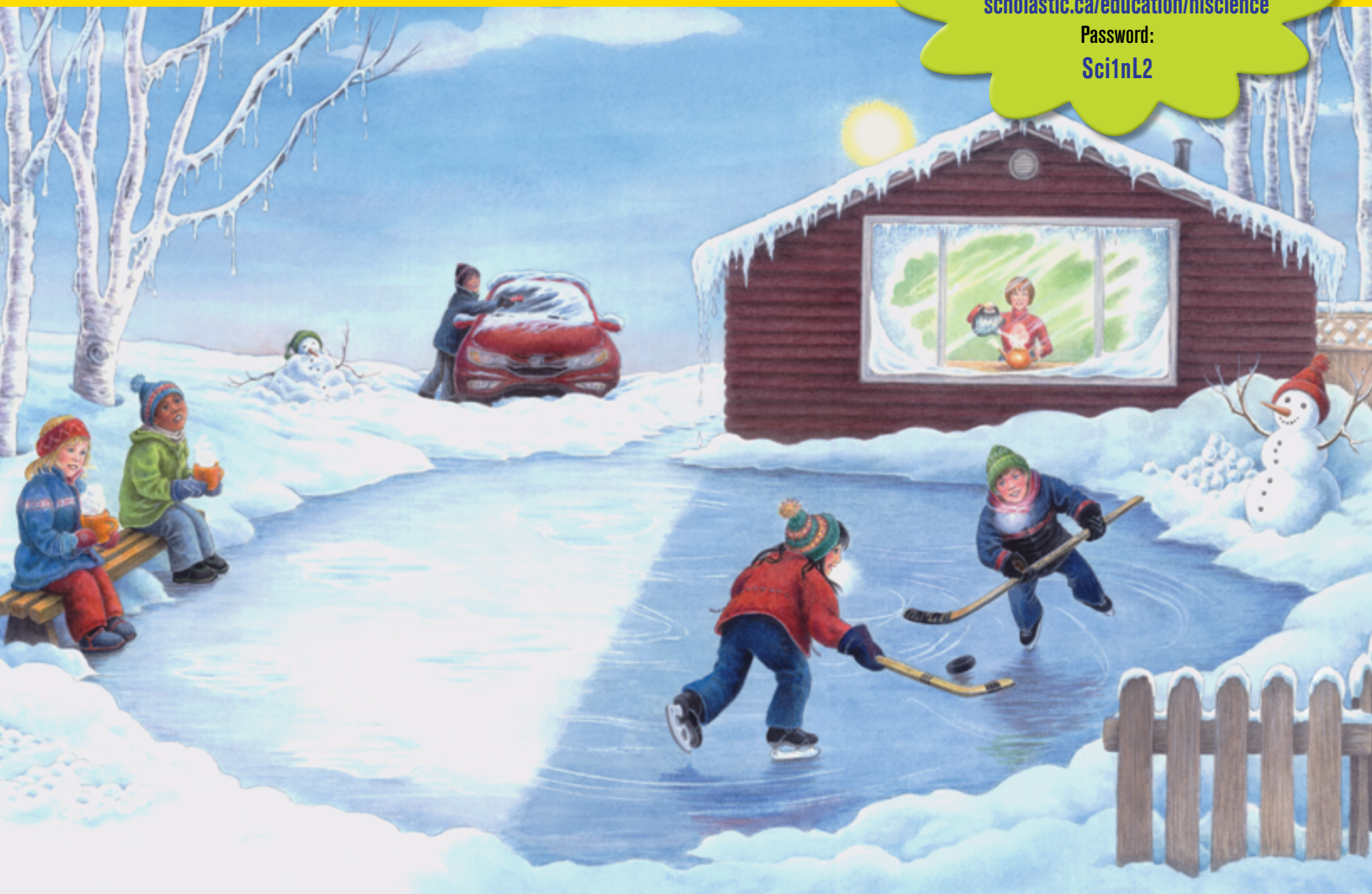


Grade **2** **Air and Water in the
Environment**
TEACHER'S GUIDE

Online version
and additional resources
available at
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Password:
Sci1nL2



Air and Water in the Environment

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Let's Do Science, Newfoundland and Labrador

Grade 2 Unit 1: Air and Water in the Environment Teacher's Guide

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Welcome to the *Air and Water in the Environment* Unit

In this unit, students develop their understanding of air and water in the environment through a variety of explorations and investigations. Multiple components will engage students and support learning of the specific science concepts.

Science Cards

This collection of 12 Science Cards will support students' exploration of air and water in the environment with each large-format card focusing on a different concept. The bright, colourful photographs and detailed illustrations will engage students and give them multiple opportunities to explore a variety of concepts. These stand-alone cards can also be used at centres to stimulate student explorations. Also, digital versions of these cards are available on the Teacher's Website to be used with an Interactive Whiteboard.



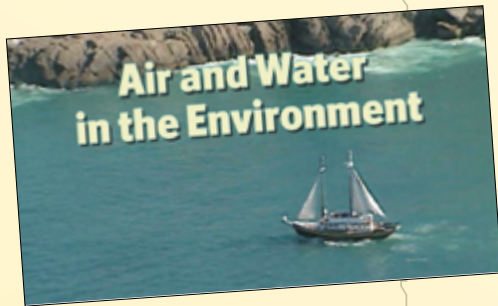


Science Read Alouds

Two Read Aloud texts allow you to introduce and engage students with science concepts. *Come On, Rain!* by Karen Hesse and Jon J. Muth is a story full of wonderfully rich vocabulary that introduces the concepts of moisture in the environment and changing air conditions.



The Little Knight Who Battled the Rain by Gilles Tibo and Geneviève Després is a delightful story that explores the effects of weather on objects and materials and which can lead students to an investigation of how to protect objects and materials under different weather conditions.

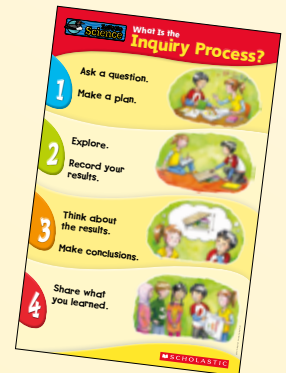


Anchor Video

The Anchor Video: *Air and Water in the Environment*, found on the Teacher's Website, introduces students to essential questions about changing air conditions; moisture in the air, in materials, and in living things; and how we can keep our air and water clean and safe to use. The video gives a number of examples to activate students' thinking and to promote questions.

Poster

The *What Is the Inquiry Process?* poster will support students as they follow the steps for guided and open inquiries throughout the unit and learn to question, observe, and explore.



Interactive Whiteboard Activities

There are 9 interactive activities for the Interactive Whiteboard (IWB) found on the Teacher's Website. These activities provide students with a variety of hands-on learning experiences and the opportunity to apply learning in a supported environment. The IWB Activities are tied to the teaching plans to ensure that the learning is done in context.





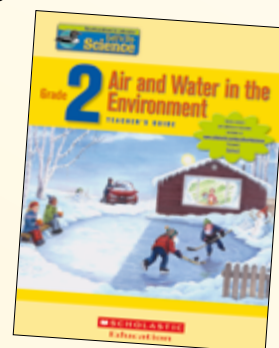
Science Library

The Science Library provides a collection of colourful and engaging non-fiction and fiction texts at a variety of reading levels. These texts support students as they explore various science concepts and skills. See the *Science Library Guide* in the Teacher's Guide Binder or online for brief summaries, science connections, and suggested reading approaches (e.g., Independent Reading and Read Aloud).

Teacher's Guide

This guide provides detailed suggestions for using all of the components including the Science Cards, Anchor Video, reproducible Blackline Masters (BLMs), and IWB Activities with your students. Visual cues such as book covers, thumbnail images, and icons highlight the use of each component along with tools such as Science Folders and Journals, the Word Wall, and the I Wonder Wall. Strategies and tools you need to assess students' learning, such as rubrics and checklists, are also included.

Embedded within the teaching plans are connections to Guided and Shared texts from *Literacy Place for the Early Years*, Grade 2 that relate to the concepts explored in *Air and Water in the Environment*.



Teacher's Website

In addition to the Science Cards, Anchor Video, and IWB Activities mentioned above, the Teacher's Website provides a digital copy of the Teacher's Guide for this unit along with access to an image bank containing the variety of photographic images found on the Science Cards and IWB Activities. These images may be used for teachers to create new IWB Activities or for students to incorporate into presentations. Find the Teacher's Website at scholastic.ca/education/nlscience
Password: Sci1nL2



Planning Guide for *Air and Water in the Environment*

Teaching Plans	Specific Curriculum Outcomes	Components	Materials	Literacy Place Connections
Air in the Environment Students will explore evidence that air exists all around them and use scientific terminology when communicating their understanding.	Skills [GCO 2] • 1.0 • 2.0 STSE/K [GCO 1/3] • 3.0	• Science Card 1 • Anchor Video: <i>Air and Water in the Environment</i> • IWB Activity 1	• electric fan (optional) • streamers or light scarf (optional) • balloons • books • hand-held pump • shatterproof cups • low-sided container of water (e.g., a baking dish) • empty water bottles • scrap paper • plastic or paper bags • straws • whoopy cushion (optional) • students' Science Journals	
States of Water Students will identify the three states of water and compare the characteristics of water and ice.	Skills [GCO 2] • 1.0 • 2.0 STSE/K [GCO 1/3] • 4.0	• Science Card 2 • IWB Activity 2 • BLM <i>Same or Different?</i> • IWB Activity 3	• students' Science Journals • washing tubs, plastic sheeting, newspapers, or towels • ice cubes or Freezies (optional) • warm, room temperature, and cool water in shatterproof glasses, tubs, or bottles of various volumes • sponges • various kinds of paper • empty containers of various sizes • thermometers • digital camera (optional)	<i>An Early Worm Got Out of Bed</i> ("Fog," page 7, Shared Reading–Active Learning Kit)

Teaching Plans	Specific Curriculum Outcomes	Components	Materials	Literacy Place Connections
Water and Temperature Students will predict how and why water changes from one state to another, make and record observations and measurements while investigating how and why water changes state from liquid to solid or vice versa, and discover the role of temperature in changes of state.	Skills [GCO2] • 6.0 • 7.0 STSE/K [1/3] • 5.0	• Science Card 3 • <i>What Is the Inquiry Process?</i> poster • BLM <i>When Did It Melt?</i> • IWB Activity 4	• kettle or humidifier • two mugs • thermometers • metal spoons or hand mirrors • frozen shapes or Freezies (optional) • incandescent lightbulb or hair dryer • containers of different shapes and sizes • tray or container for transport • timer (optional) • ice cubes • cups with warm, room temperature, and cool water • trays • index cards • markers • plastic googly eyes • bowls, cardboard, bubble wrap, and other materials to insulate ice-cube people • students' Science Journals • washtubs or other large waterproof containers • water or snow (optional)	<i>Journey of a Water Drop</i> (Guided Reading, Level N)
Moisture Around Us Students will ask and explore questions about the amount and location of moisture in the environment and in living things.	Skills [GCO 2] • 9.0 • 10.0 STSE/K [GCO 1/3] • 8.0	• Science Card 4 • BLM <i>Which is the Juiciest?</i> • <i>Come On, Rain!</i> (Read Aloud) • <i>What Is the Inquiry Process?</i> poster • BLM <i>My Plan</i>	• slices of fruits and vegetables of varying moisture levels • paper towels • clear plastic bag • leafy house plant • digital camera (optional) • spray bottle of water • dehumidifier • students' Science Folders • students' Science Journals	

Continued on next page...

