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Grade 2

## **Cluster 4: Air and Water in the Environment**

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### **Overview**

Air and water are major parts of our physical environment and are essential for life. Yet our awareness of them is often limited, largely because we identify them only in their most obvious and observable forms. Through investigations, students learn about the characteristics of air, and the various forms of water in the environment. Students continue to build their understanding of the nature of science by describing evidence of the water cycle (see *Grade 2, Cluster 2: Properties of Solids, Liquids, and Gases*) and of moving air in indoor and outdoor environments. In the process, students discover the many ways in which air and water contribute to the health and survival of living things, including themselves.

**PRESCRIBED LEARNING OUTCOMES**

**SUGGESTIONS FOR INSTRUCTION**

*Students will...*

**2-4-01** Use appropriate vocabulary related to their investigations of air and water.  
 Include: wind, air current, temperature, changes of state, water cycle, freeze, melt, condense, evaporate, sources of drinking water, pollution.  
 GLO: C6, D4, D5

➤ Introduce, explain, use, and reinforce vocabulary throughout the cluster.

**2-4-02** Recognize that air can move.  
 Include: wind, air current.  
 GLO: D5

**2-4-03** Observe and identify evidence of moving air in indoor and outdoor environments.  
*Examples: leaves blowing, drapes moving...*  
 GLO: B1, C2, D5

**2-4-04** Identify positive and negative effects of changes in air temperature and air movement in indoor and outdoor environments.  
 GLO: B1, E3

➤ **Activating Prior Knowledge**  
 Use a KWL Strategy (Ogle, 1986) to activate prior knowledge related to wind and identify questions that students may have. The teacher should model the use of the terms “wind” and “air current” in discussions and ensure that students relate these to air movement. (Note: KWL is discussed in *ELA, Strategies*, pp. 89-92.)

➤ **Observing the Environment — Who Can See the Wind?**  
 On a windy day, take a class walk to observe the effects of wind on the environment. Challenge students to find evidence that the air is moving. Students can also look for evidence of water in the environment at the same time (link to 2-4-06).

➤ **Charting Changes**  
 Use a Think-Pair-Share (McTighe and Lyman, 1992) to create charts showing positive and negative effects of air temperature and movement in both indoor and outdoor environments. Have students add to their own charts when they hear new ideas. (Note: Think-Pair-Share is discussed in *ELA, Strategies*, p. 15. This strategy has been suggested throughout this cluster.)

I noticed changes	in Air Temperature	in Air Movement
When	I went into my house	I went to play in the playground
The change was	It was cooler	The wind grew stronger
Positive effects	I stopped sweating	It was better for kite flying
Negative effects	I got too cold later	The papers blew away

**2-0-1a.** Ask questions that lead to investigations of living things, objects, and events in the immediate environment. (ELA 1.2.4, 3.1.2, 3.1.3; Math SP-I.1.2) GLO: A1, C2, C5

**2-0-5a.** Make, with guidance, observations that are relevant to a specific question. GLO: A1, A2, C2

**TEACHER NOTES**

**SUGGESTIONS FOR ASSESSMENT**

**Science Journal Entry: Effects of Moving Air**

Have students answer the following question: How does moving air affect our lives? Provide three examples.

Look for

- wind can cool us down, blow things away, damage property, etc.
- dry clothes
- fly kites, etc.

