

RAFT IDEAS

Topics: Wind, Weather, Fluids, Atmosphere

Materials List

- ✓ Index card, 7-1/2 cm x 13 cm (3" x 5") or equal
- ✓ Wooden coffee stirrers, 2, 14 cm (5-1/2") long, rounded ends
- ✓ Drinking straws, 2
- ✓ Straw, sip and stir (with a smaller diameter than the drinking straw)
- ✓ Paperclips, smooth finish, 4
- ✓ CD, media tray, or equal, for a base
- ✓ Adhesive tape or glue
- ✓ Copy of compass rose printed on paper or on a transparency
- ✓ Directional compass, if needed

This activity can be used to teach:

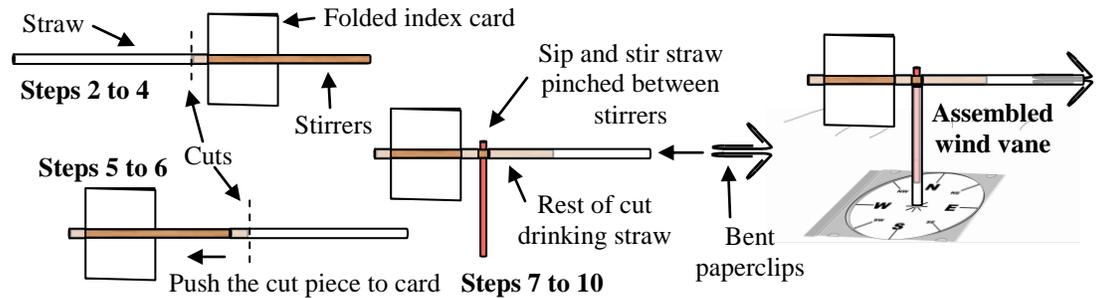
Next Generation Science:

- 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 1-8)



A Better Wind Vane

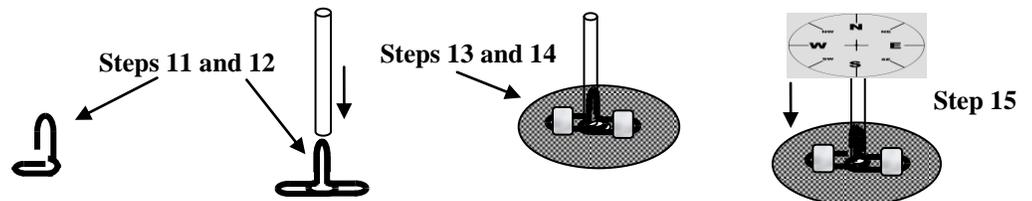
Let the paperclips point the way!



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

Assembly (Younger students will need adult assistance to assemble the wind vane)

1. Fold an index card in half so the narrower edges overlap.
2. Stack 2 wooden coffee stirrers on top of each other. Insert 1 cm (3/8") of a drinking straw, with a diameter that allows an easy a slip fit, over the end of the stirrers.
3. Insert the middle of the folded edge of the index card in between the stirrers so the fold touches the end of the straw inserted over the stirrers in step 2, as shown above.
4. Cut the straw close as possible to the ends of the stirrers.
5. Insert 1 cm (3/8") of the remaining straw section over the other end of the stirrers. Cut the straw close as possible to the end of the stirrers. See the illustration above.
6. Slide the newly cut straw piece toward the index card by using the remaining straw section to push the cut straw piece along the stirrers. **Caution:** watch out for splinters in the wood! Remove the long straw section from the stirrers.
7. Insert 1 cm (3/8") of a sip and stir straw in between and perpendicular to the stirrers as shown above. Flatten the sip and stir straw by pressing the stirrers together.
8. Slide the flattened part of the sip and stir straw toward the index card until stopped by the short piece of straw that is next to the folded index card.
9. Insert the remaining long section of the straw over the ends of the stirrers until the straw touches the sip and stir straw as shown in the illustration above.
10. Bend the narrow loops of 2 paperclips up and outward to form 45° degree angle. Place the wider loops of the 2 paperclips together and insert the wider loops into the open end of the longer straw section, as shown above, to form an arrow point.
11. Bend the wider loops of 2 other paperclips up and upward to a right angle (90°).



