## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 050 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Analyze and interpret data
Infer cause and effect

**ISAT:**
Apply fundamental concepts and laws of science to physical and biological systems

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Examining the changes in Earth's atmosphere that affect daily weather conditions

### Materials

Science notebooks
Large clear, plastic bowls
Water
Styrofoam peanuts
Clear plastic cups
Clear plastic cups with a small hole in each
Straws

### Educational Strategies/Instructional Procedures

Write the word *atmosphere* on the chalkboard and ask the students what they think it means. Record the students' responses on the chalkboard for later comparisons. Tell the students that the earth's atmosphere is where weather occurs. Air is a mixture of gases that takes up space and has weight. This mixture of gases is composed of nitrogen, oxygen, carbon dioxide, and water vapor. Ask the students the following questions:
1) *How do we know if air is around us?*
2) *How would Earth be different without air?*
Encourage all students to give a response.

Tell the students that they will focus on finding out if air takes up space.
Tell the students that the science vocabulary terms for this lesson are: **air, nitrogen, oxygen, carbon dioxide, water vapor, atmosphere, troposphere, weather,** and **greenhouse effect**. Write these terms on the chalkboard and have the students pronounce each one. Tap the students' prior knowledge about the meaning of the terms through class discussion. Have the students write the science terms and record their meanings in their science notebooks.

Divide the students into groups of two or three, and have each group collect the materials listed above for their group. Have the students' pour water into a clear bowl until it is full and place a floating Styrofoam peanut in the water. Tell them to predict as a group the result of covering the peanut with a cup and pushing the cup down to the bottom of the bowl. Have students draw pictures of their predictions in their science notebooks. Direct them to test their predictions by performing the activity using a clear plastic cup with a hole in its side near the base and note the results in their science notebooks.

Allow time at the end of the session to discuss why students observed what they did. Ask: *When did the peanut get wet? Why do you think this happened? What do you think would happen if you covered the hole with your finger? Was the cup empty? What makes you think so?*

## Integration with Core Subject(s)

MA: Analyze and interpret data

## Connection(s)

**Enrichment:** Ask the students to use a straw to blow air into the bottom of the bowl of water. Have a partner observe what happens to the level of water in the bowl as each blows into the straw. Have the students infer what is causing a change in water level.

**Fine Arts:** Have students draw a diagram showing what happens in the final two steps of the activity.

**Remediation:**

**Technology:**

## Assessment

Do students know that air takes up space? Did the students grasp the idea that air leaving through the hole makes space?

## Homework

Have students complete the following activity with a family member:

1. Fill a glass with water. Ask a family member if the glass is empty or full.
2. Have the family member drink all the water in the glass. Ask if they now think the glass is empty or full.
3. Explain to the family member why the glass was full both times-first with water, and then with air.
4. Work with the same family member to write a description of the activity and the results.

## Teacher Notes

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 051 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Analyze and interpret data

**ISAT:**
Apply fundamental concepts and laws of science to physical and biological systems

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Predicting and observing how temperature changes air pressure
Understanding how gravity relates to air pressure
Understanding how air pressure can be measured

### Materials

Per group of three or four students:
- Balloons
- Plastic soda bottle with cap (2L)
- Small plastic dish tubs
- Hot tap water
- Ice water
- Ice cubes
- Timer

Science notebooks

### Educational Strategies/Instructional Procedures

To activate students' prior knowledge, provide each student with a balloon. Have the students inflate the balloons and tell them to push gently on the sides of the balloons. Ask the students the following questions: *What do you think air pressure is? What does air pressure do to you or the weather?* Tell the students to record their responses in their science notebooks. Explain to the students that they will focus on how air pressure changes with temperature. Introduce the students to the science terms for this lesson and have them record the information in their science notebooks: **air pressure, atmosphere, weather, climate,** and **barometer.**

Divide students into groups of three or four. Have each group collect the materials listed above, write these directions in their science notebooks, and follow the directions.

1. Take the cap off of a two-liter soda bottle for a few seconds, and then twist it back on.

2. Fill one plastic tub with hot water, and one with cold water and ice cubes.
3. Predict what will happen to the soda bottle when you put it in the hot water, and when you put it in the cold water. Record your predictions in your science notebooks.
4. Lower the bottle into the hot water, keeping as much of the bottle under water as possible for one minute. Feel the sides of the bottle and record in your science notebook how the bottle feels.
5. Repeat Step 4 with the ice water.
6. Answer the following questions:

   Compare how the bottle felt after it was in hot and cold water.
   What happens to air pressure when the air gets hot? When it gets cooler?

Allow time after the experiment for groups to discuss their results with other groups.

## Integration with Core Subject(s)

MA: Applying measurement skills

## Connection(s)

**Enrichment:** Have students repeat the experiment, except have them add several mL of hot or cold water to the bottle before beginning. Have students predict whether this will have any effect on the results.

**Fine Arts:**

**Home:**

**Remediation:**

**Technology:**

## Assessment

Performance assessment: Check for the following:

1. Were students' guesses rational?
2. Did they notice that variations in temperature have an effect on air pressure?
3. Did they conclude that providing heat increases air pressure in the bottle and cooling the air in the bottle decreases air pressure?

## Homework

## Teacher Notes

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 052 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Analyze and interpret data

**ISAT:**
Apply fundamental concepts and laws of science to physical and biological systems

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Measuring air pressure
Understanding a barometer

### Materials

Scissors
Large round balloons
Small coffee cans
Rubber bands
Tape
Plastic straws
Cardboard strip
Science notebooks

### Educational Strategies/Instructional Procedures

Tell the students that they will focus on how barometers measure air pressure and that they should find that a barometer can help predict the weather. Divide students into groups of three or four, then demonstrate each step of the following activity. Have one student from each group collect the materials listed above for their group. Have all students copy these directions in their science notebooks.

1. Cut a large balloon lengthwise and stretch it over the top of a coffee can. Secure the balloon in place by taping the edges of the balloon to the coffee can, and placing a rubber band around the coffee can above the tape.
2. Cut one end of a plastic drinking straw at an angle to form a point. Tape the uncut end to the center of the balloon covering the coffee can.
3. Set the coffee can barometer on a flat surface, next to a wall. Tape a sheet of paper next to the coffee can so that the pointed edge of the straw just touches midway down the center of the paper.