Planning Guide for *Air and Water in the Environment* (continued)

Teaching Plans	Specific Curriculum Outcomes	Components	Materials	Literacy Place Connections
Changes in Moisture Students will explore changes in location, amount, and form of moisture, and communicate with others as they are exploring.	Skills [GCO 2] • 12.0 STSE/K [GCO 1/3] • 11.0	- Science Card 5 - IWB Activity 5 - BLM <i>Concept Diagram</i>	- paper towel - pencils or markers - wet towels or bowls of water - two identical containers (ideally metal cans) - water and ice - students' Science Folders - students' Science Journals - plastic wrap - ice cubes or snow - warm water - metal tray or pie plate - large glass jar with a wide mouth - digital camera (optional) - coloured paper - paint brushes (optional)	
Changing Moisture Levels Students will, through guided inquiry investigations, discover how and why moisture changes, and communicate what they did and what they found out.	Skills [GCO 2] • 14.0 STSE/K [GCO 1/3] • 13.0	- Science Card 6 <i>What Is the Inquiry Process?</i> poster - BLM <i>My Inquiry</i>	- identical pieces of cloth - sealable plastic bags - slices of fruits and vegetables - digital camera (optional) - Flex Arm camera (optional) - food dehydrator (optional) - containers of various shapes and sizes (e.g., cups, saucers) - variety of materials (e.g., foil, construction paper, mirrors, plastic wrap, wax paper, felt, cotton) - heat sources (e.g., hairdryers, electric fans, or heat lamps) - students' Science Folders - small plastic cup and container it will fit in (e.g., bowl) - plastic wrap - marker - small stone - lamp (optional)	

Teaching Plans	Specific Curriculum Outcomes	Components	Materials	Literacy Place Connections
Changes in Air Conditions Students will observe and measure changes in air conditions, select tools appropriate for their needs, and explore how weather affects objects and materials.	Skills [GCO 2] • 16.0 STSE/K [GCO 1/3] • 15.0	- Science Card 7 - BLM <i>Venn Diagram</i> - IWB Activity 6 - BLM <i>Pinwheel</i>	- variety of weather instruments - thermometers - paper or index cards - markers - crayons - coloured pencils or markers - scissors - straws - paper fasteners - single-hole paper punch - digital camera (optional)	<i>The North Wind and the Sun</i> (Guided Reading, Level H)
Protection from Different Weather Conditions Students will explore and choose materials that can protect objects and materials in specific weather conditions.	Skills [GCO 2] • 19.0 STSE/K [GCO 1/3] • 17.0 • 18.0	- Science Card 8 <i>The Little Knight Who Battled the Rain</i> (Read Aloud) - Science Card 9	- coloured construction paper (sheets) - students' Science Folders - common and galvanized nails - rust protection coatings - craft sticks - paint and/or wood stain - leather swatches - plain fabric and waxed fabric - protective spray, such as Armor All - small squares of dark- and light-coloured construction paper - digital camera (optional)	
Air, Water, and People Students will explore how water is used and obtained in their homes and local community, and construct and label pictographs to communicate some of their findings.	Skills [GCO 2] • 21.0 STSE/K [GCO 1/3] • 20.0	- Science Card 10 - IWB Activity 7 - BLM <i>Our Water Use</i> - IWB Activity 8	- students' Science Folders - students' Science Journals	
Pollution Students will explore the causes and effects of air and water pollution, and suggest personal actions they can take to reduce pollution.	STSE/K [GCO 1/3] • 22.0	- Science Card 11 - IWB Activity 9 - Science Card 12	- bottle of dirty water - bottle of clean water - students' Science Journals	

Preparing for the Unit

1. Curiosity Centre

The Curiosity Centre gives students an opportunity to investigate science ideas and tools through active participation, free exploration, and independent play. In this hands-on centre, students can touch, feel, and explore objects related to air and water in the environment.

The Curiosity Centre could have

- bags, balloons, transparent plastic cups, whoopy cushion, straws, paper, paper towels, containers of various sizes and shapes
- samples of liquid and solid water: ice cubes; Freezies; warm, room temperature, and cool water in various containers
- bubble wrap, plastic wrap, felt, cardboard, various fabrics, Styrofoam, and other materials useful for wrapping ice to slow melting times
- baking trays, newspaper
- items to test for moisture, such as soil, moss, baby wipes

Check the centre frequently to ensure it is well stocked with items. Invite students to contribute to the centre by bringing in items or photographs related to air and water in the environment. Remind students to tidy up the materials when they are finished.

Note: You may choose to display new items every few days or introduce items one at a time throughout the unit.

2. Science Journals and Folders



Demonstrate for students how to record observations, questions, ideas, results, notes, and so on, by writing or drawing pictures in their Science Journals. Encourage students to add new questions or ideas to their Journals as often as they like.

Science Journals along with completed BLMs, drawings, stories, etc. related to the unit can be stored in the students' Science Folders

3. Word Wall



Add any relevant science terminology to the Word Wall throughout the unit.

4. I Wonder Wall



Build the I Wonder Wall throughout the unit by posting students' questions as they arise. Refer to the I Wonder Wall often and select questions that students may be ready to answer.

5. Reading Centre

Add texts (books, magazines, and photographs) relating to air and water to the Reading Centre. Or, you may choose to include these texts in the Curiosity Centre. The titles in the Science Library will help start off a collection of books. Also refer to the lists of texts pertaining to Air and Water in the Environment in the Additional Resources section of this guide (pages 86–87).

Air in the Environment



Focus: Students will explore evidence that air exists all around them and use scientific terminology when communicating their understanding.

Specific Curriculum Outcomes

Students will be expected to:

- 1.0 pose questions that lead to exploration and investigation [GCO 2]
- 2.0 communicate using scientific terminology [GCO 2]
- 3.0 explore how air surrounds us, takes up space, and is felt as wind when it moves [GCO 1/3]

Performance Indicators

Students who achieve these outcomes will be able to:

- select materials to demonstrate how air surrounds us, takes up space, and can be felt as it moves
- use scientific terminology to communicate their observations

NOTES:

Attitude Outcome Statements

Encourage students to:

- recognize the role and contribution of science in their understanding of the world [GCO 4]

Cross-Curricular Connections

Social Studies

Students will be expected to:

- describe how people's interactions with their environment have changed over time [2.4.2]

English Language Arts

Students will be expected to:

- speak and listen to explore, extend, clarify, and reflect on their thoughts, ideas, feelings, and experiences [GCO 1]
- respond personally to a range of texts [GCO 6]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 1 • Anchor Video: <i>Air and Water in the Environment</i> • IWB Activity 1	• electric fan (optional) • streamers or light scarf (optional) • balloons • books • hand-held pump • paper towels • transparent, shatterproof cups • low-sided container of water (e.g., a baking dish) • empty water bottles • scrap paper • plastic or paper bags • straws • whoopy cushion (optional) • students' Science Journals	• Display a KWLN chart. • Create a Wordle or another word cloud puzzle. • Invite an Elder or an Indigenous Knowledge Keeper to participate in the Nature Walk.	• air • water • weather • wind • temperature • question • explore • observe • evidence

Safety

- Review school safety rules before students go outside for an investigation.
- Use trays or other containers when working with water and wipe up any spills immediately.

Science Background

- “Air” is the mixture of gases found in the lowest part of Earth’s atmosphere. Air is 78% nitrogen and 21% oxygen, with traces of water vapour, carbon dioxide, and other gases.
- Air takes up space. A balloon expands when inflated with air because air takes up space.
- Air has mass. Weight is a measurement of mass; if a balloon were weighed before and after it was inflated with air, the inflated balloon (balloon + air) would weigh more.
- Air moves. We feel air movement or see its consequences when it makes other objects or substances move. Wind is the movement of large masses of air.
- Air can exert pressure. As air is pumped into a container, it fills the container and then compresses (squeezes), generating pressure. Air pressure can be used to do work; for example, in automobile tires, air pressure supports the vehicle.
- The volume (amount of space it takes up) and density (mass per unit volume) of air changes with temperature. Heating adds energy, which causes the gas particles in air to move faster and further apart; in a flexible container (e.g. a balloon) or in the atmosphere, this causes the volume to increase and the density to decrease. Therefore, a cubic litre of cold dense air will weigh more than a cubic litre of warm, less dense air. A hot air balloon rises because the air within it is less dense than the air surrounding it.

Possible Misconceptions

- Students often believe that scientists only invent things or solve practical problems, and imagine them as working alone in laboratories. Address this misconception by integrating “science” and “scientist” into enjoyable activities that involve observation and exploration. For example, during the nature work, mention how a scientist would look for interesting things and try to find out more about them, just like they are doing.
- Grade 2 students rely on their five senses to tell them about their world far more than logical ideas. Perhaps because air is invisible, students may not think of air as being a substance at all, or imagine that it comes and goes (such as with wind or by breathing), not existing otherwise. Students may think of wind as a different substance than air.
- Students at this age often think that evidence is something they already know, have personally experienced, or that someone told them, and are unlikely to consider observations of an experiment to be evidence. Ask students to explain their reasoning to get insight into their viewpoints and gently challenge these ideas.

ACTIVATE



Air and Water Around Us

Create a chart, such as a KWLN chart, for recording the class exploration of air and water. This is also an opportunity to start the I Wonder Wall. Share Science Card 1 and ask students to tell you what they notice about the pictures. Prompt thinking by asking:

- **What do these pictures show?**

Record students' ideas and questions on the KWLN chart. Then, wonder aloud why the flag, the dandelion seeds, and ribbons on the fan are moving and then, if there is anything the same about the iceberg, the running water, and the steam from the kettle. Pause during your wondering so that students can respond, and encourage them to share any questions they have. Then ask:

- **Where can you find air and water?**
- **How do you know if there is air and/or water in the picture?**
- **How can we group these pictures into air and water?**

Record students' responses using a T-chart or take the opportunity to demonstrate using a graphic organizer such as a Venn diagram.

Anchor Video

Play the Anchor Video: *Air and Water in the Environment* which is located on the Teacher's Website. Set a focus for viewing by asking students to think about why air and water are important. You may choose to pause the video to allow students to answer questions or to discuss any questions which students may have.

I Wonder Nature Walk

Take the class on a walk outside, somewhere that has natural water (e.g., a body of water, a puddle) and objects that will readily show wind movement (e.g., a flag, vegetation). You might invite an Elder or an Indigenous Knowledge Keeper to participate in the walk, and ask her or him to share stories or other cultural aspects of how air is important to Indigenous peoples, such as the importance in predicting weather when living on the land. Photograph or have students sketch things that pique their interest and which relate to air and water in the environment.

As you are walking, model posing "I wonder" questions about air and water. For example, ask:

- **I wonder why the leaves are moving?**
- **I wonder why it's warmer out of the shade?**
- **I wonder why the grass is wet?**

Ask students what they wonder about as the walk continues. Students may not naturally generate I wonder questions related to air and water around them, but do not restrict the topic of their questions.



Back in the classroom, sketch a large map of the walk route in a central place and, working as a class, have students add the photographs and/or sketches from the walk. Students might make drawings from memory and add these images. Continue to model “I wonder” questions about air and water as students work on adding images. Prompt students to ask their own questions. Encourage creative ways of expression, such as supporting a student to draw a picture of a phenomenon they are curious about. Use of a question generator such as Wonderopolis or question matrix may lead students to deeper questioning. Add these questions to the I Wonder Wall in the classroom.

Air and Water Words

Create and make copies of a Wordle, using terminology that came up in the Nature Walk or any or all of the following unit terminology: air, water, ice, water vapour, steam, moisture, weather, wind, rain, snow, hail, fog, cloud, dew, frost, humidity, question, explore, investigate, observe, predict, measure, record, sequence, group, conclude, communicate, solid, liquid, gas, evaporation, condensation, melting, freezing, temperature, thermometer, rain gauge, windsock, anemometer, weather vane, waterproof, rust, stream, river, lake, pond, ocean, wells, pipes, tap, pollution, conservation. Have students circle any words they don’t know, and tell that they will learn about these words in this unit. Have students keep the Wordle somewhere they can access easily and refer to throughout the unit. Alternatively, make thematic Wordles based on key concepts, such as air, states of matter, moisture, drying, weathering, and the environment.

Introducing Air

Open a window or turn on an electric fan to show students the effects of air movement on a light object, such as a streamer or light scarf. Ask students to explain what happens to the object. Respond to students’ suggestions by asking:

- **How do you know? What is the evidence?**



Explain that evidence is something we observe (e.g., see, hear, or feel) that backs up an idea. Add “evidence” to the Word Wall, and continue to use it during discussions with the students. Then, ask:

- **Is there anything else you wonder about what we observed?**
- **Is there anything you wonder about evidence?**



Add students’ questions to the I Wonder Wall.

CONNECT

Carnival of the Air

You will perform three demonstrations, some of which involve direct student participation. Before class, or at the start of class with student help, set up a stage area to perform the demonstrations as acts in a show. Students can

create a banner or sign for each act. You might wear a costume, such as the top hat and tails of a ringmaster for the Carnival of the Air; you could also present the demonstrations as a magic show. Make a video of each demonstration.

Demonstration 1:

Gather balloons, a few books, and (if available) a hand-held pump. Speak like a carnival barker and say:

- **Watch as I raise these books without touching them!**

Show a balloon to the students, and then place it under the books. Using the pump or your breath, inflate the balloon until the stack of books begins to rise. You might ask for a volunteer to inflate the balloon. When the performance is over, ask:

- **Why do you think the books rose?**
- **What was in the balloon? What is the evidence?**
- **Where did the air come from? How do you know?**

Demonstration 2:

Gather paper towels, a transparent shatterproof cup, and a low-sided container of water, such as a baking dish. In your carnival voice, say:

- **I am now going to put a paper towel in water, and it won't get wet!**

Place a crumpled paper towel inside the bottom of the cup, and invert the cup in the container of water. The air in the cup will displace the water, so water will not enter the cup and moisten the towel. Ask for volunteers to perform the same act. Challenge students to explain the trick and provide evidence for their explanations. If any of the towels get wet, ask students to suggest reasons to explain this, again asking them to provide evidence.

