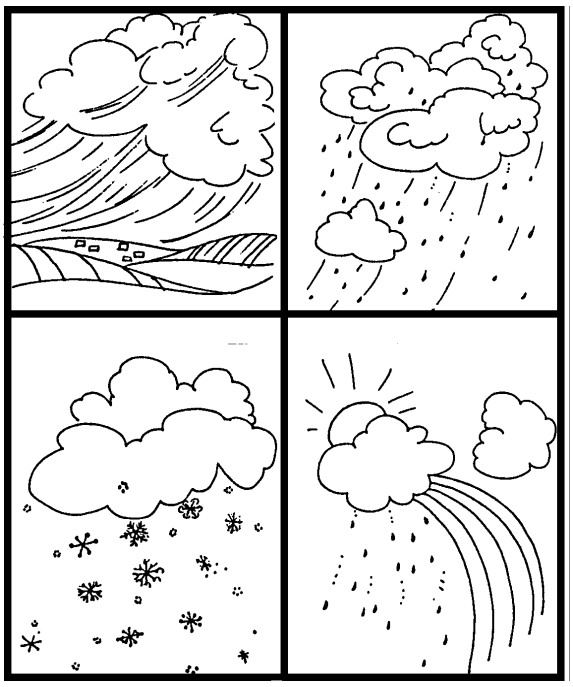
Water Cycle

The Earth's Gift

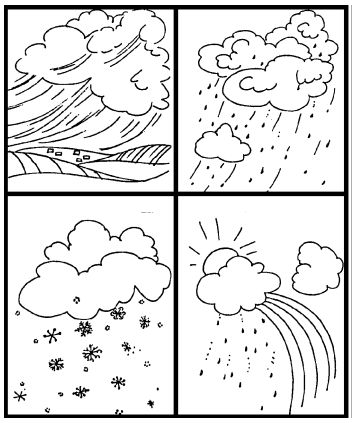
FIFTH GRADE

WEATHER



1 WEEK
LESSON PLANS AND
ACTIVITIES

WATER CYCLE
OVERVIEW OF FIFTH GRADE



WATER

WEEK 1.

PRE: *Analyzing why water is important.*
LAB: *Comparing the density of water to that of other liquids.*
POST: *Exploring how water is used in our society.*

OCEANS

WEEK 2.

PRE: *Distinguishing between fresh and salt water.*
LAB: *Exploring what lies under the oceans.*
POST: *Exploring estuarine systems.*

ATMOSPHERE

WEEK 3.

PRE: *Analyzing the composition of air.*
LAB: *Discovering that some components of air can be depleted.*
POST: *Distinguishing amongst different pollutants.*

WEATHER

WEEK 4.

PRE: *Comparing the different layers of the atmosphere.*
LAB: *Classifying clouds.*
POST: *Comparing an artist's interpretation of clouds.*

WATER CYCLE - WEATHER (5)

PRE LAB

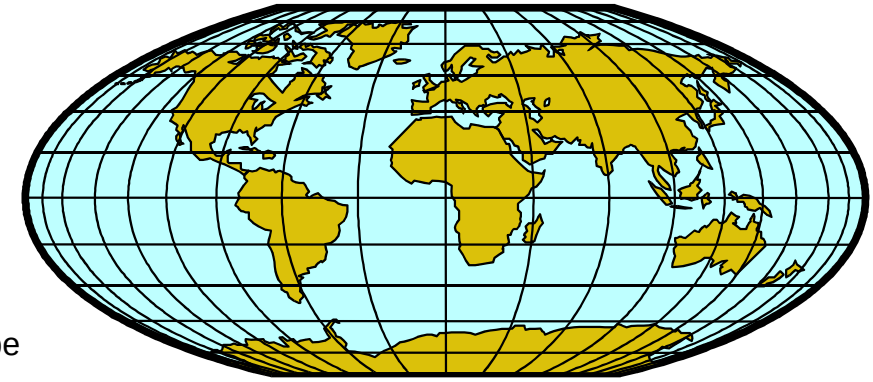
Students compare ocean and land climates.

