

RAFT IDEAS

Topics: Wind, Weather, Fluids, and Atmosphere

Materials List

- ✓ Foam plate or tray
- ✓ Drinking straw
- ✓ Paperclips, smooth finish, 2
- ✓ Straw with a smaller diameter than the drinking straw
- ✓ CD or equal
- ✓ Adhesive tape or glue
- ✓ Copy of compass rose printed on paper or a transparency
- ✓ Scissors
- ✓ Directional compass, if needed

This activity can be used to teach:

Next Generation Science Standards:

- Forces & Motion (Grade 3, Physical Science 2-1)
- Weather conditions (Grade 3, Earth and Space Science 2-1)
- Wind (Middle School, Earth and Space Science 2-5)
- Science & Engineering Practices (Grades 3-12)



Thar She Blows

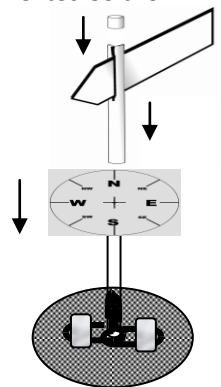
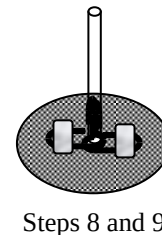
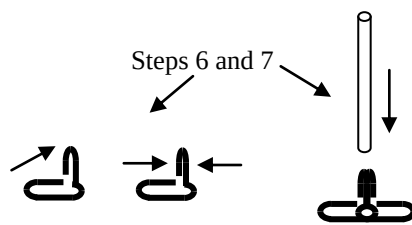
Let the wind vane point the way!



This easily made wind vane will point to the source of a real or a student generated wind!

Assembly

1. Cut a pointer about 10 cm x 2½ cm (4" x 1") from a foam plate or tray.
2. Cut a drinking straw in half. Take one of the halves and make two 4 cm (1½") long slits on opposite sides of the straw at one end as shown to the right.
3. Cut a 1 cm (~½") section from the other half straw. Save rest for step 12.
4. Insert the foam pointer down into the slits, made in the drinking straw, at a point 1/3 of the way from the pointed end, as shown in the top illustration.
5. Place the 1 cm (~½") straw section over the slit ends of the drinking straw to hold the pointer in place. See the rightmost illustration below.
6. Bend the narrower loops of 2 paperclips upward to a right (90°) angle. Pinch the narrower loops to make them narrower.
7. Insert both paperclips' narrower loops into a smaller diameter straw oriented so the wider loops are on opposite sides of the straw as shown below.
8. Place the wider loops of the bent paperclips on a CD, or other suitable base, positioned with the narrower loops at the center.
9. Tape or glue the wider loops of the paperclips to the CD.



