UNDER THE WEATHER
GRADE 8

LESSON # 4 **TITLE: METEROLOGY**

OVERVIEW:
How often do you watch the weather on TV or listen on the radio for the weather forecast? The weather affects everything from afternoon swim practice to attacks on enemy forces during wars.

Students will learn how meteorology works and make working weather maps.

STANDARDS:
Standard 8 Forces that Shape the Earth

Benchmark 8.8.3 Describe how the Earth's motions and tilt on its axis affect the seasons and weather patterns

Benchmark 8.8.4 Explain how the sun is the major source of energy influencing climate and weather on Earth

Benchmark 8.8.6 Explain the relationship between density and convection currents in the ocean and atmosphere

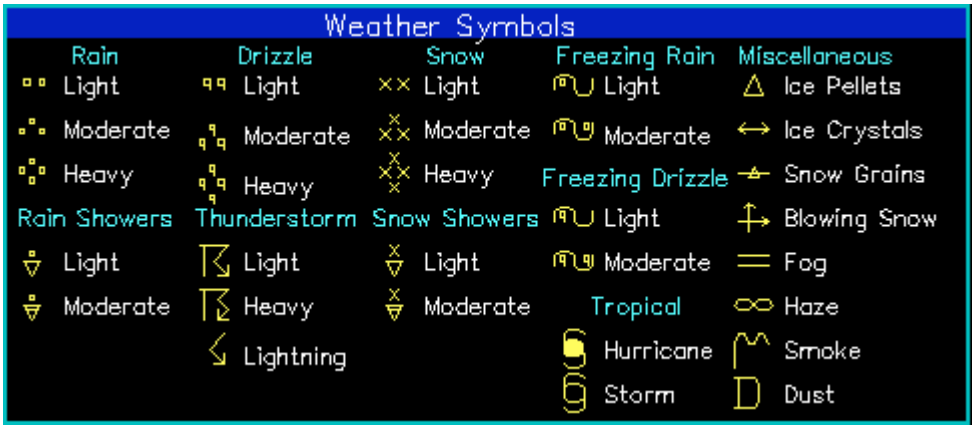
MATERIALS NEEDED:
- Drawing paper
- Notebook paper
- Pencil and pen

DURATION: 90 minutes or approximately 2 class periods.

PROCEDURE:

<u>Get Info</u>

- Draw examples of weather map symbols.
- Define common weather terms.
- Explain weather systems.



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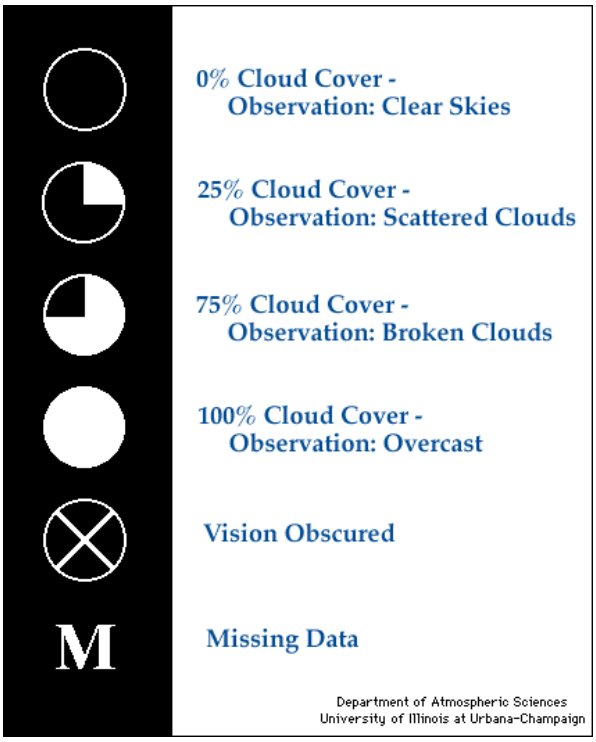
Gather Data

- Interpret temperature, wind, pressure, and cloud maps.
- Draw cloud positions based on pressure maps.
- Forecast the position of clouds three days from today.
- How would you show the skies were about 50% cloudy?



Application

- Relate temperature maps to pressure maps.
- Relate pressure maps to wind maps.
- Relate wind chill to wind and temperature maps.
- How do you show from which direction the wind is blowing?
- What is the relationship between the length of the lines on the wind barb and the speed that the lines indicate?
- Write a sentence describing a wind barb showing that a southerly wind is blowing about 15 knots with clear skies.
- Draw a wind barb showing a northwesterly wind blowing at 20 knots with 25% cloud cover.
- Convert 20 knots to miles per hour.
- Draw a wind barb showing 86 mile per hour southwesterly wind and overcast skies. (First, convert miles per hour to knots.)