4. Each day for one week, note where the tip of the straw is pointing. Mark that point with a dot, and label the dot with the date and the observed weather at the time. (sunny, humid, rainy, etc.)
5. Each day for one week, also record the actual weather conditions on a separate sheet of paper.

Have students answer these questions about their barometer readings:

1) Explain how you could tell whether the air pressure was high or low. (High pressure pushed down on the balloon surface, causing the straw pointer to go up; low pressure did the opposite.)

2) Compare your barometer readings to the observed weather, and the weather observed on the next day.

3) How could you use your barometer to predict the weather? (A falling barometer indicates warm, moist air is moving in; a rising barometer indicates cool, drier air is coming.)

## Integration with Core Subject(s)

MA: Applying measurement skills

## Connection(s)

**Enrichment:** Encourage the students to compare the data they collect about air pressure with television, radio, or newspaper weather reports.

**Fine Arts:** Have the students draw pictures that show the weather conditions each day and label them.

**Home:**

**Remediation:**

**Technology:**

## Assessment

Performance assessment: Check for evidence of the following:

1. Did students produce and utilize a model barometer correctly?
2. Did they comprehend that they were supposed to chart the changes in air pressure?

## Homework

Ask students to record the air pressure and the weather conditions, either from the newspaper, or the television or radio news. Have them compare the professional predictions with what they predicted using their classroom barometers.

**Teacher Notes**

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 053 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Analyze and interpret data

**ISAT:**
Apply fundamental concepts and laws of science to physical and biological systems

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Measuring air pressure

### Materials

Resource materials about weather, barometers, Torricelli
Science notebooks

### Educational Strategies/Instructional Procedures

Encourage the students to speculate how the first barometer was made. Invite the students to talk about materials that may have been used. Say: *Like many scientific breakthroughs, the first barometer was made by accident while the inventor/scientist was trying to make something else. Over 350 years ago, a man named Evangelista Torricelli was trying to make a vacuum-a place where there is no air or any other kind of matter. He used a large bowl and a long, thin tube open at one end and closed at the other and filled with mercury. He turned the tube upside down in the bowl of water, which caused some of the mercury to flow out into the bowl. The space at the top of the tube was the vacuum which was what he originally wanted to study. But Torricelli became curious about why only some of the mercury came out of the tube's open end in the water. He left the tube in the water for several days, and he noticed that the height of the mercury in the tube was different from day to day. Torricelli concluded that the changes in the height of the mercury were due to the changes in atmospheric pressure: high air pressure pushed down on the mercury in the bowl, causing mercury to go up into the tube, and low pressure allowed more mercury to come out of the tube.*

To check students' understanding of information from this and the previous lessons about air pressure, ask the following questions: *Why would weather forecasters want to determine the air pressure? Why is it important for the National Weather Service to give information to the public about the air pressure?* Divide the students into small groups and invite them to think of ways to explain to a second grader how weather is affected by air pressure. Have them make a list of key

words and then write an explanation. Encourage the groups to share their explanations with the class. Encourage students to use available resource materials as they write their explanations.

## Integration with Core Subject(s)

MA: Understand and apply principles of probability

## Connection(s)

**Enrichment:** Ask the students to imagine how Torricelli's invention might have been reported in the newspaper. Invite them to write a newspaper article about it, including a headline and a picture with a caption.

**Fine Arts:**

**Home:**

**Remediation:** Discuss the investigation with the students. Together, create a word web around the idea of how air pressure affects weather.

**Technology:**

## Assessment

Have students write in their science notebooks a description of how a barometer works. Then have them compare the barometers they made in a previous lesson to the one Torricelli made: How are they the same? How are they different?

## Homework

Have students answer the following question: Suppose you went mountain climbing. As you went higher up, you had more difficulty breathing. Why do you think this happened? (Air pressure decreases as you move away from the earth's surface.)

## Teacher Notes

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 054 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Analyze and interpret data

**ISAT:**
Apply fundamental concepts and laws of science to physical and biological systems

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Determining if Earth is warmed unevenly
Inferring why warm air rises
Describing how wind is produced

### Materials

Sheet of paper
Aluminum foil
Thermometer
Meter stick, or 12-inch ruler with cm markings
Timer
Science notebooks

### Educational Strategies/Instructional Procedures

Tell the students that the science term for this lesson is **wind**. Discuss the meaning of the term with the students. Have the students write and record the term and its meaning in their science notebooks.

To aid in the students' understanding of *wind*, invite the students to make and use a paper fan from a sheet of paper. Ask the students the following questions: *What happened when you fanned yourself?* Now ask students to blow up balloons and hold the ends closed with one hand. Have students place the balloons near the palms of the other hand and release. Say: *What did you feel?* Wind *is the movement of air due to the differences in pressure. This movement of air from the balloon to your palm was caused by a difference in pressure. On a large scale, differences in air temperature cause air to be at different pressures, causing* wind. Tell the students that they will focus on differences in air temperature and will find that different surfaces are warmed differently. Remind them that these differences cause greater or lesser warming of the air above them.

Divide the students into small groups of three or four. Choose three or four different outdoor surfaces that are easily accessible, such as grass, asphalt, dirt, and cement. Have students list these surfaces in their science notebooks, and predict whether the temperature of the air above each surface will be the same or not. Have groups predicted the difference of the hottest to the coolest air temperatures. Then have groups measure the air temperature 10 cm above each surface, and record their data. NOTE: In order to get an accurate reading, groups should keep their thermometers above each surface for three minutes, and allow the thermometers to cool after each measurement.

Allow time at the end of the activity to compare groups' information. Ask: *What can you infer about the temperature of the surfaces? How does this activity help explain how the air over the earth's surface is affected by the sun's warming of that surface?*

## Integration with Core Subject(s)

MA: Understand and apply principles of probability

## Connection(s)

**Enrichment:** Invite the students to think about a windy day. Tell them to draw as many illustrations as possible to show how wind affects things.

