Pencil
- Scissors
- Push pins
- Unsharpened pencils with eraser

ACTIVITY PART 2:

- 7** Divide the class into at least 2 teams and position them on opposite sides of the classroom, hallway, or other large space.
- 8** Give each team a roll of paper, marking pen, and masking tape.
- 9** Tell students to draw a coastline on their roll of paper and tape it in place.
- 10** Using clay bases for their pinwheels, tell each team to build a wind farm along the coastline. Have one team member use the measuring stick to measure 3 feet or 1 meter out from their middle pinwheel.
- 11** Place the fan at this middle point. Use the lowest setting and see how many pinwheels turn. Record the totals and repeat for each team.
- 12** Allow teams to redesign their farms, retest, and record their totals again.

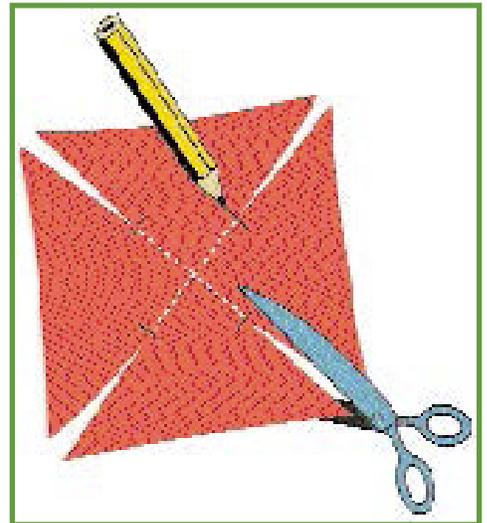
ACTIVITY PART 3:

- 13** Give each team a textbook, which represents a coastal town. They have to place the town within the wind farm, 6 inches or 15 cm from the coastline.
- 14** Deduct one point from the team's total for every turbine that is between the town and the coast, and deduct another for every turbine that had to be moved.

Guiding Questions ?

How can you position your pinwheels so that as many are spinning simultaneously as possible?

How can you position your coastal town to avoid having to move as few pinwheels as possible or lose their spin?



Engineering & Science Connections

- 🔗 Wind turbines are structures that convert the wind's energy into electrical power. Wind farms are a large group of wind turbines that are placed together in geographical locations where the wind is strong and reliable. Wind farms are becoming an important source of renewable energy—as of 2015, they generated 7% of the electricity used in the US.
- 🔗 Engineers design wind farms to provide electricity in a way that doesn't depend on fossil fuels. When designing wind farms, engineers must think about the direction of the wind, where the wind is strongest across a landscape, and how to accommodate the location of nearby towns.
- 🔗 While they don't have the same environmental impacts as fossil fuels, wind farms do create some problems. They pose a real threat to wildlife such as bats and migrating birds. They also create noise pollution and landscape degradation. Engineers are designing ways to minimize the environmental impacts caused by wind farms.



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