<p><b>PRESCRIBED LEARNING OUTCOMES</b></p>
<p><i>Students will...</i></p>
<p><b>2-4-05</b> Use the design process to construct and test a device that shows evidence of air movement. <i>Examples: windsock, wind chime, pinwheel, sailboat, kite...</i> GLO: C3</p>
<p><b>2-0-1c.</b> Identify practical problems to solve in the immediate environment. GLO: C3  <b>2-0-3a.</b> Brainstorm, with the class, possible solutions to a practical problem; and in small groups, reach consensus on a solution to implement. (ELA 1.2.3, 2.2.2) GLO: C3, C7  <b>2-0-3b.</b> Create, with the class, a plan to solve a problem or meet a need. <i>Examples: identify simple steps to follow, prepare a drawing of the object to be constructed...</i> (ELA 1.2.3) GLO: C3, C7  <b>2-0-3c.</b> Develop, as a class, limited criteria to evaluate an object or device based on its function and aesthetics. GLO: C3, C7  <b>2-0-3d.</b> Identify tools and materials to be used, and explain their choices. GLO: C2, C3, C4  <b>2-0-4b.</b> Construct an object or device to solve a problem or meet a need. GLO: C3  <b>4c2-0-</b> Test an object or device with respect to pre-determined criteria. GLO: C3, C5  <b>2-0-4d.</b> Identify and make improvements to an object or device with respect to pre-determined criteria. GLO: C3  <b>2-0-7b.</b> Propose a solution to the initial problem. GLO: C3  <b>2-0-7c.</b> Identify new problems that arise. GLO: C3</p>

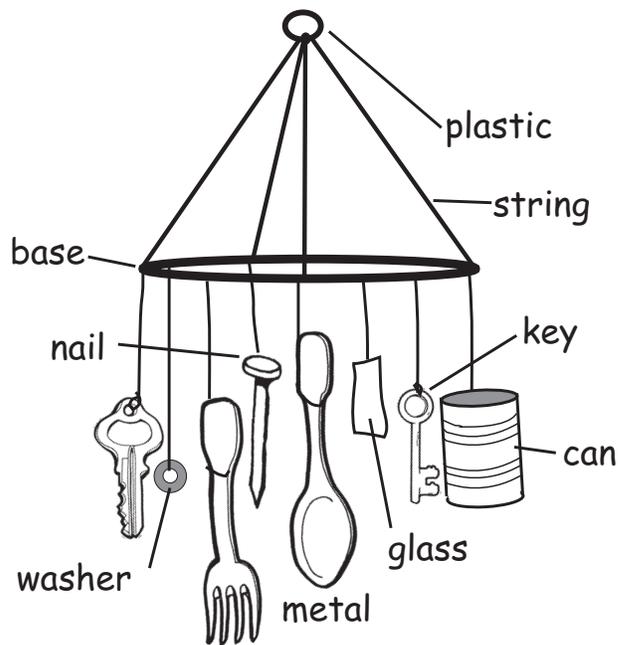
**SUGGESTIONS FOR INSTRUCTION**

➤ **Design Project: Wind Chimes**

Have students plan and construct devices that show evidence of air movement. For example, have students construct a wind chime for themselves or for a special occasion. Let students determine the materials to be used along with a base provided by the teacher. Sample evaluation criteria might include the following:

- contains at least three different materials
- has a device that enables it to be hung up
- makes a noise in a breeze
- is aesthetically pleasing

Have students use Blackline Master 3: Design Process Recording Sheet: Grades 1 and 2.



TEACHER NOTES

SUGGESTIONS FOR ASSESSMENT

**Design Process Checklist**

The student

- took part in the discussion
- used a variety of information sources to develop design
- worked cooperatively
- selected materials to build device
- used tools safely
- tested design with pre-determined criteria
- modified design to better meet criteria

**Self-Assessment of Finished Product**

How Did I Do? Answer Yes or No.

1. My device met the following criteria (example):

- contains three different materials      yes \_\_\_ no \_\_\_
- has a way/device for hanging              yes \_\_\_ no \_\_\_
- makes a noise in a breeze                yes \_\_\_ no \_\_\_
- is nice to look at                              yes \_\_\_ no \_\_\_

2. I can improve my device by \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.

Comments \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_.