**Fine Arts:**

**Home:**

**Remediation:**

**Technology:**

## Assessment

Performance assessment questions:

1) Did students take the temperatures correctly?
2) Did students presume a correlation between surface temperature and air temperature?
3) Did they deduce that the higher the air temperature, the greater the surface temperature?
4) Were their predictions sensible compared with the real measurements?

## Homework

Have the students devise a way to determine which surface is warmer without using a thermometer. (Answers will vary. Some suggested responses: feeling them with their hands; spilling equal amounts of water on each, and recording where the water evaporates more quickly; setting an ice cube on each surface and observing which ice cube melts more quickly.

**Teacher Notes**

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 055 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Analyze and interpret data

**ISAT:**
Apply fundamental concepts and laws of science to physical and biological systems

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Constructing a wind vane

### Materials

Square 1" x 4" pieces of wood
Plastic straws
Headless nails
5" long pieces of cardboard
Aluminum foil
Heavy-duty stapler
Compasses
Constructing a *Wind Vane* Worksheet

### Educational Strategies/Instructional Procedures

Say: *Today we will construct a wind vane. A wind vane is a weather instrument that determines wind direction.*

Form cooperative learning groups of four to six students to construct a wind vane. Distribute materials for the lab activity. Explain the procedures to students. (See attached sheet.)

Complete the lab activity constructing wind vanes. If time permits, have students test their wind vanes outdoors. (Weather conditions should be windy.) Provide each group with a compass. Have them put their compass on a flat surface and rotate it until the painted end of the needle points to the *N* on the dial. Using their wind vanes and compasses, have students determine which direction the wind is blowing from. The students will discover that the head of the vane will point in that direction.

Review how to use a compass to determine a relative position for *N* (north). Direct students to point in the direction the arrow is pointing. Have them look at their compasses and name the

direction to which they are pointing. Repeat this process, changing the position of the vane each time, until all the students can identify the directions indicated by the vane.

## Integration with Core Subject(s)

MA: Understand and apply principles of probability

## Connection(s)

**Enrichment:** Encourage students to research wind vane designs and make a photojournal.

**Fine Arts:**

**Home:** Have students take additional wind direction measurements at various time intervals. Suggest that students involve other family members with their readings.

**Remediation:** Review cardinal and intermediary directions, with small groups of students.

**Technology:**

## Assessment

Assess students' ability to follow directions to construct a wind vane. Assess students' ability to accurately record wind direction.

## Homework

## Teacher Notes

# Constructing a Wind Vane

**Name_____ Date_____**

**Materials:**

Square 1” x 4” piece of wood
Plastic straw
Headless nail
5” long piece of cardboard and aluminum foil

**Procedure:**

1. Mark and label the cardinal and intermediate directions on the piece of wood.
2. Hammer the headless nail into the center of the wood just until it holds firm.
3. Cut the plastic straw so it is one-third longer than the headless nail.
4. Cut the piece of cardboard into a pointed arrow. Cover it with aluminum foil (to weatherproof).
5. Staple the cardboard arrow to the top of the straw. Put the straw on the headless nail.
6. Place your wind vane outside (to field test), making sure that North on the base is pointing north.

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 056 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Analyze and interpret data

**ISAT:**
Apply fundamental concepts and laws of science to physical and biological systems

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Learning more about wind direction and speed

### Materials

Resource materials such as encyclopedias, science textbooks, or library books about weather
Science notebooks

### Educational Strategies/Instructional Procedures

Review the term *wind* and remind the students of information learned from previous lessons. Write the science terms **wind, vane, windsock, anemometer, Beaufort Scale, jet stream** on the chalkboard, and have students list them in their science notebooks. Ask the students: *How do weather forecasters determine what the wind direction and speed are?*

Tell the students that this lesson will focus on how wind speed and direction can be determined. Divide students into groups of three or four. Assign each group one of the following wind-related topics to research: *weather vane, windsock, anemometer, Beaufort Scale, jet stream.* Have a variety of resources available for students to use, such as encyclopedias, library books about weather, or science textbooks.

Have each group report their research findings to the class, and have the class write definitions of these words in their science notebooks. After all words have been defined, ask students: *How do glider pilots use air pressure during traveling? Why is it meaningful for meteorologists to know the speed and direction of the wind?*

Have each group list outdoor activities they think would be safe under each condition listed on the Beaufort scale. Invite the groups to share their lists and compare them with the warnings often broadcast on television and radio when threatening weather approaches.

## Integration with Core Subject(s)

MA: Understand principles of probability

## Connection(s)

**Enrichment:** Using the Beaufort scale, have the students determine how fast the wind is blowing today.

**Fine Arts:**

**Home:**

**Remediation:**

**Technology:**

## Assessment

Informal assessment should include the class discussion and the accuracy of the students' lists.

## Homework

Have the students research and write a paragraph about the ways in which the wind has been and can be used as a source of energy, both past and present. Then have students identify two problems in using wind as a source of energy. (not constant direction or speed, not reliable day to day)

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 057 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Know and apply concepts of physical, life, earth, and space science to relevant issues and problems

**ISAT:**
Apply fundamental concepts and laws of science to physical and biological systems

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Understanding wind power
Explaining water vapor in the air

### Materials

Resource materials such as encyclopedias, science textbooks, library books about weather
Science notebooks

### Educational Strategies/Instructional Procedures

Review students' homework and assess their answers describing why wind power is difficult to use as a source of energy. Tell the students that, in today's lesson, they will focus on the role water vapor plays in the weather. Write the following science terms on the chalkboard: **humidity, relative humidity, evaporate, condense, cloud, precipitation,** and **rain gauge**. Tell the students that this lesson will focus on how wind speed and direction can be determined. Divide students into groups of three or four. Assign each group one of the science terms listed on the chalkboard to define. Have a variety of resources available for students to use, such as encyclopedias, library books about weather, or science textbooks.