OBJECTIVES:

1. Exploring the relationship of land and water.
2. Interpreting data from the Pacific Ocean.

VOCABULARY:

climate
continental
marine



MATERIALS:

crayons
inflatable world globe
Internet
worksheet

BACKGROUND:

The land is usually divided into climatic zones which refer to the general overall weather in the region. These climate zones also take into consideration precipitation, temperature, type of vegetation it can support, and other factors. On the figure included in this lesson, the following divisions can be defined: 1. Tundra (cold, with little vegetation, high precipitation); 2. Boreal forest (cold, forest, high precipitation); 3. Temperate (moderate temperature); 4. Desert (dry climate, little vegetation); 5. Savannah (moderate precipitation, grassland); 6. Steppe (cool climate; little vegetation); 7. Tropical Rain Forest (warm, high precipitation, forest); and 8. Ice caps (cold, snow, no vegetation).

On the ocean there are also east-west trending zones which can be divided into polar, subpolar, temperate, subtropical, trades, equatorial, and monsoons. These surface waters affect the local climate, especially in the intensity and duration of wind. When there are unusual warm or cold waters in the ocean, they cause the air masses to move in different direction which can change the weather patterns severely. El Nino, a periodic condition of a warming of the waters in the Pacific is one of these phenomena.

In **polar** ocean area ice occurs at the surface most of the year and surface temperatures are at or near the freezing point. In winter there is little direct sunlight. In **subpolar regions** sea ice is seasonal, and may disappear in the summer. Surface water temperatures may rise to 5ºC. The **temperate regions** correspond to westerly winds where there are severe storms. Heavy precipitation and strong seas are present. In **subtropical regions** the winds are weak and surface currents are not strong. Clear skies,

dry air, and abundant sunshine creates a high evaporation rate. In **equatorial regions** surface waters are warm with warm, moist air that produces high precipitation.

PROCEDURE:

1. Go over the background information with students. The inflatable world globe with biomes on it also defines the different climatic zones. Students should look at the globe to find the limits of each region that you discussed.

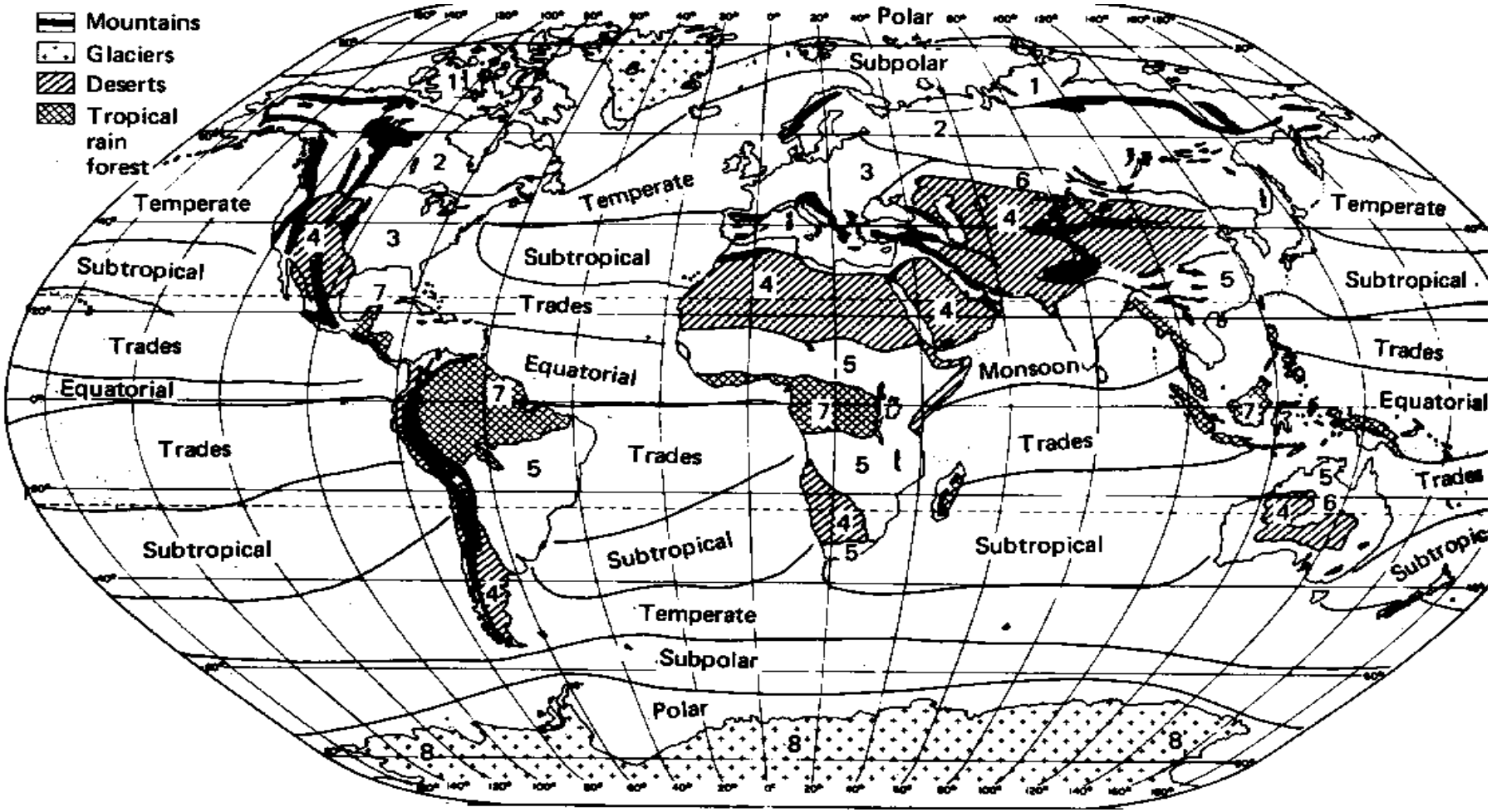
2. With the information have them design a way to show this information on the worksheet. You may want to give them clues, that color coding the information will help make a reader see areas that are warm versus cool easy. Basically, students make a color coded legend and color the appropriate region.

