

UNIT 11:

Setting Up a Weather Station

Teacher's Notes

Setting Up a Weather Station

This activity is a great group activity allowing each student to participate both when they make the station and then by continuing to make their own observations.

Weather is the state of the atmosphere at a given time and place with regard to temperature, air pressure, humidity, wind, cloudiness, and precipitation. The term weather is restricted to conditions over short periods of time; conditions over long periods are referred to as CLIMATE. The study of weather and its forecasting is called METEOROLOGY.

Terms for the Activity

Anemometer:

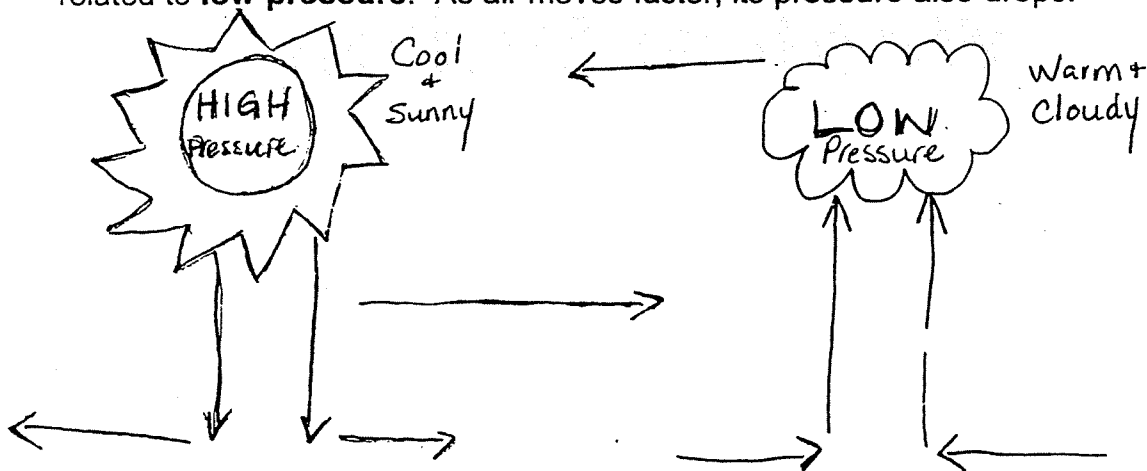
Instrument used to measure the strength of wind, a wind gauge

Barometer:

Instrument used to measure the weight or pressure of the atmosphere, indicate weather changes

Barometric Pressure:

Is a measurement of how air pushes down. Cool air is heavier than warm air and pushes down with more pressure: **high pressure**. Warm air is lighter and is related to **low pressure**. As air moves faster, its pressure also drops.



Beaufort Scale:

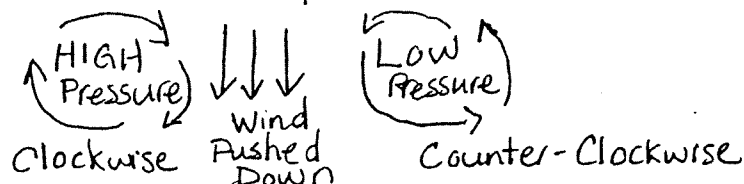
Admiral Frances Beaufort wrote the Beaufort scale to measure the speed of wind. His scale became the official method of ranking wind speed.

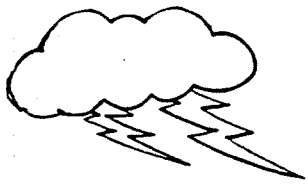
Rain Gauge:

An instrument used to measure a storm's precipitation.

Thermometer:

An instrument used to measure temperature.





Setting up a Weather Station

Overview of Activity:

Each student will make their own weather station including a thermometer, barometer, anemometer, and rain gauge. Using this weather station as a guide, students identify the temperature, precipitation, wind speed and air pressure. This activity can be completed as a whole or in parts.