Have each group report their research findings to the class, and have the class write definitions of these words in their science notebooks. After all words have been defined, ask students:
1) *Why can warm air hold more water vapor than cold air?*
2) *Why do we feel warmer when the humidity increases?*
3) *How are drizzle, rain, hail, and snow different from each other?*
4) *What happens to water vapor in the air to turn it into precipitation?*
5) *How do meteorologists measure the amount of precipitation?*

Encourage students to use the resources available to find answers to the questions. To assess understanding, divide the students into groups of three or four and have each group list five facts

they learned about ways water vapor affects the weather. Encourage the groups to share their facts with the class.

## Integration with Core Subject(s)

LA: Apply information presented in the text to a new or different situation

## Connection(s)

**Enrichment:** Encourage the students to investigate the areas of the world that receive the greatest amounts of precipitation each year.

**Fine Arts:** Discuss forms of precipitation about which songs have been composed, such as *Frosty the Snowman*, and *Rain Drops Keep Falling on My Head.* Sing some of the songs. Have the students write their own lyrics about one form of precipitation.

**Home:**

**Remediation:** Provide an example of a barometer, a wind vane, an anemometer, and a rain gauge. Ask the students to explain what each instrument measures and how it works.

**Technology:**

## Assessment

Can students accurately define terms, and use information they've researched to accurately answer the questions?

## Homework

Have students answer: *Why can you see your breath on a cold day?* (When your warm, moisture-filled breath comes in contact with cold air, it cools and the water vapor condenses because cool air cannot hold as much water vapor in it as warm air.)

## Teacher Notes

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 058 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Apply scientific method to solve problems

**ISAT:**
Know and apply scientific methods and processes

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Observing weather (part I)

### Materials

Science notebooks

### Educational Strategies/Instructional Procedures

Discuss the students' responses to the homework assignment. Be sure students understand the terms from the previous lesson, and that they have accurately responded to the homework assignment.

To further assess students' understanding, have students answer the following questions:

1) The air pressure on the top of a mountain in inches of mercury is 20.58. At the same time, the air pressure at the base of the mountain is 29.88. Why is the air pressure lower at the top of the mountain? (Pressure decreases as you move away from the earth's surface.)
2) Your school is going to have an outdoor paper airplane-flying contest. How can you use an anemometer and wind vane to help your plane fly the furthest? (Fly your plane in the same direction as the wind when it is moving the fastest.)
3) Your class has kept their barometers in working condition. You notice that the straws on your barometer are lower today than they were yesterday. What does that tell you about the air pressure? What can you predict about the upcoming weather? (Pressure has dropped; rain may be on the way.)

Discuss students' responses at the end of the lesson.

### Integration with Core Subject(s)

LA: Deduce literal meanings of words and phrases

## Connection(s)

**Enrichment:** Have the students work in groups to draw or cut out magazine pictures of precipitation. Encourage them to describe the pictures, making sure to identify the forms of precipitation.

**Fine Arts:** Invite the students to role-play a television interview focusing on the weather. Choose one student to be the interviewer, one to be an eyewitness to a form of precipitation, and one to be a meteorologist. Encourage the students to use information they have learned.

**Home:** Have students work with another family member to come up with a question they have about weather to send via e-mail to Tom Skilling, the Chicago Tribune's meteorologist, at www.asktomwhy.com.

**Remediation:**

**Technology:**

## Assessment

Use students' responses to the questions as informal assessment, or change to quiz format for a more formal assessment.

## Homework

Have the students design their own windmill or wind turbine. Ask them to draw or write a description of how their wind machine will look.

## Teacher Notes

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 059 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Analyze and interpret data
Know and apply concepts of physical, life, earth, and space science to relevant issues and problems

**ISAT:**
Interpret data from graphs and tables
Apply fundamental concepts and laws of science to physical and biological systems

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Observing Weather (part II)

### Materials

Resource books such as encyclopedias, science textbooks, or library books about clouds
Pictures of clouds
Cotton balls
Markers
Construction paper
Glue
Science notebooks

### Educational Strategies/Instructional Procedures

Tell the students that they will learn that there are different types of clouds in the sky, and clouds provide clues about changes in weather. Write the science terms **weather satellites, cumulus clouds, stratus clouds, cirrus clouds, nimbus clouds**, on the chalkboard. Invite the students to share what they know about each term. Say: *In 1803 a scientist named Luke Howard developed a way to group clouds by the way they looked. The three main families of clouds are* cumulous, stratus, *and* cirrus. Cumulous clouds *are big, puffy clouds that form when large areas of warm moist air float upward.* Stratus clouds *are flat, gray clouds that cover the sky like a blanket. They form when a flat layer of warm air rises slowly.* Cirrus clouds *are wispy, feathery clouds high up in the atmosphere, and are formed from ice crystals. Nimbus* means *rain* in Latin. Any family of clouds can be rain clouds. When you see *nimbo-* or *–nimbus* in a cloud name, such as *cumulonimbus*, that cloud is a rain cloud.
Have students write definitions of these cloud types in their science notebooks. Have available resources that picture a variety of cloud types for students to look at. Encourage students to use illustrations as part of their definitions.

## Integration with Core Subject(s)

### Connection(s)

**Enrichment:** Have students identify the types of clouds observed over the course of several days. Be sure to have students observe the sky several times during the day to see if the clouds have changed.

**Fine Arts:** Have students make cloud models using cotton balls, markers, construction paper, and glue. Have students label the types of clouds, and tape them on the ceiling if possible.

**Home:**

**Remediation:**

**Technology:**

### Assessment

Are students able to accurately define various types of clouds?