Demonstration 3:

Gather several empty water bottles and scrap paper. Hold the empty water bottles horizontally and place a small, crumpled piece of paper inside the neck of each bottle. In your carnival voice, say:

- **Blow the paper into the bottle and win a prize!**

Invite students to try to blow the paper into the bottle. It will not go in because the paper will push up against the air already filling the bottle. Guide students in coming up with an explanation and providing evidence for their ideas.

CONSOLIDATE

IWB Activity:

- Have students circle the images where air is found using Activity 1: *Is there air there?* (see the Teacher's Website).



Get In On the Act

Tell students they are going to create their own act for the Carnival of the Air; their act must show that air is a substance that takes up space. Allow students to explore and choose a variety of items (such as those at the Curiosity Centre) that can be filled with air, for example, bags, balloons, transparent shatterproof cups, or a whoopy cushion, as well as various materials that can be used to add air to or keep air in these items, such as straws, paper, and containers of water. Have students work in small groups to create and then perform their act. After performances are complete, have each group describe how their act showed how air takes up space, or ask other class members to describe what the act showed about air.

Question List

Invite students to generate a personal list of questions that they would like to explore and investigate throughout the unit. Students can record the list of questions in their Science Journals.

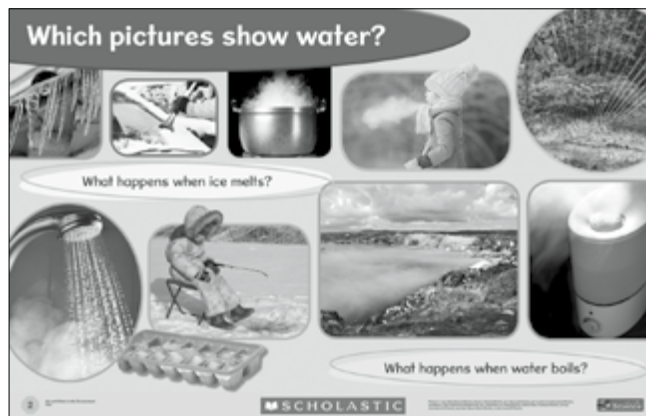
EXPLORE MORE



Weathered Objects

Ask students to bring to class a small, inexpensive object that can be left outside over the course of the year. Tell students that you will keep the objects outside and bring them back to class periodically so that students can observe how the objects have been affected by the weather. Invite students to predict what, if anything, they think will change about the object. Ask students to record their predictions in their Science Journals.

States of Water



Focus: Students will identify the different states of water and compare the characteristics of water and ice.

Specific Curriculum Outcomes

Students will be expected to:

- 1.0 pose questions that lead to exploration and investigation [GCO 2]
- 2.0 communicate using scientific terminology [GCO 2]
- 4.0 explore characteristics of the three states of water [GCO 1/3]

Performance Indicators

Students who achieve these outcomes will be able to:

- describe the characteristics of water in one of its states
- use appropriate scientific terminology to communicate their observations

NOTES:

Attitude Outcome Statements

Encourage students to:

- willingly observe, question, and explore [GCO 4]

Cross-Curricular Connections

Social Studies

Students will be expected to:

- describe how people's interactions with their environment have changed over time [2.4.2]

English Language Arts

Students will be expected to:

- interpret, select, and combine information using a variety of strategies, resources, and technologies [GCO 5]
- use writing and other forms of representation to explore, clarify, and reflect on their thoughts, feelings, experiences, and learnings; and to use their imaginations [GCO 8]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 2 • IWB Activity 2 • BLM <i>Same or Different?</i> • IWB Activity 3 Literacy Place: • <i>An Early Worm Got Out of Bed</i> ("Fog," page 7, Shared Reading–Active Learning Kit)	• students' Science Journals • washing tubs, plastic sheeting, newspapers, or towels • ice cubes • Freezies (optional) • warm, room temperature, and cool water in shatterproof glasses, tubs, or bottles of various volumes • sponges • various kinds of paper • empty containers of various sizes • thermometers • digital camera (optional)	• Freeze water in containers of various shapes or provide Freezies. • Invite an Elder or an Indigenous Knowledge Keeper to share how the different states of water figure in traditional activities. • Gather Internet and print resources related to the importance of ice to polar bears.	• explore • investigate • evidence • solid • liquid • gas • water vapour

Science Background

- There are three main states of matter: solid, liquid, and gas. Solids, liquids, and gases have distinctive physical properties. When a substance changes from one state to another (e.g., ice melts), the particles making up the substance remain the same, but their arrangement relative to one another and their amount of motion changes.
 - Solids are made of particles that are packed tightly together and have little movement. They keep their shape. Heating some solids can turn them into liquids.

- Liquids are made of loosely packed particles and have medium movement. Liquids can flow and take the shape of any container. Heating a liquid can turn it into a gas. Cooling a liquid can turn it into a solid.
- Gases are very loosely packed particles and have high movement. They spread out and change their shape to fill up whatever container they are in. Cooling a gas can turn it into a liquid.
- Water vapour is always present in our atmosphere and is invisible. The steam that comes from a kettle is actually small droplets of condensed water that form when the water vapour contacts cooler air. Similarly, clouds are not water vapour; they are formed of water droplets that condense from water vapour in the air high in the atmosphere.

Possible Misconceptions

- Students are likely to see ice, water, and steam as distinct substances and believe one substance “turns into” another. Address this by asking students to explain their thinking (e.g., when ice melts, ask where the ice went and where the water came from).
- Young students rely primarily on their senses to get information about the world. Gases can therefore be difficult for grade 2 students to conceptualize, since they generally cannot be seen. Prompting students to smell cologne or other aromatic substances, can help them move toward an acceptance of the existence of gases. Note that water vapour is always invisible: steam (and fog and clouds) is made up of tiny droplets of liquid water suspended in air, which condensed from the water vapour when it contacted cooler air (such as outside a kettle).

ACTIVATE



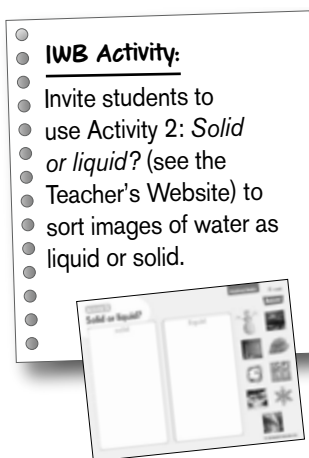
Gas, Liquid, Solid

Share Science Card 2 with the class. Invite students to describe what they see. Then, tell students that every picture has the same thing in it, and challenge them to tell you what it is. Allow students to make suggestions.

After listening to suggestions, point to the water in each picture and ask students to name it. Students likely will call each state of water by a different name (e.g., ice, water, steam). Link back to previous knowledge of seasons and weather, and of hot and cold, by asking questions such as:

- **What is the weather like in this picture? How do you know?**
- **What time of year was this picture was taken? What clues do you see that tell you?**
- **What is the temperature like? What evidence is there of that?**

Invite students to answer the question on the card: *What happens when ice melts?* and *What happens when water boils?* Introduce the terms “solid,” “liquid,” and “gas” and add them to the KWLN chart. Prompt students to share what they know about each term and what they wonder about each of the terms. Challenge students to give other examples of each state of water.





Students may have difficulty thinking of examples of gas; if so, present familiar examples and ask if it is a gas or not. Examples may include your breath (air), car or ATV exhaust, helium for balloons, or propane for a bbq. Point very close to steam and clouds on Science Card 2 to “show” water in the gas state and say that this is evidence of water being a gas. You might introduce the term “water vapour.” Add “solid,” “liquid,” “gas,” and “water vapour” to the Word Wall and then have students draw an example of a solid and a liquid in their Science Journals.

CONNECT

Water World

Create mini science centres with tangible examples of liquid and solid water that students can explore. Examples may include ice cubes (various shapes and sizes) or Freezies (different sizes); and warm, room temperature, and cool water in shatterproof glasses, tubs, or bottles of various volumes. Use washing tubs, plastic sheeting, newspaper, or towels to keep the area dry. Also provide material that will allow students to explore the properties of liquid and frozen water using their five senses, such as sponges, various kinds of paper (e.g., loose leaf, toilet paper, wax paper, paper towel), empty containers of various sizes, and thermometers. Make a record of students explorations by making a video or taking digital photos. As students explore, prompt deeper questioning and thinking by wondering aloud:

- I wonder if ice makes things wet?
- I wonder what happens when I put ice in water?
- I wonder what happens when I put this paper in the water?
- I wonder what material would best clean up a water spill?
- What do you wonder about?



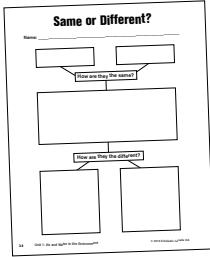
Invite students to record any new questions they have on index cards or sticky notes and add them to the I Wonder Wall.

Introduce/review the terms “explore,” “investigate,” and “evidence” during discussions and add these terms to the Word Wall. Provide prompts such as:



- How could you explore that idea?
- How might a scientist investigate to see if that idea is true?
- What evidence can you find to support your thinking?

CONSOLIDATE



Same or Different?

Divide the class into small groups, and provide copies of BLM *Same or Different?* Instruct students to think back to their explorations of ice and water. Ask:

- **How are ice and water the same? How are they different?**

For each answer given, have students decide as a group where and how to record that answer on their graphic organizer. When work is complete, have each group display their finished graphic organizer in the classroom. As a class, discuss any differences between the graphic organizers, whether in categorization of a response or in how groups decided to represent it.

Three “Types” of Water

Provide students with materials with which to create a scene depicting water in each of its three states. If students struggle, consider providing a scenario. For example, say:

- **Imagine you and your family go for a walk in the winter beside a river or the ocean. You bring along a thermos of hot chocolate to drink along the way. Can you think where you might find water in its liquid, solid, and gas state on this day?**

Alternatively, provide students with pictures to use as reference and/or for clues, such as pictures of a kitchen scene, a waterfall in winter, or a picnic scene.

Living with the Three States

Invite an Elder or Indigenous Knowledge Keeper to talk about the effects and importance of the different states of water on traditional activities such as hunting or fishing. For example, the visitor could talk about how snow changes with the temperature and affects activities such as pulling sleds (e.g., on warmer days, snow melts, which makes it more difficult to pull sleds; on colder days, snow is dry and crystalized and so blows in wind more easily, which makes travel more difficult).

IWB Activity:

- Challenge students to name each form of water shown in the illustration using Activity 3: *Where's the water?* (see the Teacher's Website).



Literacy Place Connection:

“Fog” on page 7 of *An Early Worm Got Out of Bed* describes the feeling of fog. Revisit or read the text with students and ask:

- **Is fog a solid, a liquid, or a gas?** (Fog is made up of tiny droplets of liquid water suspended in the air.)



EXPLORE MORE

Polar Bears and Ice

Working in small groups, challenge students to find an answer to the question:

- **Is ice important for polar bears?**

Provide Internet and print resources. Groups can share their findings with the class as a poster or an oral presentation.

Labelling States of Water

Revisit Science Card 2 and invite students to use sticky notes to label the images on the card according to the states of water shown. (Students will readily identify liquids and solids. Help them to identify gases [water vapour] any time there is air shown. Remind students that water vapour is invisible: steam, fog, and clouds are made up of tiny droplets of liquid water suspended in air, which condensed from the water vapour when it contacted cooler air.)



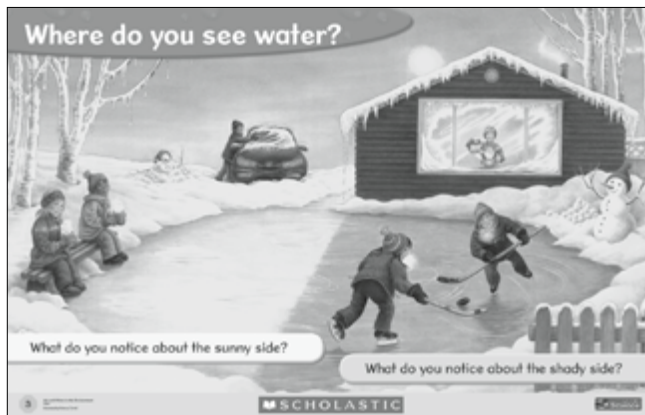
Same or Different?

Name: _____

How are they the same?

How are they the different?

Water and Temperature



Focus: Students will predict how and why water changes from one state to another, make and record observations and measurements while investigating how and why water changes state from liquid to solid or vice versa, and discover the role of temperature in changes of state.

