Activity Title: Wind, Electricity, and Pinwheels

Recommended Grades

Kindergarten, Grade 1, Grade 2, Grade 3, Grade 4, Grade 5, Grade 6

Curriculum Connections

Matter
- K – properties of objects.
- 1 – analyze properties of objects (measurement)
- 2 – create an object for a purpose

Energy
- K – explore movement of objects
- 1 – investigate moving objects
- 5 – renewable and nonrenewable resources, drag/lift
- 6 – energy resources (renewable/nonrenewable, processed/unprocessed)

Earth Systems
- K – examine and describe environments
- 1 – caring for nature (connect to renewable energy)
- 2 – investigate Earth (components include air)
- 3 – Earth is warming up, human activities change Earth
- 4 – conservation, natural resources include air
- 6 – climate change

Computer Science
- K – interpret instructions
- 1 – relate instructions to purpose

Scientific Methods
- 1 – predict answers, make observations

Time

15-30 minutes

Skills Focused On

• Critical Thinking • Hypothesizing	• Fine Motor Skills • Observation

Materials Needed

Experiment 1: **Make Your Own Pinwheel**	**Experiment 2:** **Make Your Own Windmill**
• Square paper • Pencil • Paper straw (or another pencil with an eraser) • Pushpin • Scissors • Ruler	• A juice or milk carton • A wine cork • Skewers • Cardstock • Scissors • Tape • A pencil • A ruler • You might need a screwdriver.

Background Information

Have you ever seen a windmill or a wind turbine? These machines convert energy from the wind into other forms of energy. As the wind blows through the blades, it causes them to spin. The blades are attached to a shaft which spins as the wind spins the blades. In a windmill, this shaft can be connected to gears, which may pump water, or to a gearstone, which grinds flour, or does other tasks. In a wind turbine, this shaft is connected to a generator which produces electricity.

We are seeing more and more wind turbines all around us. Next time you go for a drive or walk, see if you can find any wind turbines. If you are ever near the ocean, you have a good chance of spotting one! There are more and more turbines being built just offshore, catching wind blowing in from over the oceans.

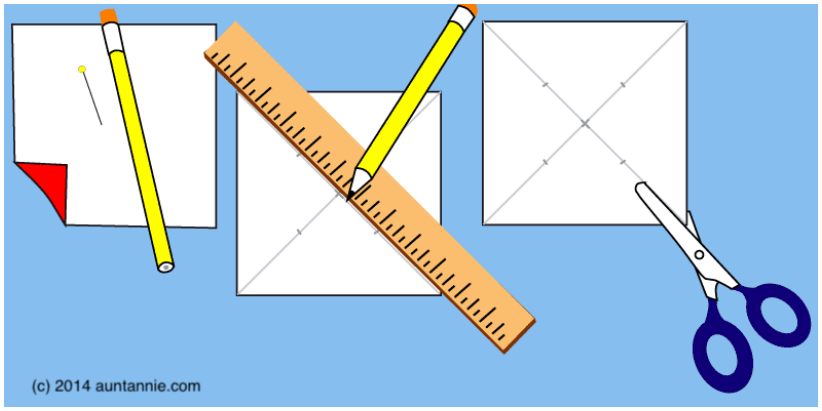
The wind is free, and it doesn't produce any greenhouse gases. That means it doesn't contribute to global warming, which is great! However, wind turbines can be expensive to make. Wind also doesn't blow all the time – can you imagine if you could only use your iPad when it was windy outside?

There are lots of positives and negatives to wind energy. There is still so much more to learn. We need more scientists to help solve challenges with wind energy to create a better future for everyone.