PRESCRIBED LEARNING OUTCOMES
<i>Students will...</i>
<p><b>2-4-06</b> Observe and identify examples of water in the environment.</p> <p><i>Examples: dew, frost, snow, rain, lakes, puddles, clouds, fog, perspiration...</i></p> <p>GLO: C2, D5</p>
<p><b>2-0-2a.</b> Access information using a variety of sources. <i>Examples: elders, simple chapter books, concept books, CD-ROMs, Internet...</i> (ELA 1.1.2, 3.2.2 Math SP-II.1.2; TFS 2.1.1) GLO: C6</p> <p><b>2-0-2b.</b> Match information to research needs. (ELA 3.2.3, 3.3.3) GLO: C6, C8</p>
<p><b>2-4-07</b> Describe evidence of water changing state, and recognize that these changes are part of the water cycle.</p> <p><i>Examples: puddles evaporating after a rainstorm, snow melting...</i></p> <p>GLO: D4, D5, E2, E3</p>
<p><b>2-0-1a.</b> Ask questions that lead to investigations of living things, objects, and events in the immediate environment. (ELA 1.2.4, 3.1.2, 3.1.3; Math SP-I.1.2) GLO: A1, C2, C5</p> <p><b>2-0-1b.</b> Make predictions based on observed patterns or on collected data. (ELA 1.1.1, 1.2.1) GLO: A1, C2</p> <p><b>2-0-5a.</b> Make, with guidance, observations that are relevant to a specific question. GLO: A1, A2, C2</p> <p><b>2-0-5c.</b> Estimate and measure the passage of time related to minutes and hours. (Math SS-VI.1.2) GLO: C2, C3, C5</p> <p><b>2-0-5e.</b> Record observations using written language, drawings, and, with guidance, charts. (ELA 4.1.2, 4.2.5) GLO: C2, C6</p> <p><b>2-0-7a.</b> Propose an answer to the initial question based on their observations. (Math SP-IV.2.2) GLO: A1, A2, C2</p> <p><b>2-0-7e.</b> Describe, in a variety of ways, what was done and what was observed. <i>Examples: concrete materials, captioned drawings, oral language...</i> (ELA 4.1.2, 4.2.5) GLO: C6</p> <p><b>2-0-8a.</b> Recognize that learning can come from careful observations and investigations. (ELA 3.3.4) GLO: A1, A2, C2</p>

SUGGESTIONS FOR INSTRUCTION

➤ **Where’s the Water?**

Place a mirror in the freezer section of the refrigerator for five to ten minutes. Remove the mirror from the freezer and breathe on it. What forms on the mirror? Explain why.

Have students work in pairs to read and view informational texts (books, illustrations, filmstrips, videos, and CD-ROMs) to gather information about water in the environment. Have students make a picture glossary of examples in their science journals.

Use the following questions to review findings:

- In which new places did you find water?
- Does water exist in all parts of the world?
- What different forms of water did you discover existing at different times of the year?

➤ **Observing Puddles**

After a rainstorm, take the students outside to observe a puddle or pour water on the sidewalk or tarmac to create a puddle. Working in pairs, the students should make a list of everything they observe about their puddle and trace their puddle using chalk. Ask students to predict what changes they will see in their puddle when they return after two to three hours. Revisit the puddle and trace its size (if it is there at all). Have the class brainstorm possible explanations for the “disappearing puddle.” The teacher should record possible explanations and revisit these after the following demonstrations.

**Math Link:** Create an in-class puddle by pouring water onto acetate, or a similar plastic material. Have students trace the puddle using a marker. After wiping up the water they can cover the inside of the puddle tracing with interlocking cubes or centimetre squares to discover its area. They can go around the outside of the puddle with a piece of string and then measure the string to discover the perimeter of their puddle.

➤ **Demonstration: Cloud in a Bottle**

Pour hot water into a large jar (4 litres) and swirl it around to warm up the glass. Pour the hot water out of the jar, keeping the jar upside down to prevent any heat from escaping. Light a match or a couple of matches at once and let the smoke rise inside the jar. Quickly place the lid on the jar to trap the smoke inside.

Once the lid is on, turn the jar upright and place ice cubes on the lid. Shine a flashlight through the jar to help students observe what happens. Fog or cloud begins to form when the air near the lid starts to cool. Have students draw what they see. Ask students to explain where the cloud came from. Record possible explanations and revisit these after the next demonstration.

