

1 GRADE TWO WINTER NATURE WALK Using Thermometers

OBJECTIVES:

- Use thermometers to measure temperature.
- Compare temperature of air and water inside and outside the school.
- Relate temperature to the state of water: solid or liquid
- Discover locations of highest and lowest temperature outside.
- Recognize the effect of temperature on the winter survival of animals.

PREPARATION:

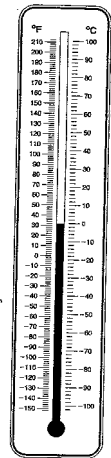
- Room coordinator schedules walk for January, February, or early March.
- If possible, schedule walk after morning or lunch recess so that the air is warm and some melting might have taken place. Walk should last about 30 minutes. Winter walks are always shorter than spring and fall ones. Don't stay out longer than the comfort level of the children allows.
- Be sure children are dressed appropriately.

MATERIALS:

- Thermometers (2 or more per group). Should have both Fahrenheit and Celsius scales.
- Tissues or paper towel to dry thermometer bulb if it gets wet.
- Clipboard, "Temperature Report: Our Big Backyard" worksheet, and pencil.
- Trowel (for ice and soil).
- Hand lenses (2-3 or more per group).
- Optional—for snow and ice: 4" x 4" squares of black paper for observing snow crystals (2-3 per group).

ACTIVITIES

- Measure indoor and outdoor air temperature.
- Find water outside, note whether it is solid or liquid, and measure its temperature. Locate places where water is frozen and places where it has melted and try to explain why this has happened.
- Brainstorm places in the schoolyard that might have the highest and lowest temperature, and measure the temperature of a few of these.
- Relate air or ground temperature to the ways animals survive in winter.



PRE-WALK ACTIVITIES: TO BE LED BY THE TEACHER

1. Mathematics Connection: Temperature measurement. **(ESSENTIAL.)**
Plan to teach the following Everyday Mathematics lessons before the Grade 2 winter walk:
 - Lesson 1-12, Reading a thermometer, Home Link master 1-12.
 - Lesson 4-3, Exploring Temperature.
 - Lesson 4-4, Temperature Changes.
 - Math Journal 1, pg. 87, 90, 91. (Activities that follow supplement the journal pages.)
2. Science/Mathematics Connection: Measuring Temperature Activity. **(ESSENTIAL.)**
(See Activity pg. 271 in the EDM teacher guide: Writing Number Stories about Thermometer Experiments.)

Materials needed for each group of 2-3 students:

(Most of these materials can be found in the Big Backyard supply area. Coordinate with your grade level colleagues so that the materials are available to take outside when students go out on their walks.)

- 1 plastic or metal backed thermometer (Fahrenheit and Celsius scale).
- 1 clear plastic cup with water and ice or snow.
- A clock or timer for the class.
- Student worksheet, Measuring Temperature.

Activity:

- Distribute the student sheets, Measuring Temperature. Ask: *What scientific instrument can help show you how warm or cool something is?* (Thermometer.) Tell students that they will use thermometers to measure the temperature of the air in the room.

CAUTION: Remind students that the glass part of the thermometer can break and that they need to handle the thermometer with care. (The red liquid inside is alcohol and does not pose a hazard.)

- Demonstrate how to hold the thermometer by the metal edges rather than by the bulb. Ask: *Why not hold the bulb?* (You would measure your finger temperature!)
- Remind the students to be sure that the bulb of the thermometer is dry when measuring air temperature. If the bulb is wet, dry the thermometer bulb with the tissue before using it to measure air temperature. If there is water remaining on the bulb, until it completely evaporates, the temperature reading will be lower than the air temperature.
- Invite groups of 2-3 children to practice using a thermometer to tell the

temperature of the air in the room. Each child should have a chance to read the thermometer. Have them shade in the picture of the thermometer on the attached student sheet to show the air temperature and write in the temperature in the space provided. Ask: *Is all the air in the room the same temperature? If not, why do you think it is not?* (Heater, draft, etc.)

- In addition, have students measure and record the temperature of ice and water. (It should be near 32°F or 0°C). Ask children to notice what happens to the level of the red liquid when the thermometer is placed in ice water. Have them watch as the level gets lower and lower. Record how long it takes before the level no longer changes. (It may be a few minutes.) If necessary, help students read the thermometer scale. Note that each mark on the °F side represents 2 degrees. You might point this out on the student sheet.
- You may want to have students add some other points to the large thermometer on the student sheet: freezing point of water, human body temperature, etc.
- If you have time, allow the ice to melt and the resulting water to come to room temperature. Ask students to measure the temperature of the water in the cup as it warms up. Ask: *What makes ice turn to liquid water?* (Heat from the room is added.) *How could we make the water change back to ice?* (Cool it; lower its temperature in a refrigerator or outside.)