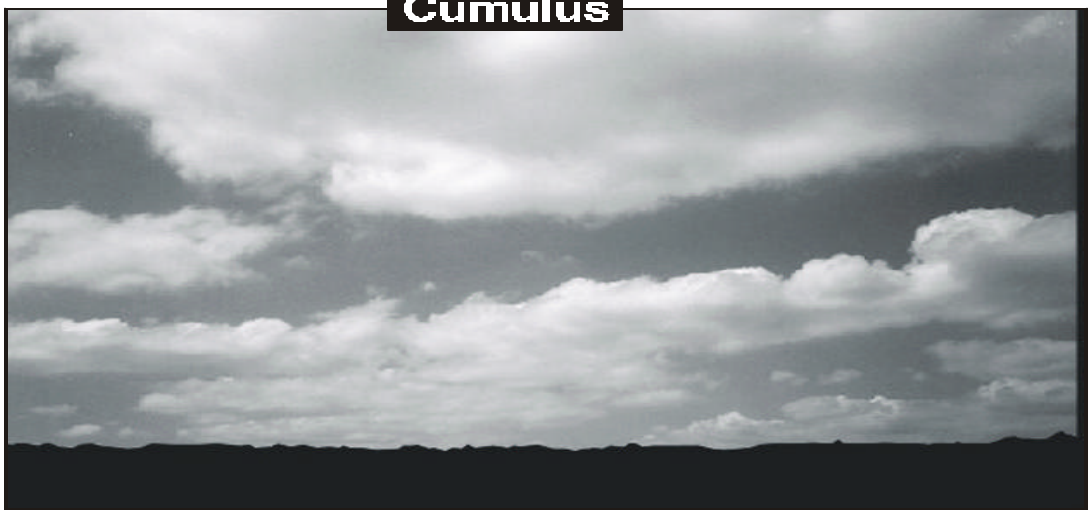
### Homework

Have students watch the weather forecast from a local news station to view satellite pictures of cloud cover.

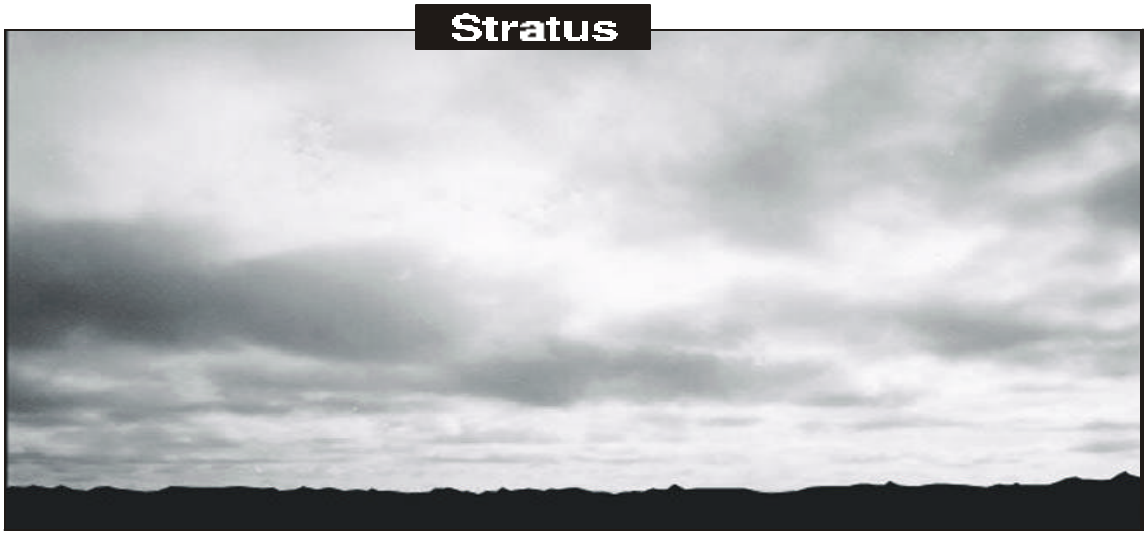
### Teacher Notes

# Clouds

## Cumulus



## Stratus



## Cirrus

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 060 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Know and apply concepts of physical, life, earth, and space science to relevant issues and problems

**ISAT:**
Know and apply scientific methods and processes

### Unit Focus/Foci

Weather/ Climate

### Instructional Focus/Foci

Observing weather (part III)

### Materials

Resource books such as encyclopedias, science textbooks, or library books about clouds
Pictures of clouds
Science notebooks

### Educational Strategies/Instructional Procedures

Have the students discuss the weather maps they saw as part of yesterday's homework. Say: Clouds are one factor scientists use to predict the weather. Weather satellites are used to take pictures of clouds from space. The satellites send images of the clouds to weather stations on the ground. This information can help people know when storms are coming so they can be better prepared. *Satellites increase the accuracy of weather predictions. Before weather satellites, people were able to predict upcoming weather just by looking at the sky. You are going to watch cloud cover for a week to see if you can predict weather, too.*

Have students create a chart in their science notebooks with headings labeled *Date, Time, Type of Cloud Cover, Current Weather Conditions.* Tell them they will be checking clouds for one week to see if certain clouds precede certain weather conditions. At the end of the week, have students look at the cloud conditions on one day, and the weather on the following days. Discuss if there is any connection between clouds on one day and the weather on the next. (Cirrus clouds indicate a change in weather; cumulous clouds indicate fair weather.)

### Integration with Core Subject(s)

LA: Apply information presented in the text to a new or different situation

## Connection(s)

**Enrichment:** Have the students draw clouds with different appearances at appropriate levels in the atmosphere. Tell them to show each of the 10 types and label them.

**Fine Arts:**

**Home:**

**Remediation:** Record a TV weather forecaster's description of cloud movement as shown from a satellite and play the tape several times so the students can relate cloud movement to the verbal explanation.

**Technology:**

## Assessment

Are students able to accurately and logically predict weather from cloud patterns?

## Homework

Have the students bring pictures of clouds from magazines and newspapers. Tell them to be prepared to explain what type of cloud is shown and what type of weather it brings.

## Teacher Notes

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 061 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Know and apply concepts of physical, life, earth, and space science to relevant issues and problems

**ISAT:**
Know and apply scientific methods and processes

### Unit Focus/Foci

Weather/ Climate

### Instructional Focus/Foci

Analyzing severe weather (part I)

### Materials

Weather safety reference materials
Construction paper
Markers
Stapler
Scissors
Science notebooks

### Educational Strategies/Instructional Procedures

Discuss the students' homework and encourage them to present it to the class. Tell the students that, in this lesson, they will focus on safety precautions for severe weather and produce weather safety booklets. Introduce science terms: **thunderstorm, flash floods, hurricane**, and **tornado**. Write the terms on the chalkboard and allow the students to record them with the definitions in their science notebooks.