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TEACHER NOTES

SUGGESTIONS FOR ASSESSMENT

**Dew** is the moisture found on grass and other objects on the Earth’s surface in the early morning. This is replaced by **frost** in colder weather. Ensure that students identify forms of water found at different times of the year as precipitation, such as **snow, rain**, and the resulting **puddles, lakes**, or **snowbanks**. Students should also be looking to themselves for signs of **perspiration** and **water vapour** (in the breath).

**Paper and Pencil Task: Where’s the Water?**

Draw and label a picture to show where water is found in the environment. Include at least six different places.

Use the following checklist to assess the drawing:

- includes detail
- is labelled
- shows an understanding of the location of water in the environment
- includes six or more different places

**Clouds** and **fog** are made of small water droplets or tiny ice crystals that form around dust particles and float in the air. The tiny drops of water move together, forming larger, heavier drops. These water droplets are formed from water that evaporates from ponds, streams, lakes, oceans, moist plants, or soil. The evaporated water is called **water vapour**. When there is too much water vapour for the clouds to hold, the water falls as **rain, sleet**, or **snow**. The form of precipitation depends on the temperature.

PRESCRIBED LEARNING OUTCOMES
<i>Students will...</i>

SUGGESTIONS FOR INSTRUCTION

➤ **Demonstration: Making It Rain**

Place ice cubes on a cookie sheet for a long enough duration to make the metal cold. Hold the cookie sheet over a steaming kettle. Ask students to notice what happens when the steam from the kettle hits the cold cookie sheet. (Droplets of water form on the bottom of the cookie sheet. When the droplets of water become too heavy they fall like rain.) Have students draw what they see. Ask students to explain what happened to the water.

➤ **Where Did the Water Go?**

The class should revisit the explanations suggested for **Observing Puddles**, **Cloud in a Bottle**, and **Making It Rain** and suggest possible revisions to the original explanations. After students have made their changes, stimulate further student discussions by stating that water does not “disappear” but changes “state.” Students can help identify two states of water at this point (liquid and gas). Review the three learning experiences and trace the movement of and changes that occur to a water droplet. Pictures or words could be used to summarize as follows:

**Observing Puddles:** The drop started in the puddle as a liquid and then went into the air where it looked as if it disappeared as a gas.

**Cloud in a Bottle:** The drop started as hot water, a liquid. It went into the air as a gas. When it hit the cold lid it turned back into a water drop, a liquid.

**Making It Rain:** The drop started in the kettle as a liquid. When it got hot it left the kettle as steam, a gas. When it hit the cookie sheet it changed back to a liquid water drop.

➤ **Demonstration: Miniature Water Cycle**

The concept of water changing state as evidence of the water cycle can be illustrated using pop bottles. Cut the top off two two-litre plastic drink bottles and put wet sand in the bottom of one. Attach the second drink bottle with strong tape. Put the bottles on the window ledge in the sun. Identify water changing states as it goes through the water cycle.

Observe and record observations of the water cycle several times during the day, over a period of several days.

Have students record their understanding of the water cycle in their science journals by drawing and labelling a diagram.

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TEACHER NOTES

SUGGESTIONS FOR ASSESSMENT

In order for students to get the maximum benefit, demonstrations should be done in front of small groups. Other students could be working independently or in groups on centre activities, or carrying out an activity supervised by a helper.

**Caution:** The use of a kettle and boiling water raises safety concerns. Steps should be taken to ensure that the kettle will not be left unattended and cords are not placed where someone can trip over them.

**Learning Log Entry: Water**

Answer the following questions about water:

1. What do I know about water?
2. What did I learn about water today?
3. What questions would I like to ask?

**Performance Task: The Water Cycle**

Have students use a paper plate, markers, construction paper, cotton balls, etc. to make models/pictures of the water cycle. Students should label all parts and be able to explain their model to the class/teacher.