3. If you have internet access you may want students to look at the site:

http://www.cdc.noaa.gov/USclimate/USclimdivs.html

Climate Diagnostic Center of the National Oceanographic and Atmospheric Agency. You may want to see if this years climate actually coincides with this generalized pattern.

CLIMATIC ZONES OF WORLD OCEANS AND CONTINENTS



WATER CYCLE - WEATHER (5)

LAB

Students create pictural cloud classification.

OBJECTIVES:

1. Exploring where weather occurs in the atmosphere.
2. Predicting weather patterns by looking at clouds.

VOCABULARY:

alto
cirrus
cumulus
nimbus
stratus
ionosphere
mesosphere
ozone layer
stratosphere
troposphere

MATERIALS:

cloud charts
Internet

BACKGROUND:

The atmosphere is the gaseous envelope which covers a planet or large satellite. Most planets in our solar system have some type of an atmosphere. The Earth's atmosphere is a mixture of gases. Heavier gases tend to settle to the lower layers and lighter gases like hydrogen and helium go toward the top of the atmosphere.

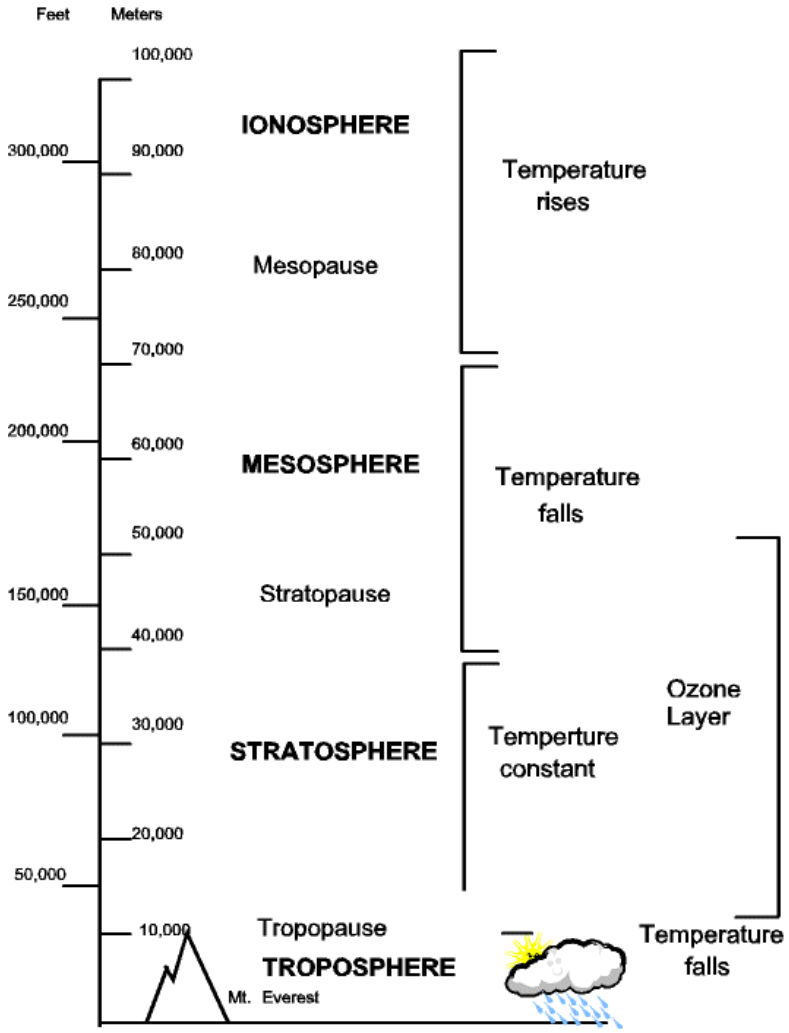
The atmosphere can be divided into the following layers: **troposphere** (0-8 to17.6 km depending on location on Earth, temperature decreases with height, major gas is nitrogen, water vapor is component); **stratosphere** (17.6-48 km, temperature constant, weather constant); **ozone layer** (32 km thick, ozone is formed by a photochemical process. Solar ultraviolet radiation causes oxygen O_2 to become O_3 or ozone); **mesosphere** (44-88 km, temperature falls); **ionosphere** (88-200 km; temperature rises, short wave radiation causes a large number of charged ions and free electrons, good conductor of electricity).

Clouds, in combination with wind and pressure differences, are useful indicators of weather changes. The amount of water vapor decreases the higher you go into the troposphere, the highest clouds are relatively thin. However, the lower levels of the atmosphere can form clouds that are both thicker and denser.