Tell children that they will go outside on their Big Backyard walk to look for water and measure the temperature of air and water and other things. Ask: *Where can we find water outside today? Do you think the water we find outside will be a solid or liquid today? Why? What place do you think will be warmest outside? Coldest?*

3. Science Connection: Changes--Properties of Water. (Lessons 1, 2, and 5.)

Ask questions such as:

- What do you know about water?
- What does water look like? What color is water?
- What does it feel like? Is it soft or hard?
- Can you hold water in your hand?
- Is water runny or can you pick up a piece?
- Can you walk on water?
- Is water hot or cold?

Summarize by saying:

Sometimes water is clear and you can see through it, like a rain drop. Sometimes water is cloudy, or different colors when things like salt or dirt or food coloring dissolve in it. Sometimes it looks white when it is snow.

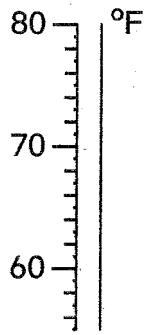
Sometimes water is runny and goes through our fingers when we try to pick it up. That's when it is a liquid. But sometimes water becomes solid and hard, and then we can pick up a piece of solid frozen water or a snowflake.

Ask: *What can you do to change water from a solid to a liquid? What would you do to melt an ice cube? (Make it warmer; add heat.) How could you make the water change back into an ice cube? (Make it colder; take away heat.) (See Lesson 2, Changes.)*

NAME _____

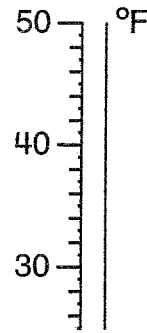
Measuring Temperature

Measure the temperature of the air in the room.
Color in the thermometer below to show the temperature. Write the temperature.



AIR TEMPERATURE _____ °F

Measure the temperature of water and ice in the cup. Color the thermometer below to show the temperature.

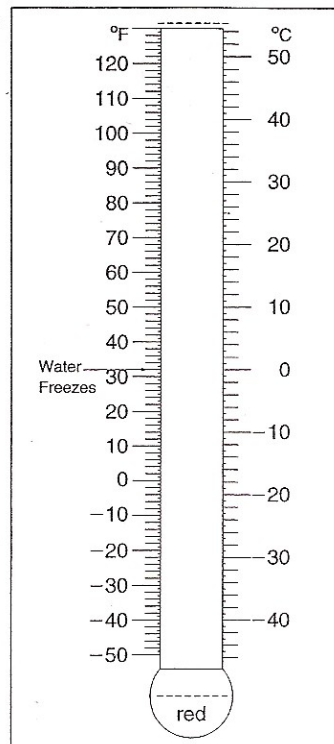


WATER AND ICE _____ °F

Draw a line on the thermometer below to show CLASSROOM AIR TEMPERATURE
Draw a line on the thermometer below to show WATER AND ICE TEMPERATURE

CLASSROOM AIR

WATER AND ICE



NATURE WALK: TO BE LED BY BIG BACKYARD VOLUNTEER**1. Measuring temperatures inside the school.**

- Measure the air temperature in the hallway and/or classroom while you walk toward the outside door. Walk leaders: Record all temperatures on the walk worksheet.
- As appropriate, review the following (from classroom activity led by teacher):
 - CAUTION: Remind students that the glass part of the thermometer can break and that they need to handle the thermometer with care. (The red liquid inside is alcohol and does not pose a hazard.)
 - It may take several minutes for the thermometers to adjust to each new location.
 - Hold the thermometer by the plastic or metal edges so fingers do not warm the glass.
 - Dry the thermometer bulb before using it to read air temperature. (If there is water remaining on the bulb, the temperature reading will be lower than the air temperature until the water completely evaporates.)
- Ask: *Do you think the air outside will be a lower temperature or a higher temperature than inside air today? What do you think the outside temperature will be? Do you think the water we find outside will be a solid or liquid today? Why?*

2. Measuring temperatures outside the school.

- Tell students that they will measure the temperature of air, water and other things outside the school. Just outside the school, have your group measure the air temperature in degrees Fahrenheit. Try to shield the bulb from direct sunlight with a clipboard or hand. It will take a few minutes for the thermometer to stabilize. Go on to the next discussion point while waiting. Return to record this temperature.
- Ask the children: *Where do you think the temperature is highest? Where is it lowest?* Have children look all around the schoolyard for places they think will have a higher or lower temperature than the one they just recorded. In addition, challenge them to find some water (snowdrifts, ice, puddles, mud, icicles, etc.). Remind them that water is sometimes a solid and sometimes a liquid. As a group, decide on several areas to investigate.
- Possible locations:
 - Under leaves or a log. (If dark colored leaves are on top of the snow, they sometimes melt into the surface, leaving a leaf print.)
 - On the asphalt black top. (Bare, or with snow, ice, or puddles.)
 - Under the soil. (Use the trowel to make a hole for the thermometer.)
 - Inside a snow bank. (Use the trowel. Try different depths. Snow actually keeps temperatures from going much below freezing, as it is a good insulator.)
 - On top of a snow bank.