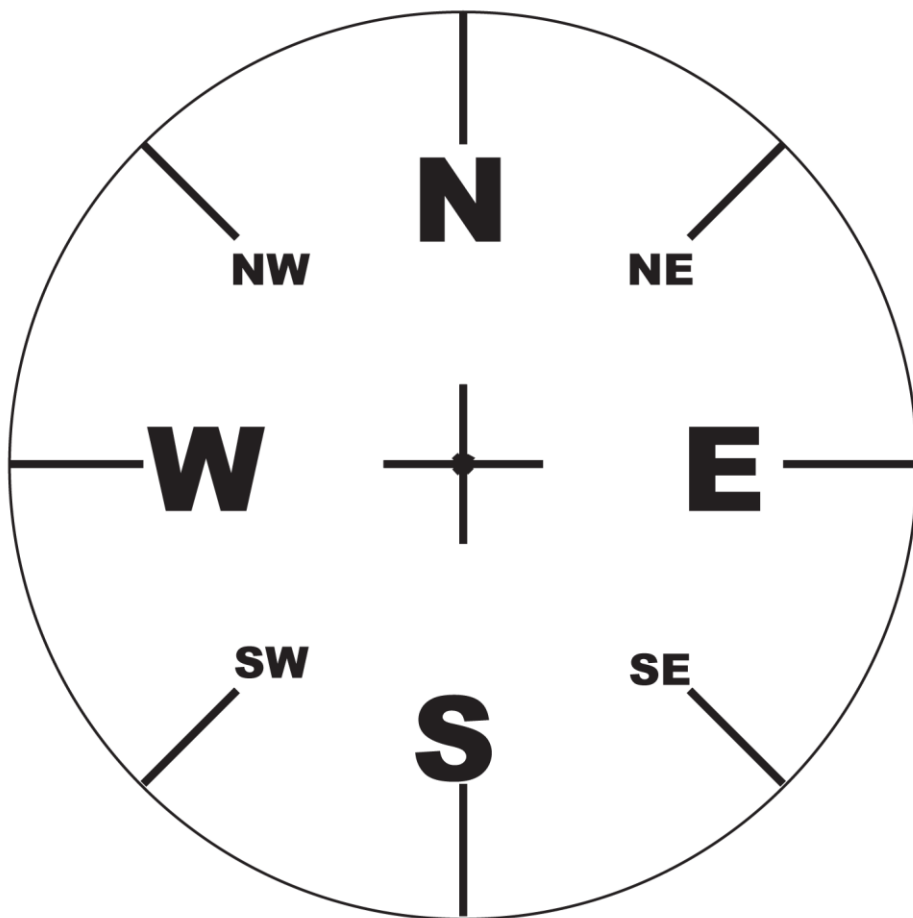
10. Fold a printed compass rose in half and make a 1 cm (½") center slit. Unfold, fold in half the other way, and slit again. Unfold and place over the straw on the CD.
11. Insert the bottom end of the pointer straw over the top of the straw sticking up from the CD. The pointer should turn easily with a light touch or student created wind.
12. Slit the straw saved from step 3 from end to end and insert into the straw holding the pointer, if a tighter fit is needed.

To Do and Notice

1. Blow toward the wind vane. Does the vane point toward the source of the "wind?"
2. Choose a location away from buildings, trees, etc. to use the wind vane outside.
3. Orient the compass rose correctly by using a directional compass to find north.
4. Record the wind's direction at regular time intervals (e.g., hour, day, week, month).

The Science Behind the Activity

Sunlight's radiant energy warms the water, rocks, sand, and other parts of the Earth's surface unevenly. Given the same amount of radiant energy, rocks and sand warm up much more quickly than water. There is also more radiant energy available, per a unit of area, at locations nearer the equator than for locations closer to the poles. The unevenly warmed surfaces will, in turn, unevenly heat the air above (a mixture of different gases). When a volume of gas is heated the gas expands and become less density, with less gas per unit of volume. When cooled a volume of gas contracts and become denser, with more mass per unit of volume. Gravity will cause a denser volume of air to sink down and to push up a less dense volume of air. The resulting air movements cause winds and air currents. Wind is the horizontal movement, more or less, of the air while air currents are the more vertical movements. The direction of a wind can be affected by the spinning of the Earth underneath (the Coriolis Effect).



A **wind vane** (sometimes called a **weathervane**) is a device with a pointer that points in the direction the wind is blowing from, that is, the source of the wind. The wind vane's vane is the moveable part that rotates as the wind changes direction. The surface area will be very different for each side of the vane when viewed horizontally. The side with the greater surface area, the "tail" side, will be moved by the wind until the tail is downwind of the pivot point and aligned with the wind. In this position, as seen head on, the vane has the least surface area exposed to the wind. If the tail were to move to either side then more surface area would be presented to the wind. More moving air molecules would strike the windward side than the other side of the tail. The greater force on the windward side will move the tail back into to alignment with the wind. The side with less surface area can be formed into a pointer that points upwind when the tail is aligned to the wind direction. Some designs of weather vanes have the 4 cardinal directions, represented by the letters (N, E, S, and W) aligned correctly and permanently fixed in position. Referencing the vane's pointer and the fixed letters provides the wind's direction at a glance.

Taking it Further

- Measure the wind speed with an anemometer, see RAFT Idea Sheet *Catching the Wind*.
- Keep a weather journal over several weeks or months and graph the data.

Web Resources (Visit www.raft.net/raft-idea?isid=432 for more resources!)

- Student oriented wind information - <http://www.weatherwizkids.com/wind1.htm>
- Global wind patterns and an activity - <http://kids.earth.nasa.gov/archive/nino/global.html>
- For information on weathervanes - http://en.wikipedia.org/wiki/Weather_vane
- For general information on wind - <http://en.wikipedia.org/wiki/Wind>