Precipitation is common among altostratus, nimbostratus, and cumulonimbus clouds. altocumulus, stratocumulus, stratus, or cumulus under special conditions can cause rain. Cirrus, cirrostratus, and cirrocumulus may produce snow. Stratus clouds may produce drizzle, whereas cumulus clouds usually produce showers. Cumulonimbus clouds are usually accompanied by showers or rain, snow or hail, often with thunderstorms or even tornadoes. Altostratus or nimbostratus usually produce a steady rain.

PROCEDURE:

1. Show students the many divisions of the atmosphere. Use the diagram below. Ask the students where most of the weather occurs? The troposphere, because the interaction of the water and land throughout the water cycle makes this layer a dynamic moving system



2. In this lab the students will classify the clouds by using the enclosed pictures. Students may want to go outside first and classify the clouds that they see. Students should cut the photos out, label what they think each cloud is, and then put the clouds in some kind of collage that reflects the height of the clouds.

3. The following definitions can help you explain the characteristics of clouds. Stratus are layered, or blanket-like; cumulus are flat bottomed, globular, or heaped masses; cirrus are curl or streaks; nimbus means dark rain clouds; alto means high clouds.

FAMILY A. High clouds (mean lower level, 20,000 feet)

1. cirrus
2. Cirrocumulus
3. Cirrostratus

FAMILY B. Middle Clouds (mean upper level, 20,000 feet; mean lower level, 6,500 feet)

4. Altocumulus
5. Altostratus

FAMILY C. Low Clouds (Mean upper level, 6500 feet; mean lower level, close to surface)

6. Stratocumulus
7. Stratus
8. Nimbostratus

FAMILY D. Clouds with Vertical Development (mean upper level, that of cirrus; mean lower level, 1,600 feet)

9. Cumulus
10. Cumulonimbus

5. If you have internet access, visit the following site that can have students look at more cloud types. You can add clouds to this lab easily.

http://australiansevereweather.simplenet.com/

Australian Severe Weather has a complete photography gallery of every cloud imaginable.

6. ANSWERS: 1. Cumulus; 2. Stratus, stratocumulus; 3. Stratocumulus; 4. Stratus cumulus; 5. Cumulonimbus; 6. Cumulonimbus; 7. Cumulus; 8. Cirrus, cirrostratus; 9. Altocumulus; 10. Altostratus; 11. Stratocumulus; 12. Stratus; 13. Nimbostratus

WATER CYCLE - WEATHER (5)

PROBLEM: Do cloud types determine weather patterns?