To tap the students' prior knowledge, ask: *How anyone experienced severe weather, such as severe storms, tornadoes, or floods? What can you do to be safe in severe weather?* Record the students' responses on the chalkboard. Divide the students into groups of three or four. Have each group create a Weather Safety booklet that describes safety procedures and/or precautions to be following during thunderstorms, snowstorms, lightning, tornadoes, floods. Be sure students list the radio or television stations to listen to in case of severe weather. Encourage students to use resources as they make their booklets. When completed, have students share their booklets with another class.

## Integration with Core Subject(s)

LA: Apply information presented in the text to a new or different situation

## Connection(s)

**Enrichment:** Have the students write one-to two-page research papers about natural disasters which focus on tsunamis, thunderstorms, tornadoes, etc.

**Fine Arts:**

**Home:**

**Remediation:**

**Technology:**

## Assessment

Performance Assessment:

1) Did the students gather information and infer that different kinds of severe weather require differing safety measures?
2) Did the students chart useful, easy-to-understand information in their science notebooks?

## Homework

Have the students write a paragraph describing what they would do if caught outdoors in a thunderstorm.

## Teacher Notes

For the storm safety activity, you may want to collect books, magazines, newspaper articles, and other materials that will be helpful to students.

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 062 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Know and apply concepts of physical, life, earth, and space science to relevant issues and problems

**ISAT:**
Know and apply scientific methods and processes

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Analyzing severe weather (part II)

### Materials

Resource materials about thunderstorms
Science notebooks

### Educational Strategies/Instructional Procedures

Discuss science terms (*thunderstorms, flash floods, etc.)* and students' homework. Ask the following questions: *Why are some people afraid of thunderstorms*? *What kind of storm do you like*? *What do you like about it*?

To assess students' understanding, divide the students into groups of three or four. Have them draw a diagram that shows the stages of a developing thunderstorm. Tell them to label the warm, moist air rising, the thunderhead clouds forming, the ice crystals and rain droplets growing, and the lightning, thunder and rain or hail falling. Encourage each group to share their drawings with the class.

### Integration with Core Subject(s)

LA: Apply information presented in the text to a new or different situation

### Connection(s)

**Enrichment:** Have the students perform an activity to see mini-lightning and hear thunder. Suggest that they rub their feet on carpeting and touch a metal object if they want to hear the crackle of thunder and see the spark of lightning.

**Fine Arts:** Have students produce during- and after-thunderstorm drawings.

**Home:**

**Remediation:**

**Technology:**

## Assessment

Informal assessment can be attained through the groups' explanations of the stages of a developing thunderstorm.

## Homework

Have students write a short story in which the action occurs during a storm.

## Teacher Notes

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 063 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Know and apply concepts of physical, life, earth, and space science to relevant issues and problems

**ISAT:**
Know and apply scientific methods and processes

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Analyzing severe weather (part III)

### Materials

Resources about tornadoes and hurricanes
Science notebooks

### Educational Strategies/Instructional Procedures

Discuss the students' homework and allow them to read their stories to the class. Review science terms **hurricane** and **tornado**. Allow time for the students to write the words in their science notebooks with definitions. Ask the students these questions:

1) What kind of storms would you expect to see in Florida? What about in Oklahoma or Montana?
2) Where would you pitch a tent if you were camping during a stormy season?

Have students read resource information about *hurricanes* and *tornadoes*, or watch videos that show these kinds of violent storms. Check students' understanding by having them answer the following questions:

1) How is the eye of a hurricane different from the rest of the hurricane? Why is the eye dangerous?
2) What is the Fujita scale? How is it used to measure tornado severity?
3) Why do hurricanes start over the ocean?
4) What are the main differences between tornadoes and hurricanes?

### Integration with Core Subject(s)

LA: Apply information presented in the text to a new or different situation

## Connection(s)

**Enrichment:** Direct the students to investigate the number of severe storms that have occurred in their area during the past year and the data when each storm occurred. Encourage them to draw conclusions about times of year and weather conditions that make storms more likely.

**Fine Arts:**

**Home:** Have family members create a plan that will ensure maximum safety during a severe thunderstorm or tornado warning.

**Remediation:** Work with students to review the science terms introduced in this unit.

**Technology:**

## Assessment

Assess students' understanding by checking responses to questions. You may choose to have the homework be an "open notebook" quiz.

## Homework

Have students' review weather unit information by answering the following questions:

1. Suppose you wanted to predict the next day's weather, but you didn't have access to any weather equipment or radio or television. How could clouds help you predict the weather?
2. Watch or listen to a weather forecast. List three kinds of information that are given, and write the type of weather equipment that was probably used to gather that information.

## Teacher Notes

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 064 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12B1

**ITBS/TAP:**
Analyze and interpret data

**ISAT:**
Interpret data from graphs and tables

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Understanding seasons

### Materials

Sunrise and sunset times for the 15th of each month
Graph paper
Yellow crayons
Science notebooks

### Educational Strategies/Instructional Procedures

Ask the students to name their favorite and least favorite seasons. Lead a class discussion of their choices. Ask students: *What makes seasons change*? Introduce science terms **axis, equator, Northern Hemisphere, Southern Hemisphere**. Allow the students to record the words in their science notebooks with the definitions.

Divide students into groups of two or three. List the sunrise and sunset times for the 15th of each month, January through December on the chalkboard, and have each student copy the information into their science notebooks. Then have each group work together to graph the times onto a graph, where the *x*-axis is labeled *Time of Day*, and the y-axis is labeled *Month of Year*. Finally, have the students connect the sunrise times, and connect the sunset times, and color the space in between with a yellow crayon.

When students have completed their graphs, ask: *What does the yellow area on the graph represent? In which season is the number of daylight hours greatest? The least? Why do you think the air temperature is cooler in the winter?*

### Integration with Core Subject(s)

MA: Analyze and interpret data

## Connection(s)

**Enrichment:** Invite the students to make illustrations of the words *sunlight, sunrise, sunset, winter,* and *summer*.

**Fine Arts:**

**Home:**

**Remediation:** Work with small groups of students to complete a graph on the overhead projector which illustrates sunrise and sunset times for a period of one month.