**Scoring Rubric: The Water Cycle**

- 4 water cycle model complete showing the three processes of evaporation, condensation, and precipitation; labels are correct; explanation is accurate
- 3 water cycle model shows at least two of the three processes of the cycle; labels are correct, but some may be missing; explanation demonstrates a good understanding
- 2 water cycle model shows at least two processes of the cycle; labels may be missing or incorrect; explanation shows a grade level understanding
- 1 water cycle model shows at least one process of the cycle; labels are missing or incorrect; explanation shows limited understanding and may be unclear

**PRESCRIBED LEARNING OUTCOMES**

**SUGGESTIONS FOR INSTRUCTION**

*Students will...*

➤ **Making Solid Water**

Working in cooperative groups, have students fill plastic cups 3/4 full of water. Have students make as many observations as they can about the water in the cups. Place the cups in a freezer overnight. Repeat observations on the contents of the cups when they come out of the freezer. Use the following headings on a chart to record both sets of observations.

1. Water Before Freezing    2. Water After Freezing

\_\_\_\_\_

\_\_\_\_\_

Use Think-Pair-Share (McTighe and Lyman, 1992) to have students discuss what happened to the water and predict what they think will happen if the cups are left at room temperature. Leave the cups at room temperature and have students list their observations by adding a third component to their chart such as the one below.

3. Water After Sitting In Class

\_\_\_\_\_

\_\_\_\_\_

**2-4-08** Investigate to determine factors that cause things to dry quickly or slowly.

*Examples: air temperature, amount of moisture in the air; amount of wind...*

GLO: C2, D5, E3

**2-0-4f.** Work in a variety of cooperative partnerships and groups. (ELA 5.2.1) GLO: C7

**2-0-5a.** Make, with guidance, observations that are relevant to a specific question. GLO: A1, A2, C2

**2-0-7a.** Propose an answer to the initial question based on their observations. (Math SP-IV.2.2) GLO: A1, A2, C2

➤ **Drying Conditions**

Divide students into groups of four. In groups, have students wet four paper towels by carefully pouring approximately 25 ml of water over each one. One student should take charge of each paper towel. The first paper towel should be crumpled and set aside. The second paper towel should be held up straight without moving it. The third paper towel should be held up straight and moved gently back and forth in the air. The fourth paper towel should be held in front of a blow dryer that is set on low. When one paper towel is completely dry, students gather to compare the wetness of their four paper towels. Have students rank the towels from driest to wettest. Discuss the results. Ask students the following questions:

- Which method dried the paper towel the fastest? Why?
- Based on this experiment, would your clothes dry faster outside on the clothesline, in the drier, or hanging on a hanger in your home?
- What evidence do you have to support your prediction?
- What difference might you find if you hung your clothes outside on a hot summer day, cold windy day, and a rainy day? Why?

TEACHER NOTES

SUGGESTIONS FOR ASSESSMENT

For **Drying Conditions**, have students use Blackline Master 1: Scientific Inquiry Recording Sheet: Grades 1 and 2.

**Science Journal Entry: Drying Conditions**

Ask students: On which day will your clothes dry quickly? Explain how you know.

a cold, windy day

a rainy day

a hot, humid, windy day

a hot, dry, windy day

Explanation for “a hot, dry, windy day” should include the following points:

- the warmer the temperature, the faster the drying time
- the lower the moisture in the air (humidity), the faster the drying time
- moving air (wind) speeds up evaporation, therefore decreasing drying time