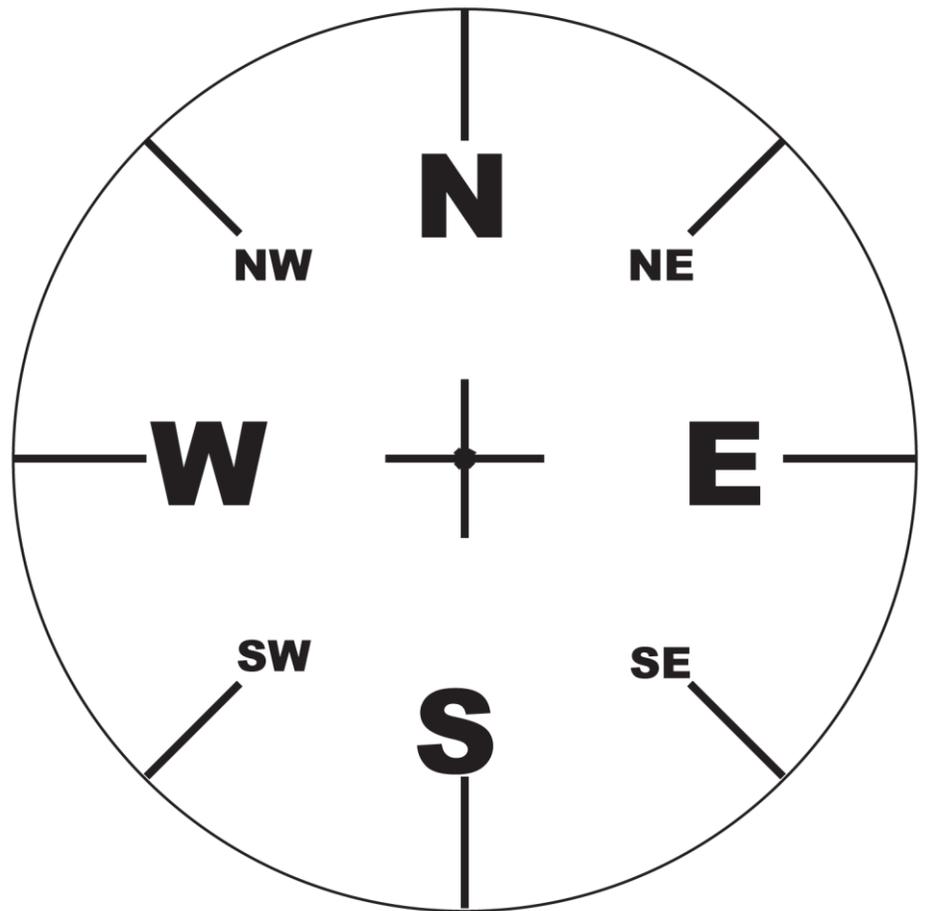
12. Insert both paperclips' wider loops into an uncut drinking straw so that the narrower loops of the paperclips are on opposite sides of the straw as shown below.
13. Place the narrow loops of the paperclips on a CD, or other suitable base, centered on the CD as shown below.
14. Tape or glue the narrower paperclips loops to the CD.
15. Fold a printed compass rose in half and make a 1 cm (3/8") center slit. Unfold, fold in half the other way, and slit again. Unfold and place over the straw on the CD.
16. Insert the stir straw's long end into the straw sticking up from the CD; see the top of the page on the right. The pointer should turn easily with a directed puff of air.

To Do and Notice

1. Blow toward the wind vane. Does the vane point toward the source of the “wind?”
2. Choose an outdoor location for the wind vane that is away from buildings, trees, or other wind obstacle.
3. Orient the compass rose correctly by using a directional compass to find north, as needed.
4. Record the wind’s direction at regular time intervals (e.g. hour, day, week, month).

The Science Behind the Activity

Wind is caused by the Sun’s radiant energy warming the water, rocks, sand, and other parts of the Earth’s surface unevenly. Given the same amount of radiant energy, rocks and sand will warm up much more quickly than water. There is 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 unevenly heat the air above. Air is a mixture of different gases. When a volume of gas is heated the gas expands and become less density, with less gas particles per unit of volume. When cooled gas contracts and becomes denser, with more particles per unit of volume. Gravity will cause a denser volume of air to sink down pushing 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 for each side of the vane must be very different 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 paperclips form a point, pointing upwind, and provide the extra weight needed to counter balance the larger tail. 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. A glance at the vane’s pointer and the fixed letters will indicate the direction of the wind’s source.

Taking it Further

- Keep a weather journal over several weeks or months and graph the data.

Web Resources (Visit www.raft.net/raft-idea?isid=612 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>