**Technology:** Have students search the Internet to find sources for sunrise/sunset data.

## Assessment

Are students able to accurately represent the data on a graph?

## Homework

Have students find the sunrise and sunset times for the day in the local newspaper weather section.

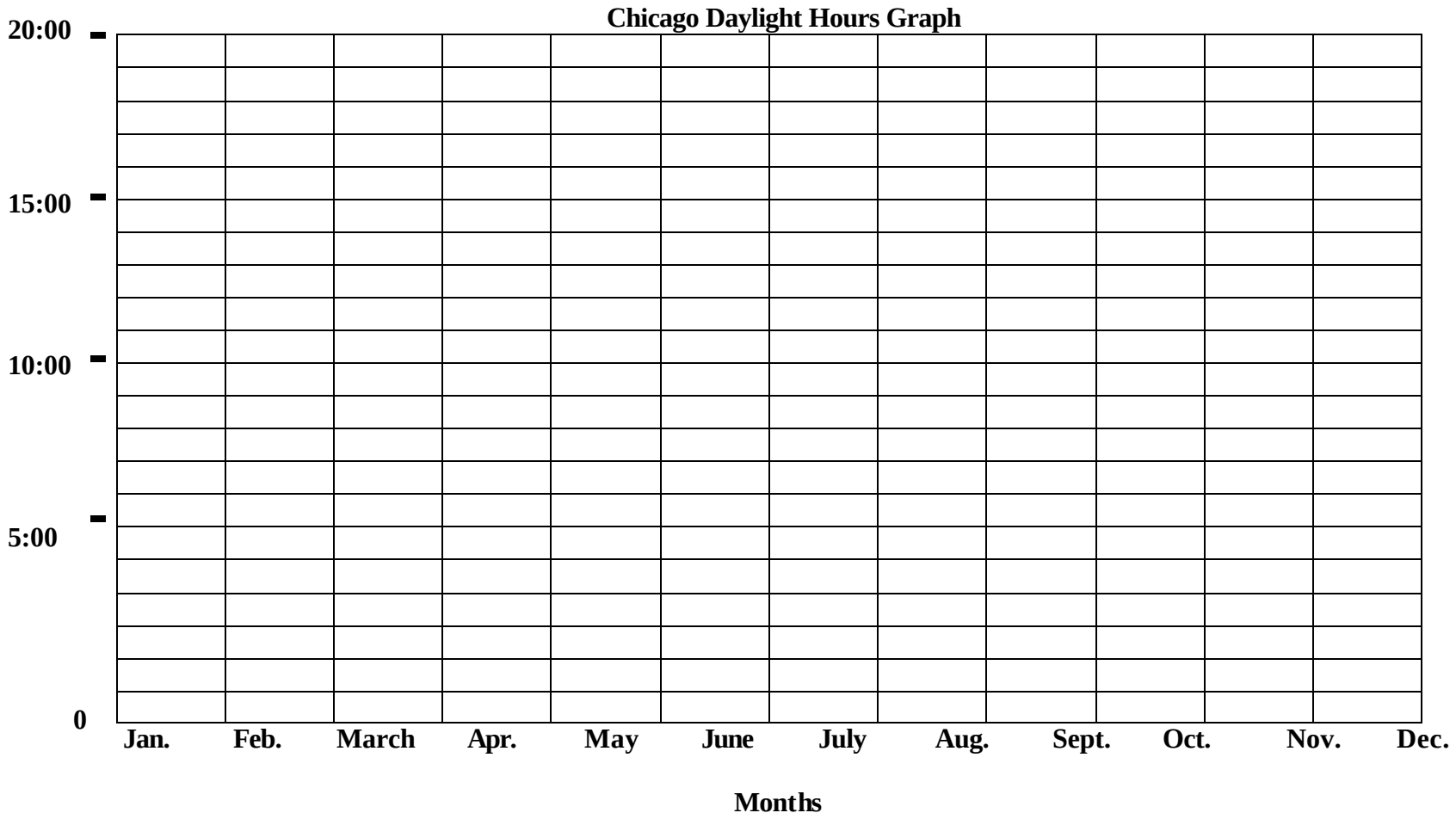
## Teacher Notes

Sunrise and sunset times are available in almanacs and on many weather websites.

# Sunrise/Sunset Data for Chicago

| 15th of the Month | Sunrise | Sunset |
|---|---|---|
| January | 7:16 | 16:45 |
| February | 6:47 | 17:23 |
| March | 6:03 | 17:57 |
| April | 5:11 | 18:31 |
| May | 4:31 | 19:04 |
| June | 4:15 | 19:27 |
| July | 4:29 | 19:24 |
| August | 4:59 | 18:51 |
| September | 5:30 | 18:01 |
| October | 6:03 | 17:10 |
| November | 6:40 | 16:30 |
| December | 7:11 | 16:20 |

*Note-Data table uses military time


Chicago Daylight Hours Graph
20:00
15:00
10:00
5:00
0
Jan.
Feb.
March
Apr.
May
June
July
Aug.
Sept.
Oct.
Nov.
Dec.
Months

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 065 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12B1

**ITBS/TAP:**
Know and apply concepts of physical, life, earth, and space science to relevant issues and problems

**ISAT:**
Know and apply scientific methods and processes

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Understanding seasons and climate

### Materials

Globe

### Educational Strategies/Instructional Procedures

Discuss the students' homework. Have them compare the sunrise and sunset times with the ones they had recorded on their graphs.

Define **climate** as being the average weather conditions over a long period of time in a particular area. Then ask: *What kinds of* **climate** *do you know about?* Have students use resource materials to answer the following questions:

1) *What are three main types of* climates*, and where are they found?* Polar: usually below freezing, near the poles; temperate: warm dry summers and cold wet winters between the poles and the equator; tropical: hot and rainy year round, near the equator.
2) *What effects do differences in climate have on animals and plants living in the region?* (adapt to live in climate conditions; many examples)
3) *Why is it hotter near the equator and cooler near the poles?* (The equator receives the most sunlight; the poles sometimes receive no sunlight due to Earth's tilt.)
4) *Besides temperature, what is the other significant factor in an area's climate?* (rainfall)

### Integration with Core Subject(s)

LA: Apply information presented in the text to a new or different situation

## Connection(s)

**Enrichment:** Have students describe how Chicago's climate is affected by Lake Michigan. Encourage students to explain what is meant by *cooler near the lake.*

**Fine Arts:**

**Home:**

**Remediation:** Describe the different kinds of climate to students. Guide them in locating the climate regions on the globe. Assist students in naming the climates being described.