PRESCRIBED LEARNING OUTCOMES
<i>Students will...</i>
<p><b>2-4-09</b> Identify sources of drinking water, and explain how this water is distributed in one’s own and in other communities.</p> <p><i>Examples: wells, springs, lakes, rivers are sources; pumps, pipes, aqueducts and water trucks help distribute water...</i></p> <p>GLO: B1, D5, E2</p> <p><b>2-4-10</b> Describe different uses of water by humans.</p> <p><i>Examples: drinking, washing, cooking, canoeing, irrigating...</i></p> <p>GLO: B1</p>
<p><b>2-0-2a.</b> Access information using a variety of sources. <i>Examples: elders, simple chapter books, concept books, CD-ROMs, Internet...</i> (ELA 1.1.2, 3.2.2 Math SP-II.1.2; TFS 2.1.1) GLO: C6</p> <p><b>2-0-7e.</b> Describe, in a variety of ways, what was done and what was observed. <i>Examples: concrete materials, captioned drawings, oral language...</i> (ELA 4.1.2, 4.2.5) GLO: C6</p>
<p><b>2-4-11</b> Explain and appreciate the importance of clean air and water for humans, plants, and animals.</p> <p>GLO: B5, D2</p> <p><b>2-4-12</b> Identify substances that pollute air and water, and describe ways of reducing such pollution.</p> <p><i>Examples: car exhaust, smoke, carbon monoxide, oil, house paints, and sewage...</i></p> <p>GLO: B3, B5, D3, D5</p>
<p><b>2-0-4e.</b> Respond to the ideas and actions of others in building their own understandings. (ELA 1.1.2) GLO: C5, C7</p>

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SUGGESTIONS FOR INSTRUCTION

- **Drinking Water Word Sort**  
Give each student a 5 x 10 cm manila tag card. Have each student write the name of a place where he/she would find drinking water. Put the titles: “**In Nature**” and “**Human-Made**” on the board. Have the students tape their words under the correct heading. Have other cards ready for students as they brainstorm other places where they would find drinking water (water fountain, sink, lake, river, well, etc.). Add these new cards to the sorting board.
- **Where Does Water Come From?**  
Have students listen to, read, and discuss texts that explain how water is delivered to their own and other communities. Use before, during, and after listening/reading strategies to help students increase their comprehension of concepts.  
Have students work with partners to make a diagram showing how water gets from its source to their home or the school and is distributed to different rooms in the building. A visit to the mechanical room of the school or the basement in a home can help students appreciate the system of pipes needed to bring water into a home and have it available at a number of locations.
- **Water Uses**  
With students, brainstorm and list different uses of water by humans. On a large diagram of a house, have students use pictures or words to indicate which uses for water occur in different rooms of a house.
- **Clean Air and Water**  
As a class, discuss the following questions:
  - Why is clean air important to living things?
  - What happens to living things if the air is not clean?
  - How does air become unclean or polluted?
  - Why is clean water important for living things?
  - What happens to living things when water is not clean?
  - How does water become unclean or polluted?
- **Focus on Pollution**  
With students, brainstorm and list causes of air pollution and water pollution. Have students work in pairs to suggest ways to reduce this pollution. Have students reach consensus and record their prevention measures.

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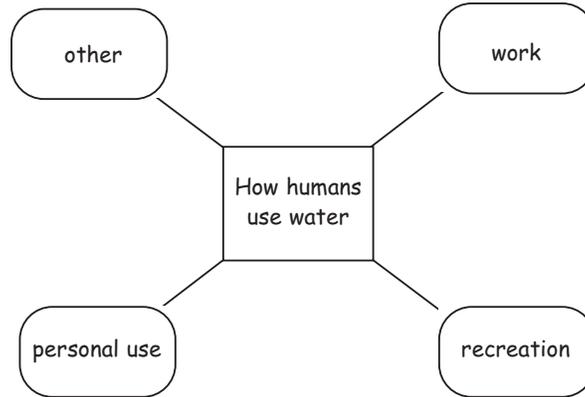
**TEACHER NOTES**

**SUGGESTIONS FOR ASSESSMENT**

The City of Winnipeg, Water and Waste Department publishes pamphlets and an education program related to water and water conservation. For more information telephone (204) 989-8355. See the References section for more information.

**Paper and Pencil Task: Water Uses**

Have students design/create a web or mind map to show how humans use water. Example:



**Mind Map/Web Checklist: Water Uses**

The student demonstrates an understanding of water use by including examples of

- personal use
- recreational use
- work-related use
- other

**Science Journals: Clean Air and Water**

Have students respond to the following prompts in their science journals.

