

THE POWER OF WIND: CAUSES AND INFLUENCE OF WIND

Master Teacher: Theresa Hoggard

Grade Level: 5-8

Time Allotment: Two 45-minute class periods

Overview: If you've ever walked barefoot from pavement to grass on a sunny day, you know that different materials absorb heat differently. On a larger scale, uneven heating like this is what produces wind. In this lesson, students will predict which material heats up and cools off faster- water or soil. Students will then test their predictions.

Subject Matter: Science

Learning Objectives:

Students will be able to:

- Identify the causes of wind.
- Describe Earth's wind patterns.
- Explain how winds influence the weather.
- Identify dominant winds.

Standards:

Texas Essential Knowledge and Skills

Grade 5

Objective 1

Scientific processes. The student conducts field and laboratory investigations following home and school safety procedures and environmentally appropriate and ethical practices.

Objective 2

Scientific processes. The student uses scientific methods during field and laboratory investigations.

Media Components:

Video:

Simply Science: Weather Systems #108

Web Sites:

What's the Forecast?

<http://www.fi.edu/weather/radar/forecasts/>

Are you ready to be a meteorologist? Apply your knowledge to see if you can predict the weather by looking at radar maps.

National Wind Technology Center

<http://www.nrel.gov/wind/usmaps.html>

Map of US average winds

Smithsonian: Ocean Planet

http://seawifs.gsfc.nasa.gov/OCEAN_PLANET/HTML/oceanography_currents_4.html

Compare cities' temperatures of the same latitude

Materials:

For each group of five students:

2 tin cans (lids removed)

water

dry soil

spoon

2 thermometers

For each student:

Pencil and paper

Prep for Teachers:

Prior to teaching, bookmark all Web sites which will be used in the lesson. Cue the videotape to the appropriate starting point. Prepare the hands-on element of the lesson by gathering materials for the experiment.

Introductory Activity: Setting the Stage

The following facts and questions will spark your student's interest.

Explain to students that they will be examining causes of wind. Ask students, "How can wind be so powerful?" (fast-moving air has a lot of energy)

Tell students that when sailing ships crossed the oceans, sailors avoided an area near the equator that is so calm a ship could simply drift for days. We call this area the *Doldrums*. Ask students, "How could sailors know that a certain area would be so calm?" (many sailors had the same experience and they warned each other to avoid the area)

Ask students to predict in which direction does the wind usually blow? (from the west)

Learning Activity:

Step 1: Explain to students that there are specific names for different kinds of winds. A *foehn* is a warm, dry, gusty wind that may blow down mountain slopes. This term was first used to describe such winds blowing off the Alps. The *Santa Ana* is a foehn that blows down the Santa Ana Mountains in southern California. Many other winds are also given names.

Focus for Media Interaction: Ask students to raise their hand every time they hear the name of a dominant trade wind.

Step 2: Insert video *Weather Systems*

BEGIN viewing tape in the section titled "The Global Picture: Water Currents."
PAUSE after Stephanie says, "...and cooler at the poles" and Darren responds by saying, "Right."

Review the concept of warmer climate along the equator and cooler at the poles. Bring out a globe to demonstrate the concept.

RESUME video. **PAUSE** after the three dominant winds are defined and discussed. (Students should have raised their hand when they heard the different types of dominant winds- trade winds, westerlies, and polar easterlies)

Review the 3 types of winds and have students talk to a partner and come up with a definition for each dominant wind.

RESUME video. **PAUSE** after the definition of a doldrum is discussed.

Remind students about what they learned earlier about doldrums and how sailors know that a certain area is calm.

RESUME video. **PAUSE** after plane takes off.

Step 3: Reinforce the idea that wind, water, and land features affect the weather. Remind students that because the Earth's surface is heated unevenly, the air above it is in constant motion. Cold air is heavier than warm air, so it sinks, forcing lighter warm air to rise. Furthermore, at the surface, two places can often have differences in temperature and air pressure. These differences cause air to move

from the area of higher pressure to the area of lower pressure. This horizontal movement of air is called *wind*. Winds can be local, affecting small areas, or global, affecting large parts of the Earth.

END OF CLASS ONE

Learning Activities:

Step 1: Review what causes wind.

Step 2: Students identify and define the 3 dominant winds by drawing the direction of the wind and writing the definition underneath.

Culminating Activity:

In order to help students understand the concept of uneven heating, try this experiment with your students.

Step 1: Divide students in groups of 4 or 5. Provide each group with the appropriate materials.

Step 2: Fill one can about $\frac{3}{4}$ full of water and the other can about $\frac{3}{4}$ full of soil.

Step 3: Place on thermometer in the can of water and the other in the can of soil. Put the cans in a shady place outside. Wait for 10 minutes and then record the temperatures of the water and the soil.

Step 4: Put both cans in the sunlight. Predict which of the cans will show the faster rise in temperature. Record the temperature of each can every 10 minutes for 30 minutes. In which can does the temperature rise faster? Which material- soil or water- heats up faster?

Step 5: Now put the cans back in the shade. Predict in which of the cans the temperature will drop faster. Again record the temperature of each can every 10 minutes for 30 minutes. In which can does the temperature drop faster? Which material- soil or water- cools off faster?

Step 6: Make line graphs to show how the temperature of both materials changed as they heated up and cooled off.

Step 7: Ask students to *draw conclusions*:

- How did your results match your predictions? Which material- water or soil- heated up faster? Which cooled off faster?
- From the results you observed in this investigation, which would you predict heats up faster- oceans or lands? Which would you predict cools off faster. Explain.
- Predict how fast other materials, such as moist soil, sand, and salt-water, heat up and cool off. Plan and conduct a simple investigation to test your prediction.

Cross-Curricular Extensions:

MATH

Calculate. About 35 percent of the sun's rays that reach the Earth are reflected back into space. Another 15 percent are absorbed or reflected by the atmosphere. What percentage of the sun's rays reaches the Earth's surface?

WRITING

Expressive Writing- Friendly Letter. Suppose you are on vacation. Write a postcard describing the weather to a friend. Include temperature, wind speed, and wind direction.

Community Connections:

- Contact a meteorologist and have him speak about winds and weather. Have students check the weather maps each day for a week and use these graphic sources of information to make predictions about the next day's weather. Then have them check the accuracy of their predictions by talking to the meteorologist.

- Invite a surfer into the classroom. Have him/ her demonstrate how wind affects the performance of his surfing. Have him/ her discuss how the speed and direction of wind is predicted and how they know which wave to take.
- Contact a pilot and have the aviator discuss wind and its properties. Also have them discuss how wind affects flight.

Student Materials:

2 tin cans, water, dry soil, spoon, thermometer