PREDICTION: _____

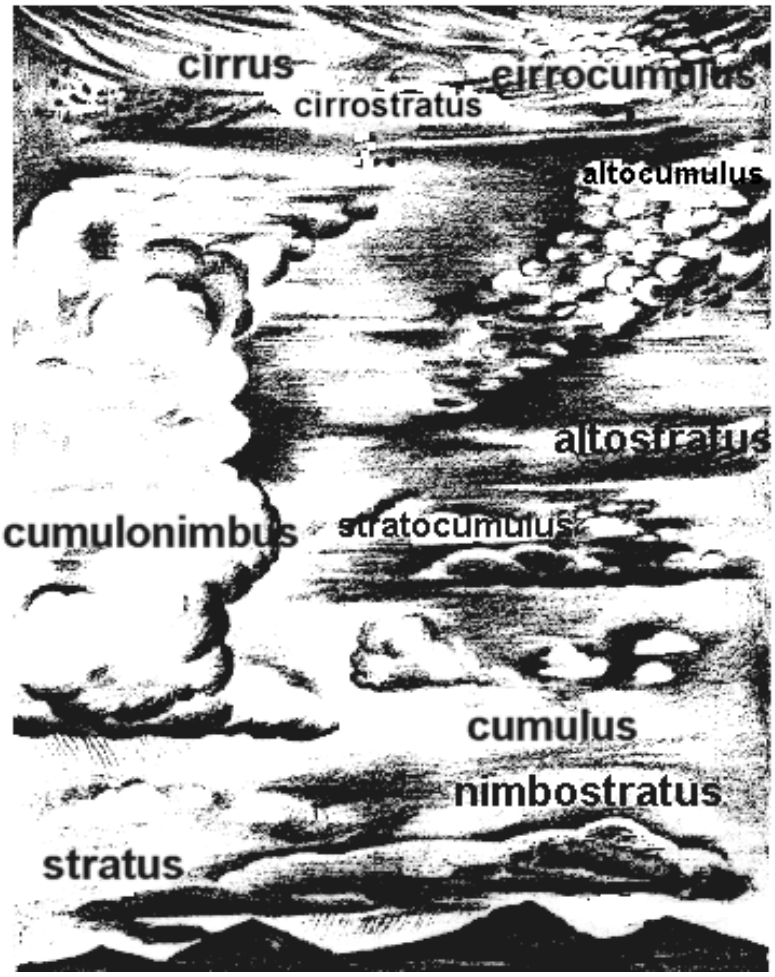
PROCEDURE:

MATERIALS: cloud type sheets (2) glue

Using the cloud type sheets, try to classify the pictures into the major types of clouds. Your instructor will go over the meaning of each of the clouds. Use the diagram to help you. Glue the cloud pictures on another sheet of paper with the correct name under each group.

Glue them in the order that they may be seen in the troposphere.

Describe the clouds that are outside today.



CONCLUSIONS: How many cloud types were your able to find? Name them.

_____

Which clouds are more likely to cause a weather change?

_____

WATER CYCLE - WEATHER (5)

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3

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5

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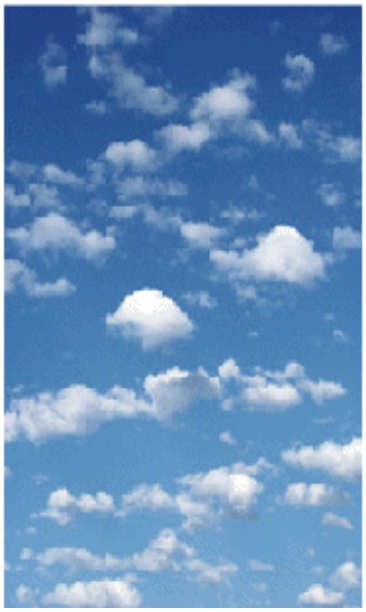
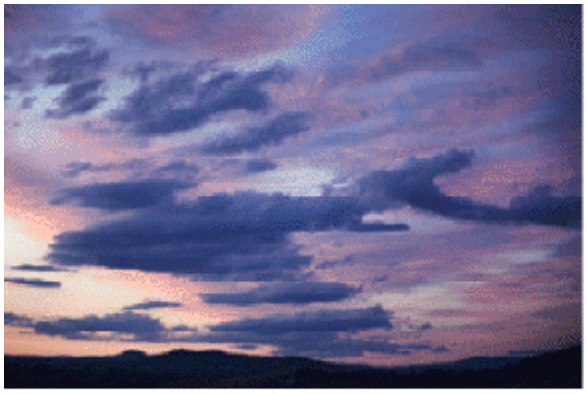