I think clean air is important to living things because:

1. \_\_\_\_\_
2. \_\_\_\_\_

I think clean water is important to living things because:

1. \_\_\_\_\_
2. \_\_\_\_\_

**PRESCRIBED LEARNING OUTCOMES**

**SUGGESTIONS FOR INSTRUCTION**

*Students will...*

**2-0-4g.** Verbalize questions, ideas, and intentions during classroom activities. GLO: C6  
**2-0-7e.** Describe, in a variety of ways, what was done and what was observed. *Examples: concrete materials, captioned drawings, oral language...* (ELA 4.1.2, 4.2.5) GLO: C6

➤ **Radio or Television Commercials**

Have students work in pairs to write slogans for television or radio commercials that promote the ideas of reducing pollution and keeping the environment clean. For example: Toss your garbage in the trash. Don't pour paint into the grass. Stop: don't pour oil in the sewer.

**2-4-13** Recognize that clean water is an increasingly scarce resource in many parts of the world, and describe consequences of a shortage of clean water.  
 GLO: B1, B3, B5

➤ **The Wealth of Water**

Have students listen to, read, and view pictures, magazines, newspaper articles, and video clips showing the scarcity of water in many parts of the world. Identify how a shortage of water might have an impact upon daily life, e.g., washing, drinking, bathing, crops, etc.

**2-0-2a.** Access information using a variety of sources. *Examples: elders, simple chapter books, concept books, CD-ROMs, Internet...* (ELA 1.1.2, 3.2.2 Math SP-II.1.2; TFS 2.1.1) GLO: C6  
**2-0-9a.** Willingly consider other people's views. GLO: C5, C7

**2-4-14** Record personal use of water, and identify ways in which they can reduce water usage.  
*Examples: rather than leaving water running while brushing teeth, turn off tap to reduce usage...*  
 GLO: B5, C2, C5

➤ **Water Diary**

Give each student a chart such as the one below to record their personal use of water for the day. Students use a tally mark every time they use water.

Math Link: The following day, when the chart is completed, ask students to tally and graph their results.

Have students use a chart similar to the one shown below.

**Personal Use Chart**

Water Use	At School	At Home	Other
Bathroom	✓✓✓	✓✓	✓
Washing	✓	✓✓✓	
Brushing teeth		✓✓✓✓	✓
Recreation		✓	✓
Drinking	✓✓✓✓	✓✓	✓

**2-0-5e.** Record observations using written language, drawings, and, with guidance, charts. (ELA 4.1.2, 4.2.5) GLO: C2, C6  
**2-0-6a.** Construct and label concrete-object graphs, pictographs, and bar graphs using 1:1 correspondence. (Math SP-III.2.2) GLO: C2, C6  
**2-0-7d.** Connect new experiences, ideas, and information with prior knowledge and experiences. (ELA 1.2.1, 2.1.2) GLO: A2

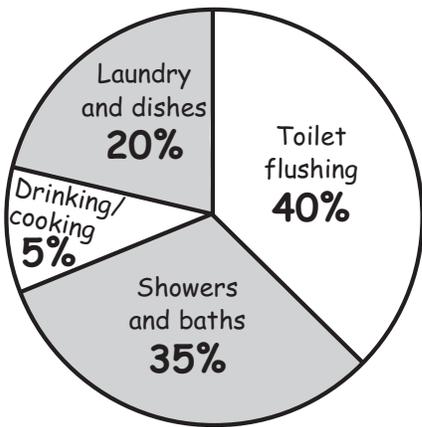
➤ **Water Conservation Posters**

As a class, review personal-use charts and brainstorm ways in which students can reduce the amount of water they use (e.g., turn off the tap when brushing their teeth, have shorter showers, don't fill the bathtub to the top, set a timer when watering the garden, fix dripping faucets, etc.). Have each student select one conservation method and make a poster to illustrate it.

TEACHER NOTES

SUGGESTIONS FOR ASSESSMENT

**Household Water Use in Manitoba\***



\* Source: *The Manitoba Clean Water Guide*, p. 14. Reproduced with permission of Manitoba Environment, 1999.

**Paper and Pencil Task: Water Waste**

Have students examine the pictures and describe how water is being wasted. Ask students how the waste can be reduced.



**NOTES**