Specific Curriculum Outcomes

Students will be expected to:

- 5.0 investigate changes that occur when the three states of water are heated or cooled [GCO 1/3]
- 6.0 predict based on an observed pattern [GCO 2]
- 7.0 make and record observations and measurements [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- plan and test a means to slow down the rate of melting of an ice-cube person

NOTES:

Attitude Outcome Statements

Encourage students to:

- willingly observe, question, and explore [GCO 4]
- appreciate the importance of accuracy [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- communicate information and ideas effectively and clearly, and to respond personally and critically [GCO 2]
- respond personally to a range of texts [GCO 6]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 3 • <i>What Is the Inquiry Process?</i> poster • BLM <i>When Did It Melt?</i> • IWB Activity 4 Literacy Place: • <i>Journey of a Water Drop</i> (Guided Reading, Level N)	• kettle or humidifier • two mugs • thermometers • metal spoons or hand mirrors • frozen shapes or Freezies (optional) • hot and cold water • paper towels • incandescent lightbulb or hair dryer • containers of different shapes and sizes • tray or container for transport • timer (optional) • ice cubes • cups with warm, room temperature, and cool water • trays • index cards • markers • plastic googly eyes • bowls, cardboard, bubble wrap, and other materials to insulate ice-cube people • students' Science Journals • washtubs or other large waterproof containers (optional) • water or snow (optional)	• If using, put metal spoons in the fridge to cool. • Make ice in containers of various sizes and shapes or provide Freezies. • Arrange access to a freezer. • Freeze ice cubes with plastic googly eyes attached to make ice people. • Make ice in various colours (with food colouring) in different shapes and sizes.	• water vapour • steam • evaporation • temperature • thermometer • evidence

Safety

- Ensure that kettle/boiling water are not left unattended and that cords are not placed where someone can trip over them.

Science Background

Change of State	Science Term
solid to liquid	melting
liquid to gas	evaporation
gas to liquid	condensation
liquid to solid	solidification (freezing)

- To change state from solid to liquid or from liquid to gas, a substance must be heated to a specific temperature. To change state from gas to liquid or from liquid to solid, a substance must be cooled to a specific temperature.
- Water is the only natural substance that can exist in all three states (solid, liquid, and gas) in the normal temperature range of Earth. Water changes from a solid (ice) to a liquid at 0 °C, and from a liquid to a gas (steam, or water vapour) at 100 °C.

Possible Misconceptions

- Students may think of water, steam, and ice as being different substances. Melting may be conceived as ice changing into water (or vice versa for freezing), and students may believe that dissolving and melting are the same thing. Evaporation (change of state from liquid to gas) is particularly challenging. Common misconceptions are that steam is hot air and that steam becomes air when it disappears. When asked to explain the bubbles in boiling water, students might call the bubbles air or heat.
- Students may conceive of heat and cold as being substances that can be added or taken away. This view can be reinforced by expressions such as “letting the heat out” or “letting the cold in.” Address this by rephrasing students’ remarks. For example, if a student were to say during the *Stop the Melt* investigation that “the bubble wrap keeps the cold in,” you might say, “So you think that bubble wrap keeps the ice from getting warmer.”

ACTIVATE



Changes

Share Science Card 3 with the class. Ask students to tell you about what is happening in the picture. Allow students to describe any element that captures their interest. Encourage students to notice differences between the “sunny” side and the “shady” side. Then, ask students to find the water in the picture. Ask about the states of water with questions such as:

- **Do you see any ice? Is that water?**
- **What is happening to these icicles? Why might that be happening?**
- **What is that coming out of the mugs?**

CONNECT



Put the Kettle On, Please

Have the students gather around you. Review safety rules and then boil a kettle. (Note: you can also use a small humidifier for this demonstration; leave out the comparison of water temperature if you do.) Before you start, pour some of the water into a mug. As the water heats, ask students to share what they think is happening. Use the term “observe” and add this word to the Word Wall. When steam begins to form, ask:

- **What do you observe is happening?**
- **What is coming out of the kettle?**
- **Where did it come from?**

Explain that the steam that comes from a kettle is actually small droplets of condensed water that form when the water vapour contacts cooler air. Remind students of the term “water vapour” and explain that it is water in the gas state. Tell students that when water goes from the liquid state to the gas state (when it becomes water vapour), this is called “evaporation.” Add this term to the Word Wall.

Pour a small amount of the boiling water into a mug, and set it beside the mug you filled before turning on the kettle. Wrap your hands around each mug or use a thermometer, and describe the difference in temperature aloud. Ask:

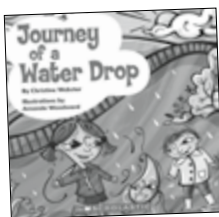
- **I wonder if temperature has something to do with steam. What do you think?**

Add students’ ideas to the unit KWLN chart.

Have ready a number of cold, metal spoons or small hand mirrors at room temperature. If you are using cold spoons, pass them around and ask students to tell you about their temperature; keep one spoon at the front. Challenge the class to predict what will happen if you hold the cold spoon or mirror in steam. Record students’ predictions. Boil water or turn on a humidifier, and carry out the demonstration. When condensation forms, ask:

- **What is this substance? How do you know?**
- **Where did the water on the spoon come from?**
- **What is the evidence for that (how do you know)?**
- **How could we find out (how can we explore/investigate that)?**

Record students’ ideas. Introduce the term “condensation” and add it to the Word Wall.



Literacy Place Connection:

Journey of a Water Drop (Guided Reading, Level N) follows a water drop on its journey from the sky to the earth and back up to the sky. You may wish to focus specifically on pages 10–13 and review with students the concepts of evaporation and condensation.



It's Melting!

Inform the class that they are going to perform an investigation to explore melting. Provide students with the frozen shapes (ice from containers or Freezies), hot and cold water, paper towels, and a thermometer. Also provide tools to apply heat, such as an incandescent lightbulb or a hair dryer—do not allow students to use these items without supervision and be aware of the potential presence of water at all times. Review what a thermometer tells you and how the liquid goes up when temperature goes up and down when temperature goes down. Add “temperature” and “thermometer” to the Word Wall.

Allow students to explore the materials independently. As they are exploring, wonder aloud if these items might be used to find out more about melting. If students need more direction, be more specific; for example, say,

- **I wonder if there is a way to make ice melt faster? Maybe we could use these materials to find out.**

As they share their ideas, guide students to think about what they think will happen (predict) and how they will know what happens (observe, measure, evidence). Remind students that they can use their senses to learn about what is happening. For example, ask:

- **What changes do you see? Feel? Hear? Smell?**

Avoid telling students what to do. Instead, ask questions to prompt deeper thinking, such as:

- **How will you know that you have made it warm?**
- **How would a scientist find that out?**



Before students begin their investigations, display the *What Is the Inquiry Process?* poster and read the steps with the students. Explain that making a plan, exploring, recording results, and drawing conclusions are all part of finding an answer to a question. Provide any materials students need to record their observations. You might also document them working with photographs and/or videos. After the investigation, have the class create a bulletin board or Webpage to share their questions and conclusions. Include a section for students to add new questions based on their results.

It's Freezing!

Ask students if they have ever waited for something to freeze, such as an ice rink or a Popsicle. Allow students to share their stories; when/if an opportunity arises, prompt students to recall specifics about the time, conditions, or any other relevant details. Alternatively, wonder aloud if it always takes the same amount of time to make ice.

Display a selection of containers of different shapes and sizes in which to make ice. Tell students you are going to fill the containers with water and put them in the freezer at the same time. Allow students time to explore the containers. Then, ask students to predict which container would make ice the fastest and explain why they think so. Record students' predictions and reasons in a central place.

Fill the containers with water and place them in a freezer. Use a tray or container to make transport easy, as you will be taking the containers out to make observations once every 15 minutes. Each time you take the containers out, have students record their observations using a method of their own choosing (e.g., digital photos, sketches, or jot notes). Or, a parent volunteer could take small groups of students to the freezer in order to observe and record the changes.

After results have been gathered, meet as a class to discuss them and ask for explanations of what happened. Prompt students to support their explanations with evidence from their observations. Ask:

- **How did what we see show that that is true?**

Add the findings to the unit KWLN chart. Encourage students to record additional questions based on the results. If time allows, assist students in exploring these questions by providing materials and supervision.

Ice and Water

This investigation may be carried out during the *It's Freezing!* investigation above, in the waiting periods. Provide ice cubes; three shatterproof cups filled with warm, room temperature, and cool water respectively; a thermometer; and trays to contain any spills. If necessary, review the use of the thermometer. Ask:

- **In which glass will the ice melt the fastest? Why?**
- **What will happen to the temperature of the water when the ice melts? What evidence could you look for to support that prediction?**

Have students work in groups of two or three; assign each group a letter (A, B, C, etc.), and a particular cup of water. Direct students to write the letter of their group on an index card. Then, have students measure and record the temperature of the water with a thermometer, by placing the index card behind the thermometer and marking a line at the top of the liquid in the column. If your class is ready, have them record the actual number (temperature) on the card.

Have all groups place one ice cube into their cup at the same time. Tell the students to watch their ice cube, and then, as soon as it is completely melted, raise the card with their group's letter on it so you can see. Record the letters in order on BLM *When Did It Melt?*

Have each group share the temperature of the water in their cup with the class and use this to sort the group(s). Record their sorting results on BLM *When Did It Melt?*, and then post the completed BLM in a central place. Have volunteers describe any patterns they see in the results. Ask:

- **What do you notice about the temperature of the water for the groups whose ice cube melted the fastest? How about the groups whose ice cube melted the slowest?**
- **Why do you think this happened? What evidence is there for that idea?**
- **Where did the ice go? How do you know?**



CONSOLIDATE

Stop the Melt

Before class, make ice cubes with added plastic googly eyes. Briefly show the 'ice people' to the class, and then return them to the freezer. If this is not possible, briefly describe the ice people or show a photo of them. Tell students that the ice people have an important message for their leader, and they all have to leave the freezer to wait for her. The leader won't come for 30 minutes! How can they make sure the ice people last long enough to deliver the message?

Provide paper towels, bowls, cardboard, bubble wrap, and other materials of your choosing at a central point in the classroom. You might want to have a cupboard or box accessible for the ice people to 'hide' from sunlight. Divide the class into groups and tell students that their job is to use the materials to keep their ice person from melting for as long as possible. Prompt them to think about what they have learned about melting and then come up with a plan of what materials they will use and how. Consider telling students that groups can work together to keep their ice people frozen longer. Students can record their plans in their Science Journals.



After allowing time for thinking and discussion, provide an ice person to each group on a paper towel or in a small container. Have students carry out their plan, working on trays to avoid spills. Invite students to name their ice person.

Direct the class to watch how quickly their ice people melt. Invite students to record the time using a digital timer or a central clock (this is not required).

While they are waiting, have students record in their Science Journals what they did to protect their ice person. When records are complete, encourage students to visit other groups to see what they did and ask questions and make comments as melting occurs. Circulate and discuss with students what they did and why they think it will work as they are working. Have students indicate when their ice person has melted by raising their hand. Note the order in a central place.

Stop the activity after 30 minutes then review the results as a class. Ask:

- Did any of the ice people last long enough to deliver the message?
- What helped them to slow down the melting? What didn't help?
- Why do you think [choose a method] slows down the melting?
- Was there anything you would do differently if you could do this again?

EXPLORE MORE

Build an Ice House

Use food colouring, water, and containers of different shapes and sizes to create ice for students to build an ice house for ice people to live in. You may provide commercially made trays in different shapes, empty juice and milk boxes, or fill and freeze balloons and then cut the balloon away. Have students work in a washtub or other large waterproof container, or outside, if the temperature is appropriate. Students can use water or snow (when available) as 'mortar.' When the house/houses are built, add ice people, and ask students to predict whether they will last longer inside the house and why.

When Did It Melt?

Starting here, write the letter of each group as soon as they raise their paper.



What was the temperature of the water for each group?

Warm Water

In the Middle

Cool Water

Moisture Around Us



Focus: Students will ask and explore questions about the amount and location of moisture in the environment and in living things.

