

Measurements and Tools

Strand	Interrelationships in Earth/Space Systems
Topic	Investigating the weather
Primary SOL	4.6 The student will investigate and understand how weather conditions and phenomena occur and can be predicted. Key concepts include b) weather measurements and meteorological tools.
Related SOL	4.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which l) models are constructed to clarify explanations, demonstrate relationships, and solve needs; m) current applications are used to reinforce science concepts.

Background Information

Weather is the condition of the atmosphere at a given time, which differs from climate: the condition over time for a specific area or region. Temperature is a physical property of matter that quantitatively expresses the common notions of hot and cold. Relative humidity is the amount of moisture in the atmosphere compared to how much moisture the air can hold at a specific temperature. Meteorologists gather data on the attributes of weather by using a variety of instruments. A barometer measures air pressure. An anemometer measures wind speed. A rain gauge measures the amount of precipitation. A thermometer measures the temperature of the air.

Materials

- Barometer
- Anemometer
- Rain gauge
- Weather vane
- Thermometer
- Sets of Scenario Cards for each student (premade and cut up)
- Science journals or loose leaf paper

Vocabulary

meteorologist, barometer, anemometer, rain gauge, weather vane, thermometer

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

Introduction

1. Ask students what they know about the weather tools that meteorologists use. Ask them how the meteorologist can predict that a storm is coming or which direction the storm is moving.

2. As students come up with the names of the tools, show them the instrument and demonstrate how it is used. If students are unable to come up with the tools' names, once students discuss the measurement, show them the tool that helps meteorologists measure it. For example, a student might say that the meteorologist knows a storm is going to hit Virginia because it was in South Carolina and then was headed to North Carolina, so it will be moving to Virginia next. This would be an opportunity to show the students the weather vane to demonstrate that the direction of the wind helps predict the direction of the storm.

Procedure

1. Explain to students that they are going to determine what instruments should be used to measure different types of weather patterns as if they were a meteorologist.
2. Hand out the Scenario Cards to each student. Have students match the appropriate scenario under the correct weather tool.
3. When students have completed this work, assign the students to four different groups. Give each group a different instrument: the barometer, the anemometer, the wind vane, and the thermometer. (The rain gauge will only work for a group if you send a group outside when it is raining.)
4. Ask the students to use the tools to measure the air pressure, wind speed, wind direction, and temperature in different areas in the building. Students will need to bring their science journals or loose leaf paper to record the locations and the measurements for each location. Ask students to find at least three different locations for each measurement. The groups with the wind tools will need to find the air conditioning or heating unit for the inside locations.
5. Allow students to move around the school building in small groups to complete this activity.
6. When students have finished, have them return to the classroom to discuss their results.

Conclusion

1. Discuss what different measurements they found in different areas around the school.
2. Regroup the students so that there is one student from each measurement tool group in the new groups. Have the students make predictions about what type of weather would occur in that location of the school building if weather could occur in those locations.
3. Have students share their results with the class and talk about any differences the groups may have found.

Assessment

- **Questions**
 - What is the difference between a barometer and an anemometer?
 - How does a meteorologist use weather tools to predict the weather?
- **Journal/writing prompts**
 - Write a weather report for the local weather channel including the weather tools and measurements you used.

- **Other**
 - Have students measure the weather conditions at home using handmade weather tools and report that information to school.

Follow-up/extension (for all students)

- Let students create their own versions of the weather tools.
- Ask a meteorologist to come and speak to your class about the weather tools they use and how they take those measurements to make predictions about the weather.
- Have students measure outside for a longer period of time to make predictions based on data over time.

Strategies for Differentiation

- Give students written directions for how to use the weather tools.
- Add pictures to the Scenario Cards.
- Allow students the chance to pick their own groups.

Scenario Cards for Weather Tools

Barometer	Anemometer	Rain Gauge	Thermometer	Wind Vane
When there is a hurricane, I can use this tool to measure the very low air pressure.	This tool rotates with the wind.	I can use a rain gauge to determine how much liquid precipitation has occurred.	I can find out that it is very hot in the middle of the day with this tool.	At an airport, this tool looks like an orange wind sock to help the pilots measure wind direction.
This tool measures air pressure.	I can measure wind speed with this tool.	I can measure the amount of rain with this tool.	I can measure temperature with this tool.	I can measure wind direction with this tool.
I can measure inches of mercury (inch Hg) to help me determine how much air pressure there is.	I want to know how quickly the wind is moving.	When there is a rain storm, I can use this tool to determine how much rain has fallen.	This tool can measure degrees Fahrenheit, Celsius, or Kelvin.	This tool can also be called a weather vane.
The barometric pressure changes are very slight – typically only .02 to .10 of an inch.	I will count how many revolutions this tool makes to determine the revolutions per minute for wind speed.	I need to place this tool in an open area so that it can properly collect the precipitation.	Meteorologists use this tool to make predictions about temperature for future times.	There is typically a compass rose located on this weather tool.
I can use this tool to help predict if a storm is coming.	I want use this tool so that I know how quickly to expect a weather pattern to approach.	Typically, this tool looks like a graduated cylinder, although there are other set-ups.	I can find out how cold it is during the winter months with this tool.	Changing wind direction helps meteorologists determine the direction of a storm or weather pattern.