WATER CYCLE - WEATHER (5)



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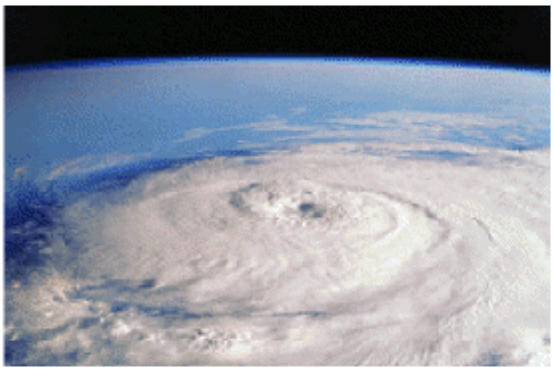

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12

13

WATER CYCLE - WEATHER (5)

POST LAB

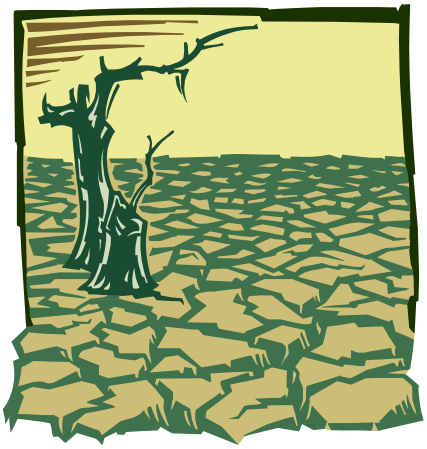
Students predict tomorrow's weather.

OBJECTIVES:

1. Predicting the weather.
2. Exploring the different ways to forecast weather.

VOCABULARY

forecasting
fronts
interpretation



MATERIALS:

Internet
newspapers

BACKGROUND:

Understanding and forecasting weather is complicated. It is now recognized that long term forecasting must include observations of ocean and atmospheric patterns. Until about 1920, most forecasting was based almost exclusively on practical experience. Recording solar radiation (temperature), humidity (hygrometer), air pressure (barometer) and cloud cover help people interpret and determine patterns.

Between 1920-1930 charting air mass movements and charting fronts greatly improved forecasting of weather patterns. After 1930 mathematical analysis and interpretation of motion of physical models that could be produced experimentally. These equations aid in forecasting.

Starting in the late 1960's, satellite images also provided continuous information. Today, information from satellites provide a detailed documentation of temperature, solar radiation, cloud movement that provided unparalleled control.

PROCEDURE:

1. The Internet is rich with information that have only been available recently tot he public. Go over the following Internet sites that can provide data for students for years to come.

http://www.weatherimages.org/

This site links to many other sites that have live image feeds. You can find

your local area so students can learn how to access information. You never know when students want to know the weather for a sporting event!

http://www.noaa.gov/

This site is the government agency responsible for weather services. The National Oceanographic and Atmospheric Agency provides information from satellite feeds and other types of monitoring system throughout the world. The National Weather Service is responsible for the weather.

http://www.cdc.noaa.gov/USclimate/USclimdivs.html

Students could compare the temperature and/or precipitation the year they were born and last year.

http://www.txdirect.net/~msattler/

Severe weather site created by student doing research. Severe weather storms, hurricanes, and tornadoes are highlighted. Many links to other web sites.

http://australiansevereweather.simplenet.com/

Australian severe weather atlas including wonderful weather photography, cyclones, lightning data, weather techniques and much more.

http://www.cira.colostate.edu/

Cooperative Institute for Research in the Atmosphere of Colorado State University.

2. If you don't have access to the internet bring in newspapers and find the weather section. Make sure that students can find, read, and interpret the maps.