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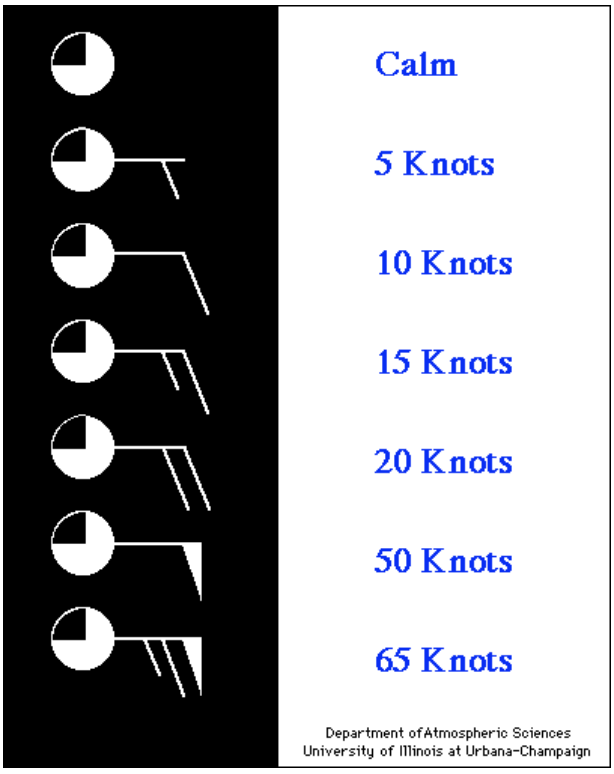

Newspaper Use

1. Collect the weather maps from your newspaper for one week. Glue or staple each one on a sheet of paper. After each day, make a prediction what the weather patterns well be for the next day. Check the weather map to see if you are correct.
2. Collect news articles about weather and its effects on areas and people. Summarize each article.

Observations

1. Record the types of clouds you see each day for five days (or longer). Draw and label each type.
2. Make a list of all the lyrics or song titles that are about weather.

ASSESSMENT:
Benchmark 8.8.3 Describe how the Earth's motions and tilt on its axis affect the seasons and weather patterns

- formative assessment – Lesson #4 understanding and correct usage of weather symbols in mapping weather patterns
- summative assessment -- Lesson #4 cumulative tracking of weather over time and formulation of forecast

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Benchmark 8.8.4 Explain how the sun is the major source of energy influencing climate and weather on Earth

- formative assessment – Lesson #4 Students weather map, completion, accuracy.
- summative assessment -- Lesson #4 Weather map activity combined with observations.

BACKGROUND INFORMATION FOR TEACHER:
Weather forecasting used to be thought of as witchcraft. Today, we rely on weather forecasters to help us plan our days and prepare for life-threatening conditions.

Some people "feel in their bones" when a storm is coming. Some people watch the animals and plants to know when it is about to storm. Those of us with televisions and radios don't have to wait for sparrows to fly by; we can just watch or listen to the weather.

WEB RESOURCES:
SciLinks, National Science Teacher's Association – *Atmospheric Pressure and Winds* - code HSM0015 www.scilinks.org

NOAA - Forecasting
http://www.oar.noaa.gov/k12/html/forecasting2.html

NASA - Athena Curriculum Weather – Project Weather Charting
http://vathena.arc.nasa.gov

PRINT RESOURCES
Holt Science and Technology, Earth Science, Chapter 15 – The Atmosphere, Section 1 – *Weather and Climate*, pp 445E-F

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ADDITIONAL ACTIVITIES

Project: Weather Charting

In this activity, you keep track of the weather in several cities.

Color	Rain/Snow	Description
blue	light	light rain or snow
cyan	moderate	rain or snow
green	heavy	light thunderstorms/moderate rain showers
yellow	very heavy	moderate thunderstorms
magenta	intense	potential flooding rains/severe thunderstorms
red	extreme	flooding rains

Activity

Compare the weather in your own city and three other U.S. cities for one month. Pick the other three cities from different areas of the United States. Other regions are: West, Southwest, South, Midwest, East, and Northeast.

Try to pick cities that you know are in different geographic settings in order to see what effect land mass and bodies of water have on weather. You may do this with a partner or in a group.

Make observations and predictions from this data. You need to know about air pressure, wind direction, type of cloud cover, precipitation, humidity, and geographic effects on weather.

Where to get your weather data:

Weather data for smaller cities may not be available on Internet. Make sure you can find weather data for all of yours.