Specific Curriculum Outcomes

Students will be expected to:

- 8.0 explore evidence of moisture in the environment, in materials, and in living things [GCO 1/3]
- 9.0 propose an answer to an initial question or problem and draw a simple conclusion [GCO 2]
- 10.0 sequence or group materials and objects [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- communicate places where moisture can be found in the environment
- sequence three fruits or vegetables according to moisture level

NOTES:

Attitude Outcome Statements

Encourage students to:

- show interest in and curiosity about objects and events within the immediate environment [GCO 4]
- be open-minded in their explorations [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- communicate information and ideas effectively and clearly, and to respond personally and critically [GCO 2]
- use writing and other forms of representation to explore, clarify, and reflect on their thoughts, feelings, experiences, and learning; and to use their imaginations [GCO 8]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 4 • BLM <i>Which Is the Juiciest?</i> • <i>Come On, Rain!</i> (Read Aloud) • <i>What Is the Inquiry Process?</i> poster • BLM <i>My Plan</i>	• slices of fruits and vegetables of varying moisture levels • paper towels • clear plastic bag • leafy house plant (e.g., Coleus) • digital camera (optional) • spray bottle of water • dehumidifier • students' Science Folders • materials to test for moisture (e.g., soil, moss, baby wipes, bread) • students' Science Journals	• Prepare slices of fruits and vegetables of varying moisture levels, some of which students can taste. • Gather photographs or videos of athletes perspiring. (optional) • Collect (or have students collect) fresh, non-food plant material.	• moisture • moist • juicy

Safety

- Ensure students are not allergic to any foods used for testing.

Science Background

- Since it can dissolve more substances than any other liquid, water is sometimes called the universal solvent. Many of the liquids found in living things are composed of substances dissolved in water. For example, our blood is 82% water. Small amounts of water (moisture) occur in almost any place on Earth, including the atmosphere (humidity) and in soil and rock pores.
- Water is essential for all living things. Water-based liquids in an organism can carry many essential substances, such as sugars (e.g. in blood or sap)

and dissolved salts (e.g. potassium, calcium). Most cell activities cannot occur without the presence of water. About 65-75% of the human body is water.

Possible Misconceptions

- Students likely will think their bodies contain only substances they see coming out of them, such as blood. Moisture in living things, such as juice and sweat, is commonly seen as distinct from water instead of containing water. Water is viewed as necessary to stop you being thirsty only, and that other liquids substitute for this need. You might challenge this by diluting condensed juice and asking students why water was needed.
- Some students may not perceive fruits and vegetables as living things. Provide pictures of the plant that produces the fruits and vegetables students explore. Have students match the pictures to the fruits and vegetables.

ACTIVATE



What Is Moisture?

As a class, review Science Card 4. Ask students if they see any water in the pictures, and if it is a lot or a little. Introduce the term “moisture” and add it to the Word Wall, and explain that we use this word to describe just a little bit of water. Add “moist” to the Word Wall, and explain that we use this word to describe things that have only a little bit of water on them or in them. Then, direct attention back to Science Card 4 and ask students to use “moisture” or “moist” to describe something on the card. Ask:

- What does moisture feel like?
- What does it look like?
- Do you have moisture in you? Do other living things? How do you know?

CONNECT

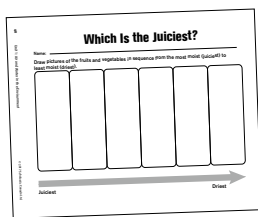
Which Is Juiciest?

Provide samples of various fruits and vegetables for students to test. Include some that are very juicy, such as melons or citrus fruits, and some that are quite dry, such as fresh beans or carrots. Tell students that foods that are juicy have a lot of moisture (water) in them. Ask:

- Which of these do you predict will be the juiciest? Which will be the least?
- If we put these in order from juiciest to least juicy, what would that look like?

As a class, predict the sequence of the items from the most moist (juiciest) to least moist (driest). Record the class prediction. You might record their prediction by taking and printing photographs and making a display of the predicted order.

Inform students that they are going to gather evidence to test their prediction by measuring the amount of moisture in each item. Divide the class into small groups, and provide each with paper towels and fruit and vegetable



samples. Tell students they are not to eat these samples. Make sure a sample of each fruit/vegetable item is tested by at least one group. Tell students to work with a fresh paper towel for each sample. Demonstrate how to blot a sample by placing it on the towel and holding it there for a few moments. Show them the difference between a very moist and a dry sample. Ask:

- **What clues are on the paper towel that I can use to measure how moist my sample is?**
- **How can I use my senses to gather evidence of how moist each item is?**

Tell students to test their samples in the same way you showed them. Remind the class that whenever they do an investigation, they need to record their results in some way. Encourage them to plan how they will keep a record before they begin testing.

As testing proceeds, circulate and make sure students are recording their results in some way. When testing is complete, gather the class together and have each group share their results. Direct attention back to the posted sequence they predicted, and ask the class to help you revise the sequence to fit with their evidence. Prompt thinking about the results by asking:

- **Did anything surprise you in the results?**
- **Is there anything you would like to learn more about?**
- **What new questions do you have?**

Have students make a record of the agreed upon sequence on BLM *Which Is the Juiciest?* Students might add magazine or computer-printed images to the BLM. You might provide new, clean samples of the fruits and vegetables and allow the students to eat them.

Moisture in Living Things

Carry out at least one of the following three demonstrations/activities.

1. Place a clear plastic bag over a leafy house plant, such as a Coleus, and tape it to the pot so it is airtight. Leave the plant in a sunny location. Moisture will fog up the bag in a few hours. Show the plant in the bag to the class and ask them to explain where the moisture came from.
2. Hand out or have students collect plant material from the schoolyard (e.g. dandelions, fresh leaves). Invite students to predict if any of the materials are moist (juicy), and then direct the class to test their prediction by the same method they used for fruits and vegetable slices. Students can record their results by drawing, writing, or taking digital photos. As they are working, circulate and informally ask if their predictions were correct and/or if they are surprised by the results they see.
3. Invite students to play a game or engage in another activity that will cause perspiration, or show pictures or a video of athletes perspiring. Challenge students to relate what they experience or see, to moisture. Ask:
 - **What is sweat made of? Where do you think it comes from?**
 - **Is sweat evidence that we have moisture in us? Why or why not?**

- **What about other living things? Do they have moisture too? How do you know?**

Invite students to find pictures of their favourite animal, including reptiles, and look for evidence that supports their ideas about moisture in living things.

Read Aloud: *Come On, Rain!*



Summary

A girl hopes for rain to break three weeks worth of hot, dry weather and is rewarded when a refreshing storm arrives and rain is everywhere.

Before Reading

Show students the cover of *Come On, Rain!* and ask:

- **What is the weather like? How might the air feel?**
- **What is the girl holding? Why might she have an umbrella when it isn't raining?**

Tell students that as you read the text aloud, they should listen to find out what the air is like throughout the story and to notice how the conditions of the air change.

During Reading

As you read the story to students, pause frequently to discuss the text and illustrations. As you finish each page, clarify any new vocabulary or concepts. Prompts for discussion could include:

After reading the first spread:

- **I wonder what “parched” means. Mamma says, “Three weeks and not a drop” so it hasn’t rained for three weeks. I think “parched” must mean “thirsty.”**
- **Do you think plants need moisture like people do? How do you know?**

After reading the next two pages:

- **Why does the sight of “gray clouds, bunched and bulging under a purple sky” fill Tessie with hope? What is she hoping for?**

After reading about Mamma kneeling over a melon:

- **What do you think the air feels like? Why do you think this?**
- **Why is Tessie sweating? How does sweating help us when we are very hot? (Sweat contains water and cools off our skin.)**

After reading about Tessie putting on her bathing suit:

- **How will the iced tea help to cool Mamma down?** (quenches thirst and replenishes water in the body)

After reading the next page when the rain comes:

- **What does the air feel like now?**

After reading about the girls and their mamas in the rain:

- **Have you ever felt the air get cooler when it rains?**
- **Why does the rain make everyone feel like dancing?**

After reading the final two pages:

- **What does the air feel like now, after the rain?**
- **What do you think “The rain has made us new” means?**
- **Do you think the rain has helped the “parched plants”?**

After Reading

Discuss with students how the conditions of the air changed throughout the story. Prompts might include:

- **What was the air like at the beginning of the story?**
- **How did this change, just before the rain came?**
- **What was the air like during the rain?**
- **How did the air change after the rain? How did this change affect the people and plants in the story?**

Moisture in the Air

In front of the class, spray water in the air from a spray bottle. Ask students if any of the water stays in the air; have students give reasons for their answers.

On a day when the air is sufficiently humid, bring a dehumidifier to class. Turn on the dehumidifier as students watch, and let it run for several hours. Help students observe the amount of water collected, then discuss the results as a class. Ask:

- **Where did the water come from?**
- **Why would we want to take moisture out of the air?**

CONSOLIDATE

Moisture Around Us

Take students on a moisture treasure hunt in their immediate surroundings or in the schoolyard. Guide students in looking for evidence of moisture (e.g., water stains on ceiling tiles, condensation on windows, dew on grass, frost on car windshields). As you are walking, ask students to suggest places to look and to explain their choices. Take digital photographs or have students draw or write to record where they find evidence of moisture. After

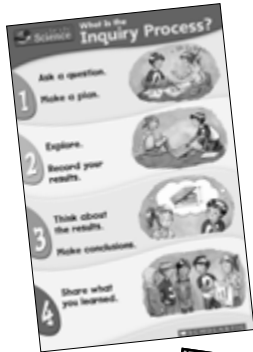


the walk, decide as a class where the most moisture was found. Ask students to tell you what evidence they used in making their decision. Photographs and other recordings may be kept in the students' Science Folders.

EXPLORE MORE

Comparing Moisture

Challenge students to conduct an independent inquiry to compare the amount of moisture in different objects and materials from the Curiosity Centre, such as soil, moss, baby wipes, or bread. Tell students they can choose any object or material they are curious about, other than fruits or vegetables. Point out the *What Is the Inquiry Process?* poster and prompt students to ask a specific question and plan how they will find evidence to answer that question. Hand out copies of BLM *My Plan* for students to record the steps of their plans. Students can communicate their results in their Science Journals, orally, or by making a digital presentation or a poster.

A form titled "My Plan" for recording an inquiry plan. It includes fields for "Name:", "My question:", "My plan:", and "I will need:". Below these are four numbered rows (1-4) for recording steps, each with a small box for notes. At the bottom, it says "© 2011 K5 Learning LLC" and "Page 1 of 100 Science Inquiry Process".

Which Is the Juiciest?

Name: _____

Draw pictures of the fruits and vegetables in sequence from the most moist (juiciest) to least moist (driest).

--	--	--	--	--	--



My Plan

Name: _____

My question: _____

My plan:

I will need:

1.

--

2.

--

3.

--

4.

--

Changes in Moisture



Focus: Students will explore changes in location, amount, and form of moisture, and communicate with others as they are exploring.

Specific Curriculum Outcomes

Students will be expected to:

- 11.0 explore changes in the location, amount, and form of moisture [GCO 1/3]
- 12.0 communicate while exploring and investigating [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- describe where liquid water comes from and where it goes during explorations of evaporation and condensation

NOTES:

Attitude Outcome Statements

Encourage students to:

- be open-minded in their explorations [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- speak and listen to explore, extend, clarify, and reflect on their thoughts, ideas, feelings, and experiences [GCO 1]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 5 • IWB Activity 5 • BLM <i>Concept Diagram</i>	• paper towel • pencils or markers • wet towels or bowls of water • students' Science Folders • two identical containers (ideally metal cans) • water and ice • students' Science Journals • plastic wrap • ice cubes or snow • warm water • metal tray or pie plate • large glass jar with a wide mouth • digital camera (optional) • coloured paper • paint brushes (optional)	• Collect some ice cubes or snow.	• evaporation • condensation

Science Background

- Evaporation is the process of water leaving the liquid phase and entering the gas phase. Evaporation occurs even at low temperatures, such as when a glass of water is left out at room temperature. The rate of evaporation increases with temperature.
- Condensation is the process of water leaving the gas phase and entering the liquid phase. When water vapour comes into contact with a sufficiently cold substance, the water vapour enters the liquid phase, or condenses.
- Sometimes, water will go directly from a gas to a solid and form frost, in a process called deposition. Deposition can only occur when air is saturated (contains all the moisture it can hold) and the temperature is below 0° C. Snowflakes are also formed by deposition.

Possible Misconceptions

- Students may think that evaporating water simply disappears or moves in some way or by some agent while staying a liquid. It can be helpful to explore the word “disappearing” with the class. For example, ask a student to step into the hall and then ask the class if the person has disappeared or gone somewhere else. When students observe evaporation, ask if the ‘missing’ water disappeared or went somewhere else, and to explain their thinking.
- Students may imagine condensation as some sort of transformation from one substance to another, such as liquid water becoming air (without a concept of water vapour). Other common misconceptions are that condensation is water leaking out of the container, or that air becomes liquid. To challenge these ideas, have students review what they found out or observed about freezing and melting, and then ask them to describe the relationship between water and ice.