Outcomes:

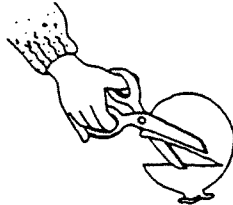
- Understand tools and terms associated with the weather
- Identify and describe weather causes and occurrences.
- Understand the effects of science in daily life.

Purpose:

Students find out how different aspects of are measured. Using various measurement tools, students will be collecting their own weather data. Students will be able to identify and use a thermometer, barometer, anemometer, and rain gauge.

Barometer Materials Needed:

- Small jar
- Balloon
- Straw
- Straight pin
- Rubber band
- Index card
- Scissors



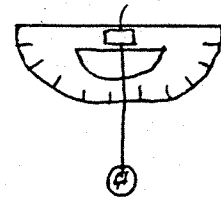
Procedures:

1. Cut the top off a balloon
2. Stretch the balloon top over the open end of a jar like a drum, and secure it with a rubber band
3. Tape a straight pin to one end of a straw. Tape the other end of the straw to the top surface of the balloon. Make sure the end of the straw is in the centre of the balloon. The pin will be the needle on your barometer
4. Tape an index card to a box and place it beside the straight pin. Mark where the pin is pointing and with a dash. If possible, find the real barometric pressure and write it beside the dash.

5. Each day, check the needle. If the needle has changed position, Mark the new location and record the new barometric pressure from the newspaper.

Anemometer

- Ping pong ball
- Protractor
- String
- Tape



Procedures

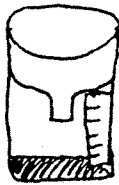
1. Cut a 30 cm length of string, and tape one end to a ping pong ball
2. Tape the other end of the string to the centre mark on a protractor
3. Hold the protractor with the base perpendicular to the ground, facing the wind. The ping pong ball should push the string to an angle between 0 and 90 degrees (ignore numbers higher than 90)
4. Record the angle measurement and use the chart to convert that number into wind speed



Rain Gauge

Materials:

- 2 litre plastic bottle
- scissors
- index card
- ruler
- tape



Procedures:

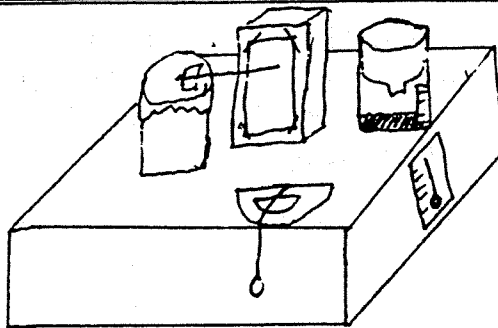
1. Cut off the top of an empty, plastic 2 litre bottle. Be careful to cut an even line all the way around. The top will act as a funnel for your rain gauge.
2. Remove the cap, turn the top upside down and insert it into the base
3. Tape the two edges together so no water can enter or escape

4. Along the edge of an index card, make a "zero" mark. From the mark, measure of 1/8 inch (or 2mm) distances to calibrate (mark) your scale
5. Tape the index card to the side of your rain gauge. The zero mark should be at least 2 inches (5cm) from the bottom of the bottle, and the scale should read up the bottle
6. Fill the rain gauge with water until it reaches the zero mark
7. Place the gauge outside where the rain can easily land on it
8. Check the gauge daily and after each rain storm. Record any change in the water level.

Setting up a Weather Station

Materials

- Store Bought Thermometer
- Barometer
- Anemometer
- Rain Gauge
- Wooden crate
- Weather data chart
- Glue



Procedures:

1. Find a good location to set up your weather station. It should be away from buildings, in the open, and easy to reach.
2. Glue the barometer and rain gauge to the top of a wooden crate to keep them from being blown off
3. Glue the thermometer on the north (shady) side of the crate. A weather thermometer should not receive direct sunlight.
4. Make a photocopy of the weather chart provided.
5. Every day, take readings from your weather station. Do not forget to use your anemometer to measure the wind speed and direction. Record any other observations in the "Notes" column.
6. You may want to record any special weather events as they happen. For example, read the rain gauge just after a thunderstorm, or measure the wind speed when it's gusty outside.

