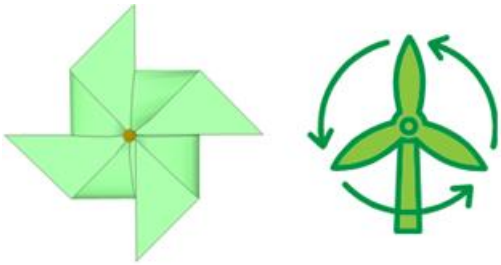
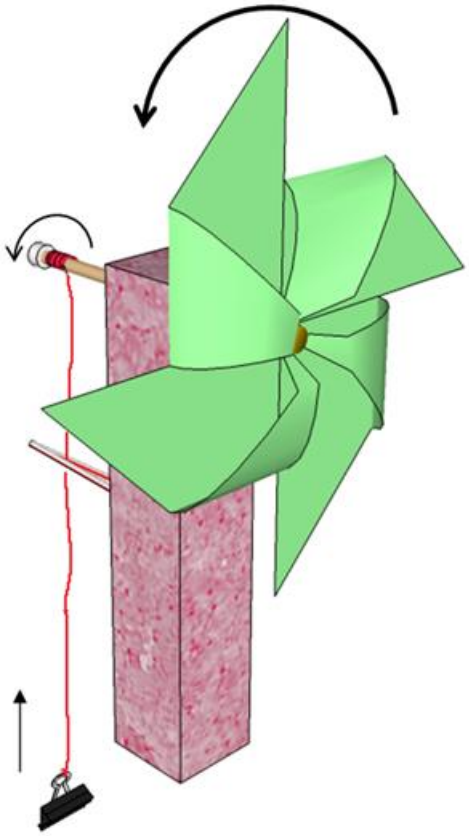
# WIND AT WORK

Get wound up with wind power!



Use this enhanced pinwheel to investigate the mechanical energy that can be obtained from moving air. Make the pinwheel spin by holding the device while walking or by using the “wind” from a fan. Record data, including measuring how much time is required for the device to lift a set weight a fixed distance.



**Curriculum topics**

- Alternative Energy
- Energy Conversion
- Investigations
- Weather and Climate
- Engineering/Design

**Subjects**

- Earth & Space Science
- Engineering
- Physical Science

**Grade range:** 6 – 8

**Who we are:** Resource Area for Teaching (RAFT) helps transform the learning experience by inspiring joy through hands-on learning.

**Share Your feedback!**
http://bit.ly/RAFTkitsurvey

# Materials

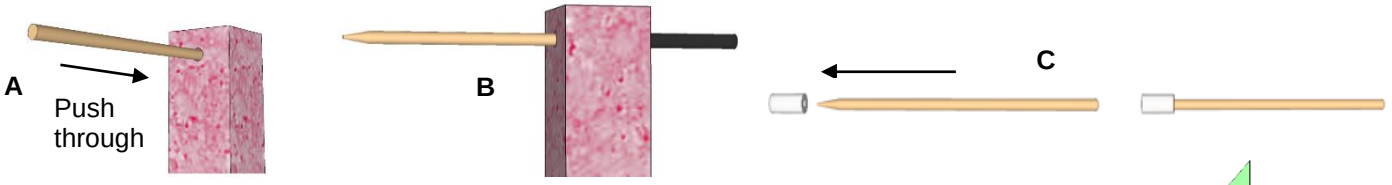
Use the following items to assemble each project:

- Foam block or equal, about 2”-6” (1)
- Wood dowel w/ tapered end (1)
- Straw section, 3” long (1)
- Pinwheel, cut from cardstock (1)
- Stir straw, 7” long (1)
- Paper fastener, ¾” long (1)
- String, 2 ft. (1)
- Silicone tubing: ¾” long (1), ¼” long (2)
- Binder clip, small (1)
  **Not included** (optional): Timer, powered fan

# To Do and Notice

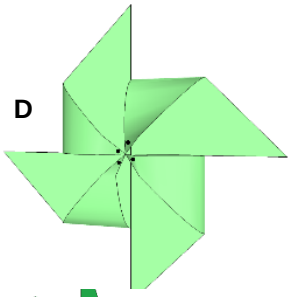
**1** Carefully push the tapered end of the wood dowel straight into and all the way through the long side of the foam block near the middle, about 1” from the end (**A**). The dowel should protrude from the foam.