ACTIVATE



Getting Dry

Share Science Card 5 with the class. Have students suggest answers to the questions on the card. Add their ideas to the unit KWLN chart. Prompt deeper thinking by asking:

- Is water always a liquid?
- Can you think of any other examples of something that we dry?
- What happens to the moisture when items are dried? (evaporation)

IWB Activity:

- Have students use
- IWB Activity 5:
- *Dry it out!* (see the
- Teacher's Website) to
- match wet items with
- the method of drying.

 A set of activity cards for an interactive whiteboard. The top card is titled "Dry it out!" and shows various wet items (like a wet shirt, a wet towel, a wet sponge) and different drying methods (like hanging, using a towel, using a hair dryer). Below it are smaller cards showing the same items and methods in different combinations.

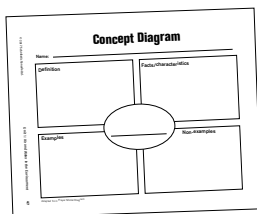
CONNECT

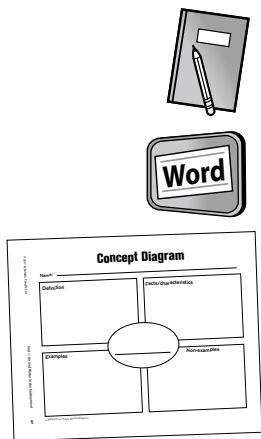
My Disappearing Hand

Provide each student with a paper towel and a pencil or marker. Tell students to place one hand on the paper towel and trace it with the other. Then, provide a way for students to wet the hand they traced, such as a wet towel or a bowl of water. Have students place their wet hand inside the tracing, which should leave a handprint within the outline. Invite students to predict what will happen to their handprint. Record their predictions.

Have the students observe their paper towel again when the handprints have at least partly dried. Ask them to tell you what has changed and if it was what they predicted. Introduce the word “evaporation” and add it to the Word Wall. Explain that when water seems to disappear like it did in their handprint, we call that evaporation. Note: you may wish to start the demonstration *It Got Wet!* as you wait for the handprints to dry.

Provide students with a copy of BLM *Concept Diagram*. Have them fill it in using the word “evaporation.” Invite students to share their diagrams with a partner. Completed BLMs can be stored in the students’ Science Folders.





It Got Wet!

Gather the class around a table. Place two identical containers (metal cans, if possible) of water on the counter and add ice to one. Invite volunteers to touch the sides of the containers and share any differences they feel. Then, let the containers sit until condensation forms on the container with the ice. You may want to complete the activity *My Disappearing Hand* in the meantime. When water has condensed on the container with ice, invite volunteers to touch both the containers and share any differences. Have students record their observations in their Science Journals.

Ask students for their ideas about where the water came from. Add these to the unit KWLN chart, along with any questions student generate. Introduce the word “condensation” and add it to the Word Wall. Explain that when water seems to appear, like it did on the container, we call that condensation. Provide students with a copy of BLM *Concept Diagram*, and have them fill it in using the word “condensation.” Invite students to share their diagram with a partner.

Open and Closed

Bring the class together to observe what you are doing. Place two identical containers with the same amount of water in each somewhere in the classroom where you can safely leave them for a few days. A sunny window would be ideal. Cover one container with plastic wrap, and leave the other one open. Invite a volunteer to draw a mark on each container to show the level of the water, or mark them yourself. You could also take a digital photo of the containers. Every day for the next few days, observe the two containers as a class, and ask students to describe any changes they notice in the containers. Take pictures or have students draw their observations in their Science Journals each day. Students will observe that the water level in the open container falls, while that in the closed one stays the same. They should also see water droplets on the plastic wrap. You might use different coloured markers to mark the new water level each day.

If you took pictures, post them in the classroom. As a class, review what was observed and brainstorm an explanation. Prompt students by asking questions such as:

- Did evaporation happen? In which one? What is the evidence?
- Did condensation happen? In which one? How do you know?

CONSOLIDATE

Foggy Days

Display some ice cubes or snow, warm water, a metal tray or pie plate, and a large glass jar with a wide mouth. Gather the class to watch you, and tell them that you are going to make fog. Pour warm (not boiling) water into the jar to a depth of about 2 cm. Place the ice cubes or snow on the metal tray or pie plate, then set the whole thing on the open mouth of the glass jar. As the students watch, the warm moist air in the glass jar will rise and condense against the cold metal surface, forming a fog-like mist.



Have the students make drawings of their observations in their Science Journals. Challenge them to show on their drawings where they think water is evaporating and where it is condensing. Ask them to explain their choices.

EXPLORE MORE

Disappearing Designs

Provide students with coloured paper, water, and a variety of paint brushes (optional). Invite students to use the various brushes, or their fingers, to 'paint' designs on the paper with water. Have them predict what will happen to the water on their coloured paper. Ask:

- **What happened to the water?**
- **Was your prediction correct?**

Concept Diagram

Name: _____

Definition	Facts/characteristics
Examples	Non-examples

Adapted from Frayer Model Diagram

Changing Moisture Levels



Focus: Students will, through guided inquiry investigations, discover how and why moisture changes, and communicate what they did and what they found out.

Specific Curriculum Outcomes

Students will be expected to:

- 13.0 investigate conditions that affect changes in the location, amount, and form of moisture [GCO 1/3]
- 14.0 communicate procedures and results [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- communicate ideal conditions for setting up a lemonade stand

NOTES:

Attitude Outcome Statements

Encourage students to:

- show concern for their safety and that of others in carrying out activities and using materials [GCO 4]
- work with others in exploring and investigating [GCO 4]

Cross-Curricular Connections

Social Studies

Students will be expected to:

- describe how people's interactions with their environment have changed [2.4.2]

English Language Arts

Students will be expected to:

- interact with sensitivity and respect, considering the situation, audience, and purpose [GCO 3]
- use a range of strategies to develop effective writing and representing and to enhance their clarity, precision, and effectiveness [GCO 10]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 6 • <i>What Is the Inquiry Process?</i> poster • BLM <i>My Inquiry</i>	• identical pieces of cloth • sealable plastic bags • slices of various fruits and vegetables • digital camera (optional) • Flex Arm camera (optional) • food dehydrator (optional) • containers of various shapes and sizes (e.g., cups, saucers) • variety of materials (e.g., foil, construction paper, mirrors, plastic wrap, wax paper, felt, cotton) • heat sources (e.g., hairdryers, electric fans, or heat lamps) • students' Science Folders • small plastic cup and container it will fit in (e.g., bowl) • marker • plastic wrap • small stone • students' Science Journals • lamp (optional)	• Invite a speaker such as an Elder or an Indigenous Knowledge Keeper to speak about drying food. Alternatively, you can collect Internet resources. • Prepare slices of fruits and vegetables, all of the same thickness (at least one slice per student). • Dry slices of foods in an oven at home.	• moisture • evaporate

Science Background

- Changes in moisture levels occur primarily through evaporation and condensation. Important factors that affect the rate of evaporation are: temperature, humidity (the amount of water vapour in the air), and air movement (e.g., wind or resulting from tumbling in a dryer). If you heat a moist object, liquid water in or on the object will change to water vapour and dissipate into the atmosphere. The less humid the air around the object, the higher the rate of evaporation, regardless of temperature. However, air can hold only so much water vapour; when the maximum amount is reached, the air is saturated. In saturated air, there will be no net evaporation from a moist object and it will not dry. Finally, as an object dries, the humidity of the air closest to the object increases. When the air is moving, this moist air dissipates more quickly and is replaced by drier air, and the rate of evaporation increases. The converse is true of condensation: the rate of condensation increases as air temperature decreases, humidity increases, and air movement decreases.
- Drying (dehydrating) food is one of the oldest and easiest methods of food preservation. Most living things depend on water, including organisms that decay our food. These organisms are therefore far less able to survive on dehydrated foods. In addition, some biological processes continue in the food items themselves after harvest, such as fruit ripening. These are cellular processes which also rely on the presence of water, and are therefore prevented by dehydration.

Possible Misconceptions

- Students are likely to have had experience using heat energy to speed drying. Some students imagine heat to be a substance of some kind, so that drying is understood as water turning into heat. Many students' understanding of energy is restricted to the movement of their bodies, or they think of it as something that is used up, like a fuel. To help students build a more accurate view, place a thermometer in, or have students feel the air coming from, a hair dryer set on low. Prompt students to consider what is happening with the temperature of the air from the dryer, and how that affects drying. Ask if the dryer would still work if it didn't produce warm air.

ACTIVATE

Preserving Food

As a class, review the evidence that living things contain moisture. Describe how Mi'kmaq, Innu, Inuit, and other groups (e.g. early settlers, hunters, fishers) used or use drying to store meats, fish, or other food. Invite a speaker or share Internet resources with the class to find out more about these methods. For example, an Elder or an Indigenous Knowledge Keeper might share traditional drying methods for food preservation (e.g., Inuit drying char, Innu or Mi'kmaq drying moose or caribou into jerky, or drying berries). If possible arrange for samples of these dried foods to be available for the students to touch and taste. The visitor might also speak about the



process of removing the moisture from animal skins so they can be used to create clothing.

Share Science Card 6 with the class. Ask:

- **Which foods are moist and which are dry?**

Have students give evidence for identifying food as moist or dry. Then, ask students if they are familiar with any of the foods or have seen them prepared. Challenge them to match the moist food with its dry form. Encourage sharing of other dried foods they know about. Ask students to explain what happens when food is dried using the words “moisture” or “evaporate.”

CONNECT

Out to Dry

Get two identical pieces of cloth and moisten them with water. Wring out any excess. Place one piece of cloth in a sealable plastic bag, and lay it on an easily accessible surface in the classroom, preferably in sunlight. Alternatively, you could place it on a cooling rack (for baking) or hang it on a clothesline you create in the window using string. Place the other piece of cloth beside it, either on a tray or piece of plastic wrap if it is on a surface or directly on the cooling rack or clothesline. As you are setting up the cloth pieces, challenge the students to predict which will dry first, and to give their reasons. Leave the cloth pieces overnight, and then observe the changes in the two cloths as a class. Ask students to explain what happened. Repeat their answers back to them but rephrase using the words “condensation” and “evaporation” when possible. Add any new student questions to the I Wonder Wall.



Where's the Juice?

Show students previously prepared slices of various fruits and vegetables (at least one slice per student). If possible, use the same types of fruits and vegetables students sorted by moisture level previously (see *Which Is Juiciest?*, page 35). Slices should all be of the same thickness. Tell students that they are going to leave the slices out in the air for the next four days. Ask:

- **Do you think the slices will stay the same as they are now? Why?**
- **How do you predict they will change? Why?**
- **What kind of evidence will you look for?**

Have each student write her or his name on a piece of paper or foil, and then choose and place one slice on it. Leave the slices somewhere they won't be disturbed. Each day, have the students check their slice and record any changes using drawings or digital photographs. Encourage students to use as many of their senses as they can to observe changes (sight, smell, touch). However, ensure that students do NOT taste the slices! You may also use a Flex Arm camera to create a time lapse video of the changes. Students might create a multimedia poster of the fruit using Glogster.

After the four days of observation, have each student use their photos or drawings to create a timeline showing the changes in the samples, along with any other observations that were noted. Post the timelines in the classroom.

As a group, discuss the timelines, and have the students agree on an order in which all the various fruit slices dried. Guide a discussion of how this order relates to how much moisture the fruit contained and where that moisture went. Extend the discussion by asking for suggestions as to how they might make their fruit dry more quickly.

After the investigation, allow students to experience how the taste of foods changes when they are dried. Dry foods in an oven at home and bring them into class, along with undried samples. Alternatively, dry fruit or vegetable slices in a food dehydrator in class.

What Do You Want to Know About Evaporation?

Wonder aloud to the class about factors that affect evaporation. For example, say:

- **I wonder if a lake evaporates as fast as a puddle?**
- **I wonder if clothes dry as fast in the shade as in the sunshine?**
- **I wonder what I can use to stop water from evaporating?**

Ask students what they wonder about evaporation. Record their questions, then inform them that they are going to have the chance to find answers to these questions.

In a central location, provide a variety of shapes and sizes of containers (e.g. saucers, cups) and materials (e.g., foil, construction paper, mirrors, plastic wrap, wax paper, felt, cotton). Provide some sources of heat and/or air movement (e.g., hairdryers, electric fans, heat lamps) and inform students that you will help them if they want to use these tools.

Divide the class into groups of three or four students. Have each group choose one of the questions you recorded during the initial discussion and use the materials to try to find an answer. Remind students about the steps of the inquiry process by pointing out the *What Is the Inquiry Process?* poster. Have students record their plan, results, and conclusion on BLM *My Inquiry* (see page 81). Completed BLMs can be stored in the students' Science Folders.

Provide materials for students to record their observations. If possible, have students record their observations with a digital camera, or do so for them. When student work is complete, have each group communicate what they did (the procedure for their investigation) and what they observed (their results) as a digital presentation.