**Technology:**

## Assessment

Assess students' responses to questions.

## Homework

Have students make a poster that uses words and pictures to describe the three main types of climates.

## Teacher Notes

The Field Museum's Harris Loan Center has available on-loan the Experience Box *Trees*. The box contains tree stem cross-sections so students may study annual growth patterns. A tree identification booklet and twig key are also included. For further information, contact 312-322-8853.

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 066 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12B1

**ITBS/TAP:**
Know and apply concepts of physical, life, earth, and space sciences to relevant issues and problems

**ISAT:**
Know and apply scientific methods and processes

### Unit Focus/Foci

Weather/ Climate

### Instructional Focus/Foci

Understanding Seasons and Climate part IV

### Materials

Sample tree stump
Reference materials about ice ages, climate, tree rings
Science notebooks
Tree Ring worksheet

### Educational Strategies/Instructional Procedures

Discuss the students' homework, and put it up to display. Then ask: *If you could go back in time 10,000 years, do you think you would like to live where Chicago is now?* Allow time for the class to respond, then say: *Actually, it would be quite difficult, if not impossible, to live here 10000 years ago because you would have about a mile of ice covering your home!*

Tell students that the world's climate has gone through many changes, lasting from a few years to thousands of years. At times the Earth has been much warmer, and at other times it has been much colder. The colder periods are called *ice ages*. The last ice age ended about 10,000 years ago. During the ice ages, much of Earth's land was covered with sheets of ice. Almost all of Canada and about 1/3 of the United States was covered in ice during the last ice age.

Say: *Scientists who study climate look for clues to find out why these changes have taken place.*

We are going to take a look at a part of a tree that scientists use to determine changes in earth's climate.

Allow each group of students to examine the tree rings. Encourage them to make observations and discuss them with the class.

Guide students to draw a conclusion about the effect of the weather and the position of the rings.

Say: We are going to use some of the resources available in the library or on our Encarta CD-ROM to identify. What would occur during an ice-age. Have groups report on how an ice-age would affect different life forms if it occurred today.

Allow students time for research; encourage them to share their findings with the class.

## Integration with Core Subject(s)

LA: Apply information presented from resource material to a new or different situation

## Connection(s)

**Enrichment:** Have students research weather records, such as the hottest temperature recorded; coldest; fastest wind speed; driest, wettest place; etc.

**Fine Arts:** Construct a tree ring using different kinds of string that reflect either warmer and moist or drier and cold weather past 15 years.

**Home:** Continue working on Fine Arts project.

**Remediation:** Have students illustrate a tree's rings, or a fossil bed, and describe how these can help scientists infer climate differences. Read, from a trade book, to the student how fossils and tree rings help scientist tell about climate changes.

**Technology:** Borrow a videocassette from the library on Climate Changes, Glaciers, Fossils & Archaeological digs, etc.

## Assessment

Were students able to justify in their story the type of weather conditions based on the tree rings?

## Homework

Have students make a sample fossil, submerge it in water and freeze it, then identify noticeable characteristics after freezing.

## Teacher Notes

Obtain a tree stump from one of the Chicago Park District's tree recycling centers. Use this to allow students' to see the tree rings. If the space between two rings is wide, the weather during that period was probably moist and warm. If the space between two rings is narrow, this indicates that the weather was drier and colder, or that the tree was stressed.

Students can construct tree rings that reflect certain periods by using construction paper and different types of string. The students can exchange their tree stumps and have classmates write a short-story about the condition of the climate of the area where this tree was found based on the position of the rings.

## STRUCTURED CURRICULUM LESSON PLAN

**Day:** 067 **Subject:** Science **Grade Level:** 4

**Correlations (SG,CAS,CFS):** 12E1,2

**ITBS/TAP:**
Analyze and interpret data

**ISAT:**
Apply fundamental concepts and laws of science to physical and biological systems

### Unit Focus/Foci

Weather/Climate

### Instructional Focus/Foci

Assessing concepts learned about weather and climate

### Materials

Weather Unit Test (attached), one copy per student

### Educational Strategies/Instructional Procedures

To check for students' comprehension of the concepts presented in this unit, assign the Weather Unit Test, which follows Teacher Notes.

### Integration with Core Subject(s)

MA: Analyze and interpret data

### Connection(s)

**Enrichment:** Tell the students to find and compare weather records for places in the center of continents and near large bodies of water at the same latitude.

**Fine Arts:** Have the students research songs that have lyrics that are related to weather and climate.

**Home:** Encourage students to discuss with parents the information learned in this unit.

**Remediation:**

**Technology:**

## Assessment

Formally assess students' understanding of the unit's concepts using the Weather Unit Test.

## Homework

Have students' look at the night sky to determine the location of the North Star.

## Teacher Notes

Unit Test answers:

1. Movement of air caused by differences in air pressure.
2. Unequal heating of the Earth produces areas of different air pressure causing air to move from a high-pressure area to a low-pressure area.
3. The Equator.
4. Cumulus

Stratus

Cirrus

5. Warm, moist air rises rapidly creating huge clouds. As the air cools, the moisture is released as water droplets. When the droplets are heavy enough, they fall as rain. The heavy drops falling create strong winds.
6. Meteorologists
7. The amount of water vapor in the air.
8. Air pressure
9. Fossil remains, tree rings
10. A scale to describe wind speed.

# Weather Unit Test

**Name:** _____ **Date:** _____

1. What is wind?

2. What causes wind?

3. What area of the Earth receives the most direct sunlight?

4. Draw three types of clouds and name them.

5. How do thunderstorms form?

6. Who forecasts the weather?

7. What is humidity?

8. What does a barometer measure?

9. How can scientists find out about climate in the past?

10. What is the Beaufort scale?