- You can get current weather from The Weather Channel Web site (www.weather.com). Choose a state then choose from the list of cities, or go to the list of International cities.
- Weather data and maps are available from CNN at http://www.cnn.com/weather/index.html. Select a city in a region using the drop-down boxes to get current conditions and the forecast.

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Many weather sites list weather statistics as follows:

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ID   TIME   T  TD  RH DIR SPD GST ALT SLP VIS CIL COV WX  MAX MIN  PR6
PR24 SC
KSEA 0756  45  44  97 220   7     986 114 2.5   5 OVC R-   52  45
KSEA 0856  45  42  89 220   9     989 122  10  23 OVC
```

Code	Meaning	Example
ID	Station identifier	KSEA
TIME	Universal time	0756, (subtract 7 hours for Pacific time - 4 minutes to 1am)
T	Temperature (degrees Fahrenheit)	45 degrees
TD	Dew point (degs F)	44 degrees
RH	Relative humidity (%)	97%
DIR	Wind direction (degrees)	220 degrees (from the southwest)
SPD	Wind speed (miles/hour)	7 miles/hour
GST	Gust speed (miles/hour)	No gusts
ALT	Altimeter setting (inches of Mercury; add a 2 in front)	29.86 inches
SLP	Pressure (millibars; add a 10 in front)	1011.4 millibars
VIS	Visibility (miles)	2.5 miles
CIL	Ceiling (hundreds of feet)	500 feet
COV	Cloud cover (overcast, broken, scattered, or clear)	overcast
WX	Weather	R- is light rain
MAX	Maximum temperature in past 6 hours	52 degrees
MIN	Minimum temperature in past 6 hours	45 degrees
PR6	Precipitation in the past 6 hours	None
PR24	Precipitation in the past 24 hours	None
SC	Snow cover	None

- This report for Seattle tells us that at 0756 UT (00:56 PDT) the temperature was 45 degrees, the dewpoint temperature 44, wind from 220 degrees (SW) at 7 mph with no gusts. The aircraft altimeter setting was 29.86" Hg, (pressure 1011.4 millibars), 2.5 mile visibility, 500 ft overcast, weather (WX) light rain, the max and min temperatures in the preceding 6 hours were 52 and 45, no precipitation in the preceding 6 or 24 hours, and no snow cover.
- The following are Internet resources for weather data -
    - National Weather Service Interactive Weather Information Network (IWIN) http://www.weather.gov/view/largemap.php has weather data by state. You can get forecast information and yesterday's weather. To get yesterday's high temperature, the overnight low temperature, and the precipitation amount, select your state on the map and then click on the button for "Climatic Data."
    - The Center for Ocean-Land-Atmosphere Studies (COLA) has weather maps for the United States http://wxmaps.org/. See the Guide to Weather Symbols http://vathena.arc.nasa.gov/curric/weather/graphing/symbols.html.
    - Forecasts for selected cities are available from USA Today http://www.usatoday.com/weather/default.htm.

Science Journal

Make a chart that includes this information for **each** city, including your own:

Date	Time	Clouds	Temperature	Humidity	Wind		Pressure	Precipitation
					Direction	Speed		
			°					

You may use a computer or draw the chart in your science journal using a pen and ruler. Try to make your observations at the same time each day. Two observations, one in the morning and one in the afternoon, might provide you with interesting data about weather changes.

Use your science journal to record your observations, thoughts, and questions. Make sure you include answers to the questions here. Include observations about severe storms, unusual weather patterns, or topics you'd like to study further.

Observations and Questions

Using a topographic map, look at the geography near all the cities. You can get a map of your cities from:

- Color Landform Atlas of the United States at Johns Hopkins http://fermi.jhuapl.edu/states/states.html
- TIGER Map Service , http://tiger.census.gov/cgi-bin/map
- An Almanac might also be a good reference.

- Are the cities near large bodies of water, mountains, or deserts?
- What is the height (altitude) of the city?
- How do you think these affect the weather in your chosen cities?
- Why?

As you graph for the month, see if your predictions are accurate.

As you record the wind direction ask yourself:

- Do storms or bad weather occur when the wind is from a certain direction?
- Does wind direction promote good weather in the area?
- Why does the direction of the wind bring different weather conditions?

Record your answers in your science journal.

Are there particular weather conditions that bring storms to any of the cities? Using your weather map observe the cloud cover over a particular area.

- Which direction do the clouds rotate?
- What weather patterns can you predict from this?

At the end of the observation period, turn in your completed charts and science journal for evaluation and classroom display.