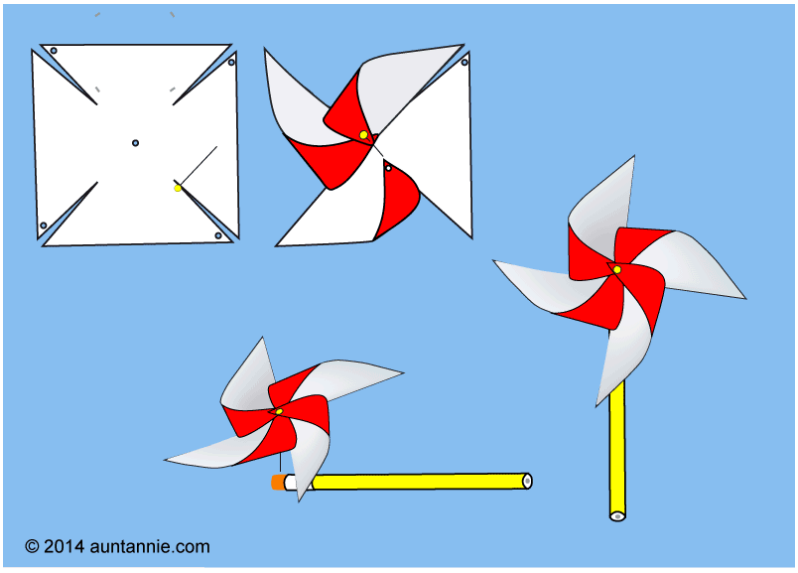
Experimental Steps

Experiment 1: Make Your Own Pinwheel

1. Draw two diagonal lines with your ruler on your square paper.
2. Mark the intersection of your lines with your pencil. This is the centre of your paper.
3. Use scissors to cut down your lines. Stop about ⅔ of the way from the centre– you don't want to cut it in half.



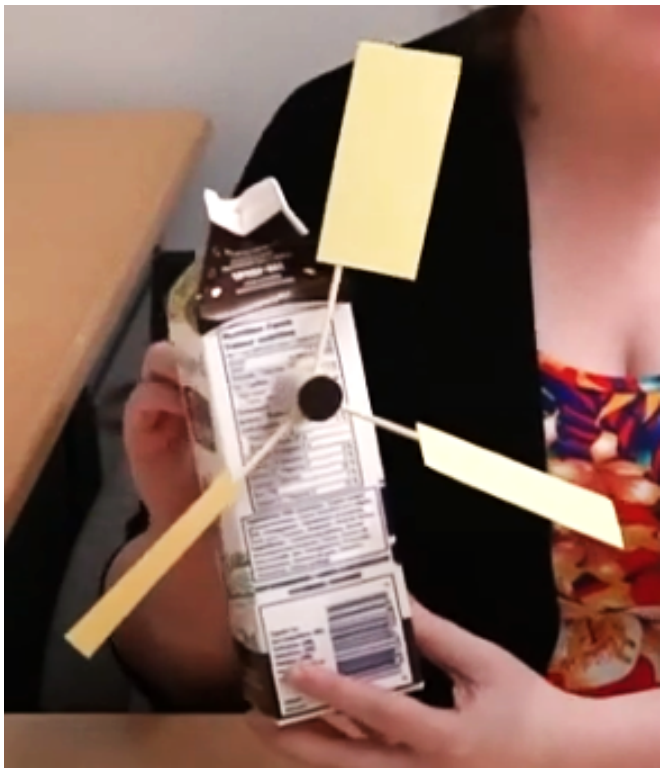
4. Fold alternating points (every other point) to the centre dot.
    a. If you are struggling, don't give up! Keep on trying. It can take time to learn a new skill, but if you practice you'll always improve.
5. Push your push pin through the gathered points of paper. Then, put the push pin through one end of your paper straw, or through your pencil's eraser.
6. Test your pinwheel! Hold it up to the wind outside, a fan, or even your breath.



Experiment 2: Make Your Own Windmill

1. If you have long skewers, break them in half. You will need one for each blade of your windmill (we made three, but you can do as many as you think will fit!) plus one extra.
2. Cut out a rectangle from cardstock for each blade of your windmill. Use a ruler to make each blade about 5 cm by 10 cm.
3. Tape each skewer to your cardstock, leaving part of the skewer hanging off the end. Experiment to see where the best position to tape it is.

4. Stick the overhanging ends of your skewers into your wine cork. Keep in mind that we want our blades to be evenly spaced! You may need to use a pen, pencil, or screwdriver to start the hole into the cork. Get an adult's help if you need it.
5. Take your final skewer and stab it into your carton of milk or juice. Then, put the cork on the other end of your skewer. Again, you might need to use a pen, pencil, or screwdriver to start the hole.
6. Test your windmill!



Discussion/Experimental Extensions

Do you think the shape of the blades matters for your pinwheel / windmill? Experiment with making your blades longer, shorter, rounder, or pointier. Which shapes catch the wind best?

How about the number of blades? Do you think more blades will catch the wind better?

How about the materials you used? Would stiffer paper or plastic be better than regular paper for your blades? Could you use something other than a carton for the body of your windmill?

Watch this video (youtube.com/watch?v=WGKIjojADmg) to learn more about the design of modern wind turbines.

Additional Resources

"Wind, Electricity, and Pinwheels" experimental video produced by Future Energy Systems - provides background information and instructions for experiment: https://www.youtube.com/watch?v=NQreX6llz44.

Learn more about Future Energy Systems (https://www.futureenergysystems.ca/) and access more learning content, including storytimes, lab tours, ask an experts and more (https://www.futureenergysystems.ca/engage/learning https://www.youtube.com/channel/UCJr8N9KyFJ6d-t36TPtUlwg).