- Sunny spot vs. shade. (Remember to shield the bulb from direct sun.)
 - Under or on the playground equipment.
 - Field vs. woods.
 - Near a dark colored tree surrounded by snow. (There is usually a melted area near the trunk—the dark trunk absorbs sunlight and heats up slightly more than the white snow.)
- Go to 3-4 of these places with your group and measure the temperature. You may want to leave thermometers in several places at once and return after a few minutes to take readings. Be sure to gently dry the thermometer bulb with tissue if it gets wet. While you are waiting for thermometers to register, invite children to use their bare fingers to briefly feel a spot and sense the degree of warmth. Walk leaders record findings on the worksheet. If water temperature is measured, record the state of the water: solid or liquid.
 - Optional: Examine snow or ice crystals.
 - Ask students to put a little snow or ice on black paper, and examine it with a hand lens. Invite them to describe its properties.
 - Ask: *How can you change snow or ice?* Have them (or you if you think that throwing snowballs is too tempting for your group!) take a bare handful of snow or ice and squeeze it to see what happens. Ask: *Why does the snow change to liquid water?* (Heat from their hand raises the temperature of the snow above the freezing point.)

3. Animals in winter.

- Ask: *How do you stay warm when the outside air temperature is low?* (Coats, mittens, go inside, etc.)
- Ask: *If you were an animal, where would you go in the schoolyard to stay warm today? Where would you find liquid water to drink?* Invite children to give examples of how animals stay warm in the winter. (Migrate to a warmer place, grow thicker fur, find a shelter, perhaps underground.) Some animals survive over the winter by finding a slightly warmer place that protects them from the cold and allows them to find liquid water. Snow actually acts like a blanket that keeps the ground below from getting even colder. Tunnels underground can reach a place that is not so cold.

4. Wrap up.

- List all children's observations and questions. Ask: *Where was the highest temperature outside? Where was the lowest? What do you think made the difference?*
- Walk back to the school.
- Give the "Temperature Report: Our Big Backyard" worksheet to the teacher.
- Return all materials to the Big Backyard supply area.

TEMPERATURE REPORT: OUR BIG BACKYARD

GROUP LEADER: _____

DATE: _____

TIME: _____

Indoor air temperature: _____ °F

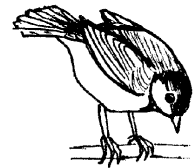
Outside air near school: _____ °F

LOCATION	TEMP. OF WATER Solid or Liquid??	TEMP. OF OTHER MATERIAL (air, soil, blacktop, etc.)

Where do you think an animal would go in the schoolyard to find the highest temperature today?

Where do you think an animal would go to find liquid water to drink today?

Most surprising discoveries:



Questions we still have:

**POST-WALK CURRICULUM INTEGRATION OPPORTUNITIES: TO BE
CHOSEN AND LED BY THE TEACHER**

1. Literacy Connection: Winter Number Story.

Write a winter story about two days in an animal's life in your school's Big Backyard. On one day, the air temperature at noon is 50°F and the next day it is 25°F. Include ways the animal stays warm and where and when it finds liquid water. Include at least one temperature reading in your story.

2. Science Connection: Changes, Lesson 2.

- Ask: *Are some locations outside warmer than others even on a cold winter day? Why do you think this is so?* (Insulation of soil, snow, or grass, heat from school building, heat from dark asphalt.)
- Ask: *Why do you think you found snow and ice in some places and not in other places? What is the evidence for your explanation? (How did you decide on your idea?)* Snow removed by plowing and shoveling is obvious. Wind can also move snow. Ask: *How do shadows affect the temperature of ice or snow?* (Encourage them to use data they collected on the walk to show that the temperature of air in the shade is lower than air in the sun.) Also ask how temperature might be affected by sunshine falling on dark vs. light colored objects. In Grade 1 they should have learned that dark colored objects (black top, tree trunks, or dead leaves on the snow) are heated more by the sun than light colored objects (from Grade 1 lesson from the Investigating Light and Shadow unit). Even in winter, water can evaporate (as in Lesson 2).
- Ask: *What do you think makes snow and ice turn to water on the playground?* (Higher air temperatures, warmer soil or warm blacktop.) Where does that water go? (Water evaporates into the air, but this concept is difficult for second graders—accept all answers that have a logical, even if not correct, explanation.)
- Ask: *Why do we get rain in summer and snow only in winter?* (Air temperature is above the freezing point of water, 32°F, in the summer, so ice cannot form.)

3. Science Connection: Changes, Lesson 2.

Ice cubes can be put in different places outside as part of the “ice cube melting race.” A variation on extension 4 in this lesson, page 40, might be to put very warm water in zip lock bags, instead of ice cubes. Challenge students to find materials that can be used to help the water in the bag stay warm. They can try different types of insulation, different locations, etc.

4. Going Further: Ask: *When we go out again in the spring, how do you think our observations on water and temperature will be different? If we compare our winter walk data with other grade 2 classrooms, will it be exactly the same or different? Why or why not?* (Walks may take place on different days and different times of day.)