**2** Slide the straw section over the back end of the dowel (**B**). Twist the straw section while pushing it through the foam until the straw protrudes from the foam block. Remove the stick from the straw.



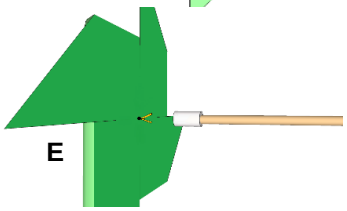

**3** Insert the tapered end of the wooden dowel into a ¾” long tubing section (**C**) so the tapered end reaches the end of the tubing but does not stick out.

**4** Form the pinwheel and insert the prongs of the paper fastener through the overlapped corner holes and then the center hole (**D**). Spread the fastener prongs slightly.



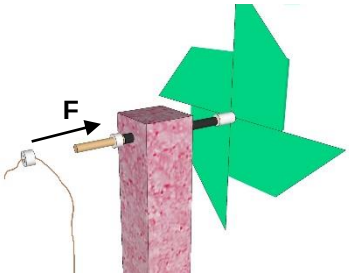

**5** Attach the pinwheel by inserting the fastener prongs into the tubing so the prongs enter on the sides of the tapered end of the dowel (**E**). Push firmly and carefully!

**6** Insert the other end of the dowel through the straw in the foam block. Slip a ¼“ tubing section over the other end near the straw. The dowel should spin freely.




**7** Insert the string through a ¼“ tubing section and slip the section over the dowel (**F**). Stop when the tubing is fully inserted onto the dowel end, securing the string.

**8** Use a pencil to poke 2 holes halfway down the foam block on the same side as the string. Bend a stir straw in half (V-shape) and insert the straw ends into the poked holes. Put the string through the “V” and tie it onto a binder clip (see title page).




**9** Unwind the string completely. Turn the pinwheel with natural or simulated wind. Measure how long it takes for the clip to reach the “V” straw. Repeat.

**10** Add weight to the binder clip, change the wind speed (adjust the fan knob or walk faster), or move the pinwheel to a different location in front of the fan. Repeat, record the time, and form conclusions.

**11** **Share** student learning with RAFT! Submit photos/video via email at education@raft.net or on social media (Facebook, Twitter, Instagram).

**Core Content Skills:**

**Science & Engineering (NGSS)**

Developing and Using Models, Planning and Conducting Investigations, Generating and Comparing Design Solutions, Properties of Matter, Forces and Motion, Definitions of Energy, Conservation of Energy, Resources and Environment, Human Impacts

**Social Emotional Learning**

- Self-awareness
- Self-management
- Responsible decision-making

# The Content Behind the Activity

An object in motion has Kinetic Energy. A heavy object traveling at a high speed has a lot of kinetic energy. But even things that are very light can still possess some amount of kinetic energy if they are moving. On a windy day, for example, the tiny molecules of gas in the moving air contain enough kinetic energy to blow your hat off! Like the hat, the blades of a **wind turbine** get pushed by the air pressing on the blades' angled surfaces. The angled surfaces cause the blades to rotate, creating rotational kinetic energy, at the same time the air passing over the blades is slowed slightly, reducing the wind's kinetic energy.

**Wind energy** can be collected by wind turbines and converted to more convenient forms, such as electrical energy to run motors or mechanical energy to turn a water pump. **Wind Farms** are large collections of wind turbines. They are often located on hilltops where strong, steady winds are common.

In this activity, "artificial wind" is created by moving a wind turbine through calm air inside a room. The relative motion creates kinetic energy, just as if a wind were blowing. Some of the wind energy is transferred to the turbine blades, causing them to spin. This energy is used to do **work**: lift a small weight attached to a string. The more wind, the more weight the turbine lifts!

# Reuse

This kit uses 100% reusable materials designed for other uses. To continue making a positive impact in reducing waste, reuse these materials in other projects. Additionally, any unused materials can be collected and delivered back to RAFT.

# Feedback

Please comment on this kit by taking this short survey: http://bit.ly/RAFTkitsurvey. Let us know of any material concerns (missing, broken, or poorly fitting parts) as well as any suggestions for improvement.

Visit https://raft.net to view related activities!

Catching the Wind
Retractor Car
Solar Cone Cooker
Whimsical Wind Vane

# Resources

- YouTube (3:16), Energy 101: Wind Power - https://bit.ly/3efdm6G
- How wind turbines work - https://bit.ly/2y3tUOA