

Weather

Strand	Matter
Topic	Investigating the atmosphere and weather
Primary SOL	6.6 The students will investigate and understand the properties of air and the structure and dynamics of Earth’s atmosphere. Key concepts include a) air is a mixture of gaseous elements and compounds.
Related SOL	6.6 The student will investigate and understand the properties of air and the structure and dynamics of Earth’s atmosphere. Key concepts include b) pressure, temperature, and humidity.

Background Information

Observations of the atmosphere have been made for centuries and were used as the starting point in an effort to understand and predict the atmosphere’s behavior. In the past, most observations were made from the ground level at stations equipped with instruments that measured pressure (barometer), temperature (thermometer), humidity (hygrometer), wind speed (anemometer), and wind direction (wind vane or wind compass). Today, hi-tech devices, which are sent up in weather balloons, electronically transmit data on wind and atmospheric pressure, temperature, humidity, and wind back to receivers on the ground. This data provides meteorologists (scientists who study weather) with basic information about what is happening at higher levels of the atmosphere than was previously possible with land-based observatories.

Materials

- Barometers
- Compasses
- Anemometers
- Celsius thermometers
- Hygrometers
- Class weather chart
- Copies of a recent weather report from a newspaper or the Internet
- Copies of the attached handouts

Vocabulary

anemometer, barometer, Celsius, compass, hygrometer, meteorologist

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

Introduction

1. Organize students into teams of four students each.
2. Give students five minutes to write everything they can think of that relates to the following questions:
 - What is weather?

- What information does a meteorologist need to know to forecast the weather accurately?
 - How would you describe today's weather? How would you describe it if you were a meteorologist?
3. Have the students share what they wrote with their team members. Then, have each team share with the class some of their important thoughts. As students share, list key weather words (e.g., *precipitation, pressure, humidity, front*) on the board.
 4. Use these student-generated words to lead into a discussion and form a definition of the word *weather*. Make sure that students understand that *weather is the condition of the atmosphere at a specific time and place*. Weather changes are the result of the interaction of heat from the sun and the Earth's air and water.
 5. Distribute copies of a recent weather report. Prompt students to underline any words in the report that appeared on the class list of keywords. Have them keep this for assessment at the end of the activity.

Procedure

1. Show each weather instrument, describe it, and pass it around. Allow students time to examine the tools and practice reading the scale on each device.
2. If possible, take students outside to measure the current weather conditions with the instruments. Remind students that it will take about five minutes for the instruments to adjust to the conditions, so readings should not be taken immediately. Alternatively, take a small group of students outside each day to measure the weather conditions until every student has had an opportunity to use the instruments. If this is not possible, obtain daily weather conditions from the Internet or local newspaper.
3. Record daily weather conditions on a class Weather Chart similar to the attached chart.
4. Give each student a copy of the attached Weather Basics Table, and distribute various resource materials to each team. Jigsaw this activity by assigning each team a different weather term on which to become "experts." Have each team search for information on their term and complete their part of the table.
5. Have students move into new groups formed so that there is an "expert" for each term. Have each expert report findings to the other team members so that each student can complete his/her table.
6. Discuss the findings as a class. Make a class Weather Basics Table with the best of the gathered data, and have the students correct their own table, as necessary. The answer key provided shows a possible way to complete the chart. You may choose to use less detail.

Assessment

- **Journal/Writing Prompts**
 - Write a weather report based on today's weather conditions and using the format of the weather report from the Introduction section of this lesson.
- **Other**
 - Have selected students present their weather reports to the class.

- Have students name and identify the unit of measure of the instruments used to measure air pressure, temperature, humidity, wind speed, and wind direction.
- Have students refer back to the weather reports in which they underlined words at the beginning of the lesson. Ask them to explain what each term means, and then guide them in defining any other unusual terms found in the report.

Extensions and Connections (for all students)

- Have students use the collected data to plot weather maps over a number of consecutive days. They should include fronts and pressure systems, which can be obtained from TV, newspapers, or the Internet. Use this activity to lead into reading a weather map and making a forecast.

Strategies for Differentiation

- Provide pictorial vocabulary cards for matching weather monitoring tools with their intended uses.
- Have students complete a closing vocabulary activity.
- Add a column to the weather table that would allow students to draw or cut and paste pictures of the equipment.
- Have students complete a Venn diagram based on any two of the weather components or instruments.
- Have the class brainstorm favorable seasonal weather conditions for a variety of outdoor activities (e.g., camping, fishing, boating, snowboarding, swimming), and list instruments that would record those weather conditions.
- Have students work in groups of five to research an assigned weather monitoring instrument. Then, have students regroup in jigsaw fashion to share information on their instruments. Using the information, have students will design group posters on the history and use of weather instruments.

Weather Basics Table

Name: _____ Date: _____ Class: _____

Weather is _____.

Weather changes are the result of the interaction of _____.

Weather Factors	Definition	Factors That Affect	Measurement
Air Temperature			
Air or Atmospheric Pressure			
Wind			
Moisture (including the following):			
Precipitation			
Humidity			
Relative Humidity			
Cloud Formation and Cloud Types			

Weather Basics Table Answer Key

Weather is the state of the atmosphere at a specific time and place.

Weather changes are the result of the interaction of heat from the sun and the Earth’s air and water.

Factors	Definition	Factors That Affect	Measurement
Air Temperature	Measure of the amount of heat (average amount of motion, or kinetic energy, of molecules) in the air	<ul style="list-style-type: none"> • Location on Earth : How directly the sun’s rays strike the area • Amount of radiation from the sun 	Thermometer; in degrees Celsius (°C)
Air or Atmospheric Pressure	The force of air exerted on an area on Earth from all directions, including directly down	<ul style="list-style-type: none"> • Gravity pulling on air • Altitude • Density of air • Temperature of air 	Barometer; average pressure of atmosphere at sea level = 1 bar; unit for reporting air pressure is millibar (1/1000 of a bar)
Wind	Movement of air from an area of high pressure to an area of low pressure; described by <i>direction</i> and <i>speed</i>	<ul style="list-style-type: none"> • Differences in the amount of solar radiation received • Coriolis effect: Rotation of the Earth 	Wind vane; measures wind <i>direction</i> ; arrow points in direction <i>from</i> which the wind is blowing; a compass point may also be used. Anemometer; measures wind <i>speed</i> in kilometers (or miles) per hour
Moisture (including the following):	Water in the atmosphere; transitions between any of water’s three states in Earth’s normal temperature range	<ul style="list-style-type: none"> • Air temperature 	Measured as humidity (see below)
Precipitation	Water falling from clouds	<ul style="list-style-type: none"> • Temperature • Air pressure • Humidity 	Rain gauge; in centimeters or inches
Humidity	Amount of water vapor in the air	<ul style="list-style-type: none"> • Air temperature: Heat from sun evaporates water. 	Hygrometer; in percent
Relative Humidity	Amount of water vapor in a volume of air compared to the maximum amount the air can hold (saturation) at a given temperature	<ul style="list-style-type: none"> • Humidity • Air volume • Temperature 	Psychrometer; in percent; can range from 0% to 100%
Cloud Formation and Cloud Types	Warm air moves upward, expands, and cools; when air is saturated, water vapor condenses around small, air-borne particles, such as dust or salt.	<ul style="list-style-type: none"> • Air temperature: Causes either rain, snow, sleet, or hail 	Shape and height: <ul style="list-style-type: none"> • Stratus—smooth layers at low elevation • Cumulus—puffy, white • Cirrus—high, thin, white, feathery