My Inquiry

Name: _____

My question: _____

My plan: _____

My results: _____

My conclusion: _____

How I will share what I learned: _____



CONSOLIDATE

Lemonade for Sale!

Tell students that they are going to create a plan for a lemonade stand, and to make sure their customers are happy, they will need to use what they have learned about the three states of water, and how water changes from one state to another. Begin with a whole group brainstorming session by asking questions such as:

- Where will you put your stand? Will it be in the shade or the sunshine?
- Will you keep your lemonade in a large pitcher until someone buys a cup, or pour out several cups beforehand?
- Where will you store the ice? What kind of container will you use?
- Should you put ice in the pitcher of lemonade before you pour it for a customer, or put some in one cup at a time when someone buys a glass?

Record students responses on a chart, but do not agree or disagree with any suggestions. Have students work in small groups to create a poster, flyer, or Webpage to describe their lemonade stand. Tell students to include all the answers to these questions in their description. Have students present their work to the class and ask them to explain the choices they made.

EXPLORE MORE



The Magic Cup

Show students a small plastic cup and a larger container it can easily fit in, such as a bowl, and tell students that you are going to move water from the cup to the container without touching anything. Fill the cup about half full with water, and mark the level with a marker. Make sure students understand that the line marks the height of the water. Place the cup into the larger container and cover it with plastic wrap. Place a small stone in the centre of the plastic wrap. Have students draw a picture of this apparatus in their Science Journals.

Leave the apparatus in sunlight or under a lamp for the remainder of the day, then leave it overnight in darkness. The next day, check the apparatus with the class. Water vapour that formed under the plastic wrap under the heat of sunlight or the lamp will have condensed, and run into the larger container. Check the level of water in the cup relative to the marker line; it should be lower. Have students make a drawing that shows how they think the water moved.

Changes in Air Conditions



Focus: Students will observe and measure changes in air conditions, selecting tools appropriate for their needs.

Specific Curriculum Outcomes

Students will be expected to:

- 15.0 explore changes in air conditions in indoor and outdoor environments, and describe and interpret these changes [GCO 1/3]
- 16.0 use appropriate tools [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- observe and measure changes in air conditions such as temperature and wind speed
- select appropriate tools to use to measure particular air conditions

NOTES:

Attitude Outcome Statements

Encourage students to:

- show concern for their safety and that of others in carrying out activities and using materials [GCO 4]

Cross-Curricular Connections

Social Studies

Students will be expected to:

- describe how people's interactions with their environment have changed over time [2.4.2]

English Language Arts

Students will be expected to:

- communicate information and ideas effectively and clearly, and to respond personally and critically [GCO 2]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 7 • BLM <i>Venn Diagram</i> • IWB Activity 6 • BLM <i>Pinwheel</i> Literacy Place: • <i>The North Wind and the Sun</i> (Guided Reading, Level H)	• weather instruments (e.g., thermometers, hygrometers, anemometers, wind socks, weather vanes) • students' Science Journals • paper or index cards • markers • crayons • coloured pencils or markers • scissors • straws • paper fasteners • single-hole paper punch • digital camera (optional)	• If necessary, gather photos or videos of various weather instruments. • Invite an Elder or an Indigenous Knowledge Keeper to talk about how knowledge of weather is important in traditional practices such as being on the land. • Punch holes through both sides of a straw at one end (one per student).	• temperature • thermometer • rain gauge • anemometer • wind sock • weather vane

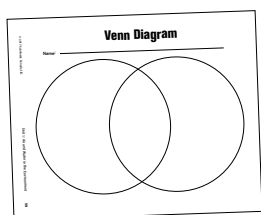
Science Background

- Weather is a combination of sunlight, precipitation (rain, snow, hail), wind, humidity, air pressure, and temperature for a given area at a particular time. Scientists measure and record these conditions in order to describe the weather and to identify patterns over time. Meteorologists forecast weather so that communities can prepare for specific conditions.

Possible Misconceptions

- Common misconceptions about weather include: clouds can block wind and slow it down; wind is caused by moving objects or by Earth turning; cold weather makes wind or makes stronger wind; rain falls out of holes or funnels in clouds; rain is clouds sweating or melting; rain is caused by the wind shaking clouds, by clouds colliding, or by clouds getting too heavy.

ACTIVATE



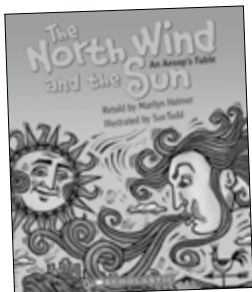
A Change in the Air

Focus on the images on Science Card 7 one at a time, and guide students on an imagination walk through each scenario. Have the class tell you what they imagine the air feels like. Record students' ideas for each scenario on a large chart and post the chart in a central place.

Then, divide the class into pairs and provide each pair with a copy of BLM *Venn Diagram*. Tell the class that they are to work with their partner to choose two of the imagination walks, and use the BLM to compare and contrast the air in each scenario. Provide prompts such as:

- Was there anything different about how the air felt?
- Was the temperature the same in both?
- Was the air moving in both? If so, was it moving the same amount?

Invite students to suggest another scenario (e.g., entering a walk-in freezer or walking on a hot beach) and lead an imagination walk to describe the air conditions.



Literacy Place Connection:

In *The North Wind and the Sun* (Guided Reading, Level H) the North Wind challenges the Sun to prove who is stronger. Invite students to describe the air conditions when the North Wind is blowing and then when the Sun is shining. Ask:

- What evidence do you see in the illustrations to show the air is moving?

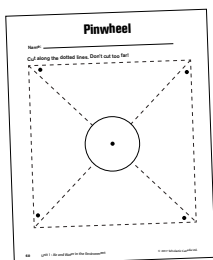
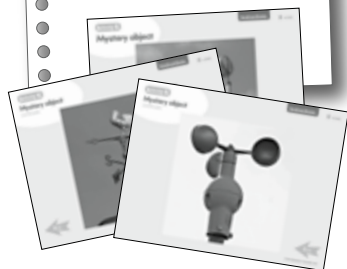
CONNECT

Measuring Weather

Gather together some instruments used to measure air conditions, wind speed, and wind direction, such as thermometers, hygrometers, anemometers, wind socks, and weather vanes. When possible, demonstrate how the instruments work. Display the instruments in the classroom and allow the students to explore them. (If you cannot assemble a collection of instruments, show

IWB Activity:

- Challenge students to identify the weather instruments using IWB
- Activity 6: *Mystery Object* (see the Teacher's Website).



students photos or videos of weather instruments.) Discuss what air condition each instrument measures and how it is used. Ask:

- **When is it important to know air conditions?**

Weather Knowledge

Invite an Elder or an Indigenous Knowledge Keeper to talk about how knowledge of weather is important in traditional practices such as being on the land. Ask the guest to share information such as, when out on the land, how they predict the weather; what they do to stay safe in severe weather; and if they use any special tools to measure the weather.

Air Temperature

Working in small groups of three or four, have students explore thermometers. If necessary, remind students how the liquid rises and falls with temperature changes. Ask students to suggest ways to record the temperature (e.g., draw a line on a paper that is as long as the liquid is high, draw a line on an index card attached to the thermometer).

Tell students that you are curious about the air temperature inside and outside the school. Invite students to ask questions about this; if necessary, prompt thinking by saying “I wonder if the temperature is the same inside all the time?” Record the students’ questions. Then, as a class, choose a question to investigate, or have the small groups decide on their own question to investigate. Work with the students to come up with a plan for gathering data with the thermometers. Students should plan to measure and record air temperature at different times of the day and in different locations, both inside and outside the school. Students can record these observations in their Science Journals. Assist students in keeping track of their data over the day as needed.

Spin Me Around: Pinwheels

Gather a class set of the following: crayons, coloured pencils or markers; scissors; straws; paper fasteners, and copies of BLM *Pinwheel*. You will also need at least one single-hole paper punch. Either before class or as the students are working, punch a hole through both sides of all of the straws at one end.

Have students collect their supplies. Draw their attention to the BLM and explain that they are to cut along the dotted lines and stop where the line stops. Circulate when the students are cutting out the pinwheel, making sure they don’t cut too far. Invite students to decorate their pinwheel after they cut it out. Tell them to decorate both sides as they will be able to see both sides of the paper when they are finished. When students have finished decorating, have them use a paper punch to make holes where there are black dots on their pinwheel.

Demonstrate the next steps to the class:

1. Form the pinwheel by looping each cut triangular piece back towards the centre and lining up all the holes.
2. Insert the paper fastener through the aligned holes, and through the holes in the straw, before opening it. It should be tight enough to keep the pinwheel together but not so tight the pinwheel won’t spin.

After your demonstration, have students assemble their pinwheels as you showed them. Circulate to offer assistance as needed. When pinwheels are finished, invite students to make them move by blowing on them. Ask:

- **What is making the pinwheel move?**

Invite students to test the pinwheels in various locations in and around the school to note how fast the pinwheel spins in different locations and conditions. Students may wish to record their observations by taking digital videos.

CONSOLIDATE

Weather Station

As a class, create a display showing the collected weather instruments and describing what air conditions each measures. If possible, create a weather station with the instruments. Make a large chart in a central area in the classroom to display collected data. Have volunteers help you to read and record data on the weather each day for several weeks using appropriate instruments. Invite a student to make a weather report to the class each day. Students could also take turns giving the weather report over the PA to the entire school.

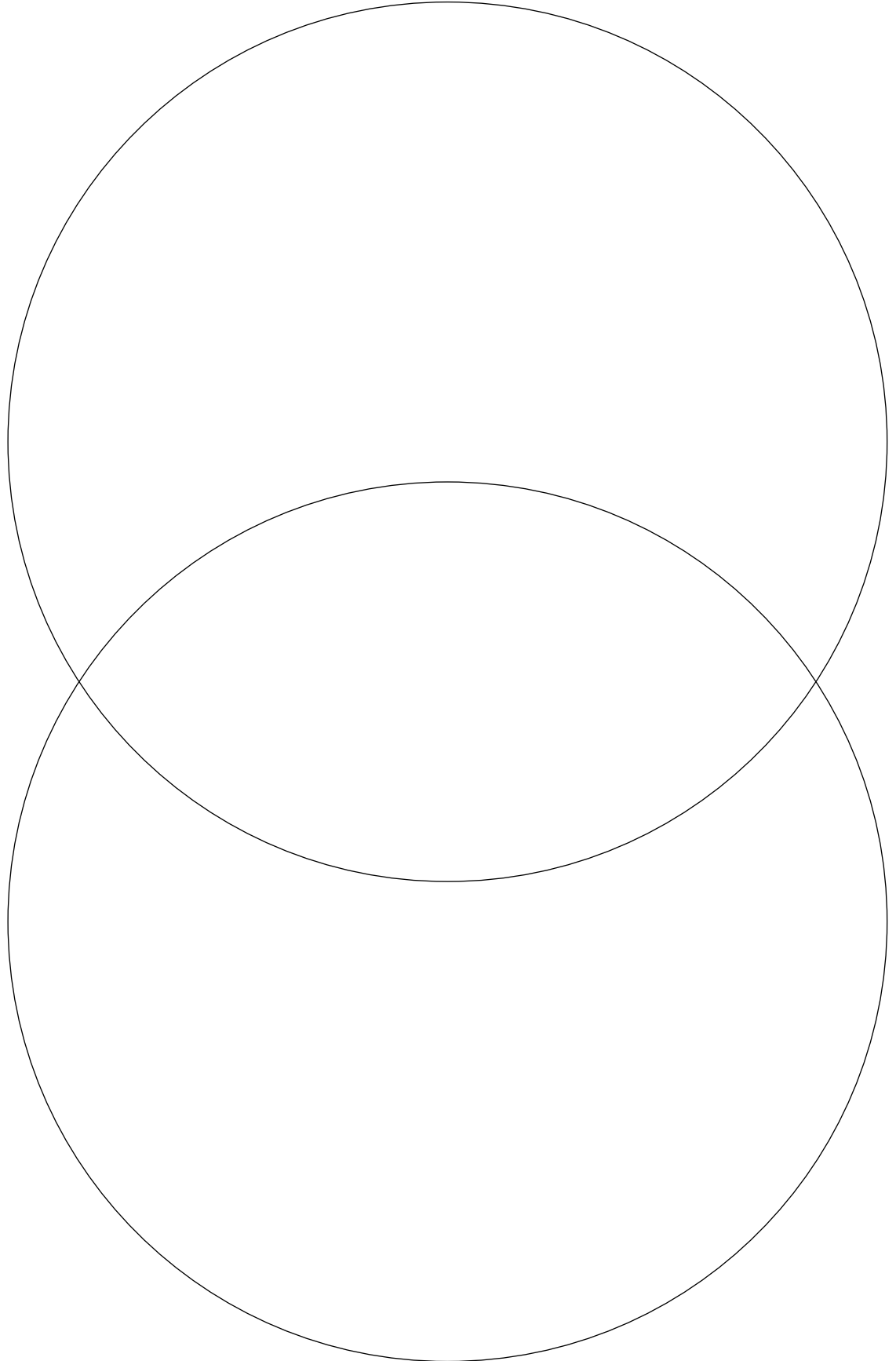
EXPLORE MORE

Blowin' in the Wind

Have students draw a series of pictures of an object (e.g., a tree, clothes on a clothesline, or a flag) to show how it looks in various air conditions (e.g., no wind, light wind, and strong wind). Encourage students to exchange their work with a partner and explain what is happening in each picture and why.

