



Exploring Prevailing Winds and the Coriolis Effect

NS 696 V: Weather and Climate for Educators

Intended Grade Level: 4

Time required: 50 minutes

Science Standards

1. Students recognize and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. (Colorado State Science Standard 4)
2. Students understand that science involves a particular way of knowing and understanding common connections among scientific disciplines. (Colorado State Science Standard 6)

Materials Required

Handout: Map of the Earth with latitudes marked (For prevailing winds discussion)

Stapler

Ruler

Scissors

Markers

Each student needs the following materials:

- a. unsharpened pencil with an eraser
- b. piece of stiff cardboard at least 4 inches by 12 inches
- c. four small paper cups
- d. pushpin
- e. small ball of modeling clay

Background Information Assumed

1. Layers of the Earth's atmosphere
2. Heating of the Earth
3. Air Pressure

Objective:

Students will learn about the prevailing winds and the Coriolis Effect.

Theory (overview)

The sun heats the Earth unevenly. Because warm air rises and cold air sinks, the air above the Earth moves from dense to less dense. The Earth rotates which causes this moving air to change its direction around the Earth.

Engage

1. Students will make their own simple anemometer.
2. Students will draw and label prevailing wind directions on a map of the Earth

Explore

Have the students hold the anemometer at different levels: one foot off the ground, at waist level, and above their head. Hold the pencil with the cups (anemometer) upright and see what direction the cups go, then hold it downward to see if the direction changes.

Explain

Explain to students that not only does air pressure affect weather, but air movement does as well. Remind students of the heating of the earth; the air around the equator is warmer and warm air rises and as it rises it leaves an area of low pressure. Air moves from areas of higher pressure to areas of lower pressure. So as the warm air from the equator is moving to the poles, the cooler air moves to the location around the equator. As this cooler air moves to the location around the equator it warms up and becomes warm air and the cycle is repeated again and again. While the air is moving, the Earth is rotating almost at a speed of 160 miles per minute. Therefore, the rotation of the Earth breaks the north-south winds into several large circular wind systems. These wind systems flow at an easterly and westerly direction. The winds curve to the right, north of the equator and to the left, and south of the equator. This is known as the **Coriolis Effect**.

With the anemometer, we are experiencing the horizontal forces of the air movement at ground level. Winds are named for the direction FROM which they flow. There are four basic types of winds: prevailing winds, seasonal winds, local winds, and storm winds. In this lesson, we are just going to take a closer look at the prevailing winds.

The **prevailing winds** are rings of wind that blow generally in the same direction all around the Earth. These winds are an important part of the system that moderates the temperatures on our planet and are broken down into four categories.

- a. **Polar Easterlies**-beginning at the North Pole and the South Pole and extending to a latitude of 60 degrees; remembering that winds are named for the direction FROM which they blow these winds come from the East and flow towards the west
- b. **Westerlies**-from 60 degrees to 30 degrees these winds flow from the west to the east
- c. **Trade winds**-are steady northeast winds above the equator; below the equator the trade winds are steady southeast winds
- d. **Doldrums**-the narrow area above the equator with calmer air movement because of the little change of temperature

Extend

Wind direction was probably one of the first weather observations made by early humans. Not the complicated system of prevailing winds, but rather just knowing what direction the wind is flowing by picking up some leaves then letting them drop while watching which direction they fall. Ask the students why they think knowing the direction of the wind was important to these early humans. (Possible answer: when hunting they would want to be downwind from the animal so the animal couldn't smell them coming). The ancient Greeks and Romans used weather vanes. They were simple pointers that would rotate as the wind direction changed. Today weather stations still use weather vanes along with windsocks, satellites and helium-filled balloons. An interesting fact to share with your students about why the rooster is portrayed on many weather vanes: A law was passed in the ninth century by a pope to make weather vanes shaped like

roosters. The pope took the image of the rooster as a reminder of temptation for everyone from the story of Peter denying he knew Christ three times before the rooster crowed. Although the religious purpose of the rooster weather vane has long been forgotten, it still is a popular symbol today.

Have students research and create a wind vane that has significant meaning to the student or represents something from the local area, state, or school.

Evaluate

Teacher will evaluate the students' understanding by looking at the Earth maps the students have completed.