Student Performance Criteria

Students will be able to identify how to measure the weather by recognizing and using the proper tools. Students should be able to identify changes that occurred in the activity using appropriate terminology (barometric pressure, condensation, etc.).

Discussions:

Anemometer

How easily can you measure wind speed using this anemometer? Does wind speed stay the same? Why or why not? What would you do if the string changed position with the wind? Could you measure the wind speed of a hurricane? Should you?

Barometer

When the barometric pressure rose, did the needle go up or down? When the barometric pressure fell, did the needle go up or down?

Gauging the Rain

How much water fell during each rainstorm you measured? As much as you expected? Can you think of ways to improve your rain gauge?

Weather Station

After a week, look back over your weather chart. Do there seem to be any patterns? Are there relationships between measurements? For example, does the temperature go up or down during a rainstorm? Does the wind blow faster during high pressure, low pressure, or neither? By recognizing patterns, you can predict the weather.

Compare your readings to the daily weather news (Activity 1)

Conclusions:

Students become aware of the various elements that create weather, how they are measured and compare the results with the daily weather readings.

Weather in the News: Activity Sheet 1

Teacher's Notes

Find a weather map from a newspaper. Use the chart to the right to identify areas of low and high pressure, cold fronts, warm fronts, and weather conditions around the country. Some maps may use additional symbols or colour patterns to make them more clear to readers.

1. What does high pressure mean?

High air pressure means that air is being pushed down.

2. What does low pressure mean?

Low air pressure means that air is being pushed up. The air that rises is warmer because hot air rises.

3. How does air travel in a high pressure system?

Clockwise

4. How does air travel in a low pressure system?

Counter-clockwise

5. What symbols on the map did you read that were different than those provided?

The students may notice individual signs that certain papers use. They may also notice variations on the typical signs in certain papers.

6. How would you improve a weather map to make it clearer to read?

Measure Your Wind Speed















Degrees	Speed (mph)	Degrees	Speed (mph)
0	0	40	18
5	7	45	20
10	9	50	21
15	10	55	23
20	12	60	26
25	13	65	29
30	15	70	33
35	16	75	38

The Beaufort Scale

British Admiral Francis Beaufort designed a scale in 1805 to help navigator's rate wind speed. Beaufort would observe his ship's flags to determine the wind speed. His scale is still used today by meteorologists.

Beaufort Number	Wind Speed (mph)	Description	Effect on Objects
0	0-1	Calm	Smoke rises straight up
1	1-3	Light Air	Smoke drifts lightly with wind
2	4-7	Light Breeze	Flags stir, leaves blow
3	8-12	Gentle Breeze	Flags blow out, leaves blow steadily
4	13-18	Moderate Breeze	Flags flap, loose paper flies
5	19-24	Fresh Breeze	Flags ripple, small trees sway
6	25-31	Strong Breeze	Flags beat, large branches move
7	32-38	Moderate gale	Flags extend, whole trees move
8	39-46	Fresh Gale	Twigs break, walking is hard
9	47-54	Strong Gale	Houses slightly damaged
10	55-63	Whole Gale	Trees uprooted, houses damaged
11	64-73	Storm	Widespread damage
12	>74	Hurricane	Excessive damage

Activity 1: Weather in the News

Symbol	Meaning	
H	High Pressure	1. What does high pressure mean?
L	Low Pressure	
	Shower	
	Snow	2. What does low pressure mean?
	Rain	
	Thunderstorm	
	Cold Front	3. How does air travel in a high pressure system?
	Warm Front	
	Stationary Front	
	Sunny	4. How does air travel in a low pressure system?
	Partly Cloudy	
	Cloudy	
	North Wind	5. What symbols on the map did you read that were different than those provided?
	South Wind	
	East Wind	
	West Wind	

6. How would you improve a weather map to make it clearer to read?
