

9. Wind

OBJECTIVES: After completing this lesson, a student should be able to:

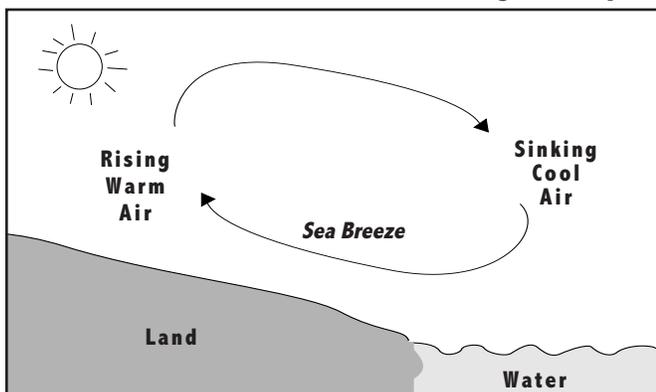
- * Describe WIND
- * Name the U.S. WIND BELT
- * Define the JET STREAM and measure WIND (Grades 4-8)

TEACHER BACKGROUND: (Grades 1-8)

Look about you for the movement of clouds in the sky, exhaust from a smokestack or a flag on a pole. Air is moving, sometimes lightly, occasionally strongly. As you look up into the atmosphere, imagine more violent movement, even though it is invisible. WIND is air in motion.

What keeps the air in constant motion around the globe? The most important factor is the incoming solar energy from the sun that is heating the earth. We know that hot air balloons rise because air within the balloon is warmer and lighter than the air outside the balloon. In lesson 6, we learned that land heats and cools faster than water. The figure below shows students in grades 4-8 how land that warms faster than water creates air movement on a small scale.

On a sunny day, warm air rising from land heated by the sun flows toward the cooler water where the air sinks. The cooler air then rushes in toward land again to replace



the warm air that is rising. This cycle continues as long as the daytime heating continues from the sun. Since air moves inland from the water, the wind is called a *sea breeze*.

At night, the opposite cycle occurs. Since the land cools

quicker than water, air over the warmer water rises and flows toward cooler land where the air sinks. This reverse cycle of wind blowing out to sea is called a *land breeze*.

On a global scale, the tropical region receives more solar radiation and heating than the poles. Similar to the sea and land breezes, the difference of heating of the earth's surface creates cycles of air movement. Air rises at the hot equator and sinks at the cold poles. Air moving between the two regions is curved by the rotation of the earth to create our wind. The **PREVAILING WESTERLIES** is the wind belt across the United States generally moving weather systems from west to east.

Additional notes for grades 4-8:

The same difference of the earth's heating that causes the prevailing westerlies also causes a strong "tube" of wind high above the surface of the earth. The **JET STREAM** is a narrow band of strong wind in the upper atmosphere. Usually found between 10 and 15 km (6 and 9 miles) above the earth's surface, the jet stream wind flows around the earth at speeds of 160 to 400 km/hr (about 100 to 250 mph). The jet stream is stronger in winter, since the temperature difference between the poles and the equator is greatest in the winter. During the winter, the jet stream is often the boundary separating cold polar air to the north from the warm subtropical air to the south.

Wind Activity

GRADES 1-3

INTRODUCTORY: *WIND WHEEL*

Draw an "X" on a square piece of colorful, heavy paper, connecting opposite corners and cutting three-fourths of the way down the line from each corner. Fold corner tips to the center point of the X. Push a pin or tack through all four corners in the center (glue may also help). Push pin into the head of a pencil eraser. Test the wind wheel outside!

ADVANCED: *WIND ENERGY*

Ask the students to brainstorm about wind and its uses. How is wind enjoyed and how is wind (energy) used? After listing responses on the board, have students draw and color pictures of the wind topics on the board. Be sure they include windmills, flags, smoke stacks, wind generators, kites, airplanes and balloons.

GRADES 4-8

INTRODUCTORY: *WIND VANE*

A plastic straw is the body of the wind vane. To complete the vane, draw an arrow head and fin on cardboard and cut the pieces out. Staple the pieces to the straw vane. Find the balance point of the vane, sticking a pin through that point and into the head of a pencil eraser. Take it outside to determine wind direction!

ADVANCED: *ESTIMATING WIND*

By observing the movement of smoke, leaves, trees and grass around you, one can usually estimate how fast the wind is blowing. Use the *Beaufort scale* (see appendix) to make your estimate. Record daily estimates on the observation sheet. Does the wind speed change at different times of the day? If the anemometer below is constructed, compare *Beaufort* estimates with instrument measurements.

MAKE A CLASSROOM ANEMOMETER (Time: 30-45 minutes) GRADES 4-8

Materials: 3 small cups, cork (or stopper), eye dropper, wood, three 7.5 cm (3") nails, one 10 cm (4") nail, red marker, hammer

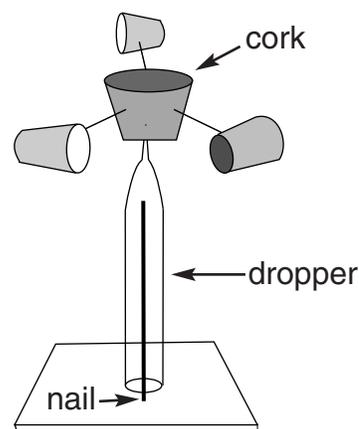
Preparation: *CAREFULLY* push a 7.5 cm nail through each cup and insert nail point into side of cork forming three equally spaced arms of cups from the center of the cork. Make a hole in the cork bottom where the small end of the eye dropper inserts. Drive the 10 cm nail (or nail with a diameter slightly smaller than the dropper) upward through a piece of wood where the dropper will rest and rotate freely. Dropper should *not* rest directly on the wood base

Procedure: To calibrate, color one cup with the red marker and hold anemometer out of a car window at one steady speed, counting the revolutions (using red cup as a guide) in 30 seconds. Make a chart of revolutions for each increment of speed.

Evaluation: Measure wind at different times. How often does it change?

Excursion: Does wind change at different heights above the ground?

Computer: Grades 4-8 students should take daily wind measurements, load data in the computer and add it to their observation sheets.



WEATHERSCHOOL QUESTION:

**The highest wind recorded in the U.S. was in: A. Florida B. Colorado C. New Hampshire
Obtain the answer tonight on your Weatherschool television channel!**