Venn Diagram

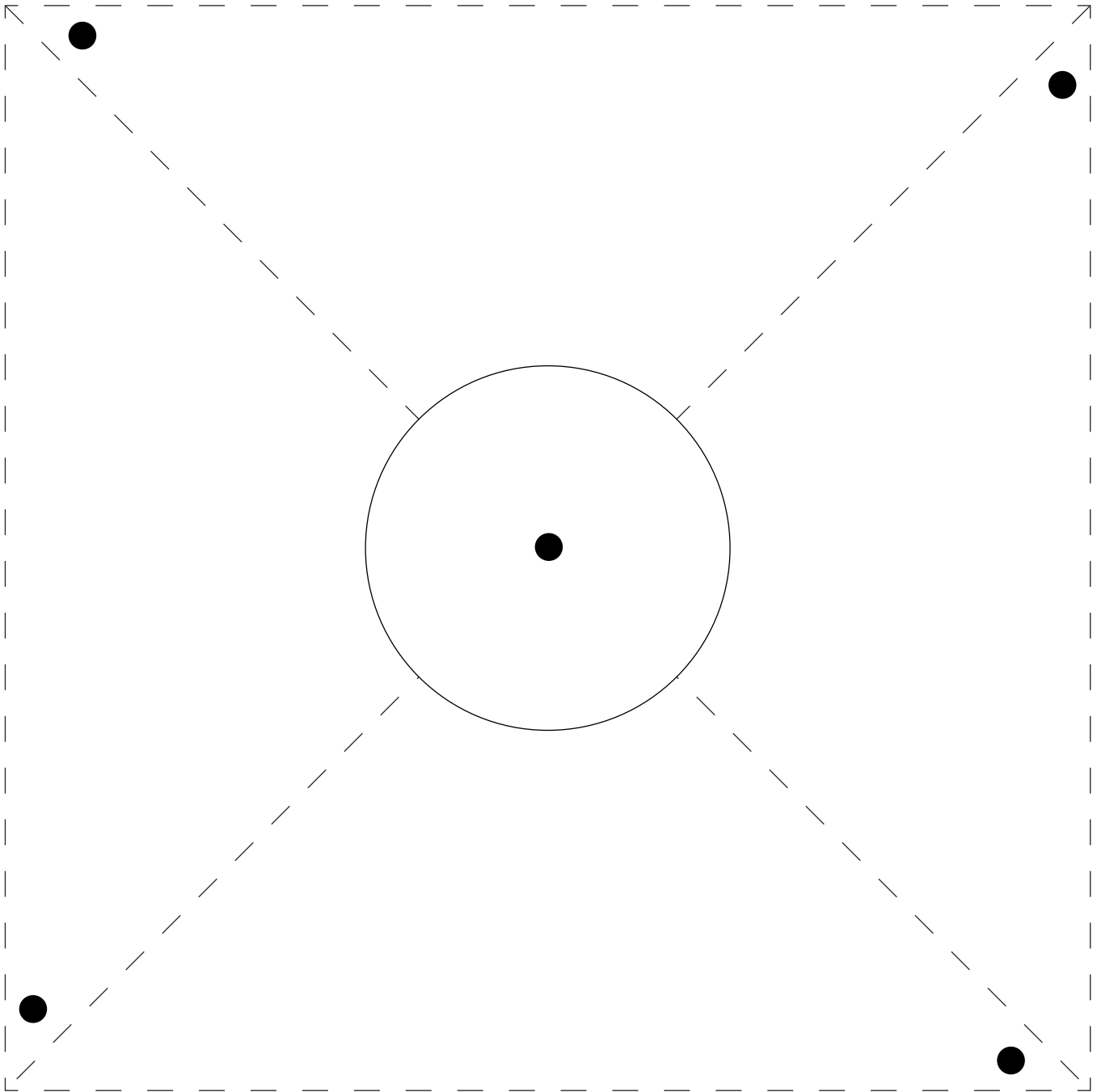
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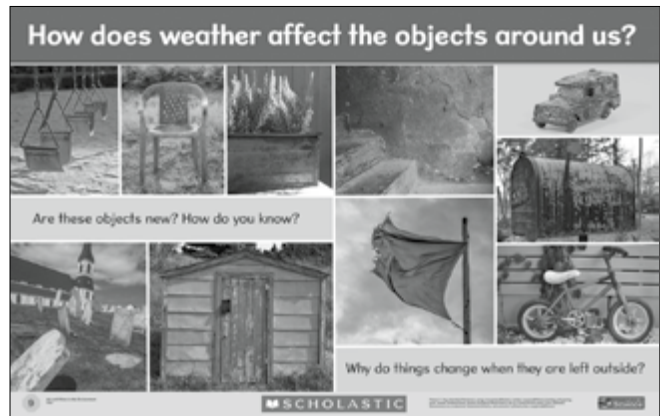
Pinwheel

Name: _____

Cut along the dotted lines. Don't cut too far!



Protection from Different Weather Conditions



Focus: Students will explore and describe how weather affects objects and materials, and investigate ways to protect objects and materials under different weather conditions.

Specific Curriculum Outcomes

Students will be expected to:

- 17.0 explore the effects of weather on objects and materials [GCO 1/3]
- 18.0 investigate ways to protect objects and materials under different conditions [GCO 1/3]
- 19.0 select and use materials to carry out their own explorations and investigations [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- describe and explain the changes that occur in objects and materials left outside
- suggest ways to protect objects and materials from particular weather conditions

NOTES:

Attitude Outcome Statements

Encourage students to:

- consider their observations and their own ideas when drawing a conclusion [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- speak and listen to explore, extend, clarify, and reflect on their thoughts, ideas, feelings, and experiences [GCO 1]
- interpret, select, and combine information using a variety of strategies, resources, and technologies [GCO 5]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 8 • <i>The Little Knight Who Battled the Rain</i> (Read Aloud) • Science Card 7 (optional) • Science Card 9	• coloured construction paper (sheets) • common and galvanized nails • rust protection coatings • craft sticks • paint and/or wood stain • leather swatches • plain fabric and waxed fabric • protective spray, such as Armor All • students' Science Folders • small squares of dark- and light-coloured construction paper • digital camera (optional)	• Survey an area around your school to find weathered human-made and natural objects and materials (e.g., rust, peeling paint, rotted wood, cracked concrete, or tattered fabrics). You may wish to add some weathered objects for students to find. • Create a list of clues describing objects and materials for the Scavenger Hunt. Alternatively, prepare copies of a numbered map identifying a material or object at each stop. • Gather pictures or articles about a recent extreme weather event in your region and invite someone from the community who remembers the event or an expert, such as a meteorologist, to add insight.	• weathering • rust • waterproof

Science Background

- Weathering is the changes that occur in materials and objects exposed to changes in moisture, air movement, and air temperature (weather). Eventually, weathering results in the breakdown of materials either into smaller parts (e.g., when paint breaks down) or changes to another chemical substance (e.g., the oxidation of metals such as iron).
- The rate of weathering can be decreased by reducing the contact of materials and objects with weather changes. For example, paints and stains keep moisture from penetrating wood, synthetic coatings are added to fabrics to make them wind- or moisture-resistant, and objects may be wrapped in waterproof substances such as plastic sheeting to protect against both wind and moisture.
- Weathering due to acid rain can be (and in many areas has been) reduced by eliminating or reducing the sources of pollution that contribute to making rain acidic.

Possible Misconceptions

- Students may think weathered objects are dirty, and imagine they can be restored by washing. They may explain weathering of objects as the result of not taking care of the object. Explain to students that weathering is a natural process when objects and materials are left outside under different weather conditions.

ACTIVATE



Dressing for Weather Conditions

Remind students that when weather conditions change, it can affect us. It can get warmer or cooler, drier or wetter, more still or windy. Share Science Card 8 with the students, and have them answer the questions: *What kind of weather is the clothing designed for? How does each item protect you?* You might also invite students to show to their classmates any items of clothing they wore today that offer protection from the air conditions (weather). Ask:

- What would you wear on a hot, sunny day?
- What would you wear on a cold, snowy day?
- What would you wear on a warm, windy day?
- What would you wear on a cool, rainy day?
- Why is it important to wear clothing that protects you from the weather conditions?

CONNECT

Read Aloud: *The Little Knight Who Battled the Rain*



Summary

The little knight isn't afraid of anything, except rain! Rain makes his armour rust. But when a tremendous rain storm with violent winds lasts for 39 days and strands the villagers in their treetop homes, the little knight must overcome his fear to save his village.

Before Reading

Ask students to think of a time that the weather interrupted their plans for something special (e.g., rain during an outdoor party or strong wind on a picnic). If student have difficulty thinking of anything, share a story about changing air conditions (temperature, wind conditions, moisture or precipitation) that you weren't prepared for, such as low temperature on a hike or having clothes on the clothesline when it started to rain.

Tell students that you will be reading a story about a huge rain storm in a special village. Ask them to listen as you read aloud to discover what effects the storm had on the village and to think about how the people could protect themselves from these air conditions in the future.

During Reading

As you read the story to students, pause frequently to discuss the text and illustrations. Alternate between asking students to respond in a whole group or with a partner. Prompts for discussion could include:

After viewing the first page of small illustrations:

- **Why do you think the little knight wears armour?**
- **What is armour made of?**

After reading and viewing the next two pages:

- **What is the only thing that the little knight is afraid of?** (rain)
- **What affect does the rain have on his armour?** (makes it rust)
- **Why might rusty armour be a problem?**

After looking closely at the illustration of the village in the treetops:

- **What is special about the little knight's village? How is it different from other places people live?**
- **What would it feel like to live in a village built in the treetops? How might the air feel?** (If necessary, remind students of the imagination walks they took for the scenarios on Science Card 7 and how the air felt in each scenario.)
- **Why are ladders important to a village in the treetops?**
- **What other ways might the people get to their homes from the ground? What do you think would be the best way to reach their homes?**



After reading about and viewing the image of the storm:

- **What would the air feel like during the storm?**

After reading the next two pages:

- **What does the little knight do when he is afraid?**
- **Why do you think eating chocolate cake makes him feel better?**

After reading the next two pages about the ladders:

- **What affect do the strong winds have on the village?** (breaks and blows the ladders away) **Why is this a problem?**

After reading and viewing the next four pages, ending when the little knight promises a solution:

- **What does the air feel like after the storm ends and the light rain is falling?**
- **What new problem do the villagers have?**

After reading and viewing the next six pages, ending when the little knight bakes chocolate cakes:

- **What idea does the little knight have to save the village?**
- **How do you think the cats and birds can help him?**

After reading about the delivery of the chocolate cake to the villagers:

- **How do you think the villagers will solve the problem of being stranded at the top of the trees?**

After reading and viewing the next two pages:

- **What did the villagers do? Was this one of the ideas we had for reaching the houses?**
- **How else might they protect their homes from strong winds?**

After reading the rest of the text:

- **Why do you think the little knight is no longer afraid of the rain?**

After Reading

Ask students to think about the effects of the wind and the rain in the story. Discuss how the villagers could protect themselves from these conditions in the future. Provide prompts such as:

- **What should the little knight do when he goes out in the rain?** (protect his armour)
- **How could the little knight protect his armour from rusting?**
- **How can the villagers keep their ladders from being blown away again?**
- **Are some materials better than others for being made into ladders? Why do you think so?**
- **Do you think it is a good idea to build a village in the treetops? Why or why not?**



Scavenger Hunt

Hold a class discussion to engage students' previous knowledge of weather. Hold a brief discussion to find out how students think weather affects objects and materials. Introduce the term "weathering" and add it to the Word Wall.

Share Science Card 9 with the class. Have students share their ideas about how weather affects the objects and materials shown. Ask:

- **Are these objects new? How do you know?**
- **Why do things change when they are left outside?**
- **How does paint change on things that are left outside?**

Tell the class that they are going to go on a scavenger hunt to find objects and materials that have been out in the weather (e.g., rusted metals, peeling paint, rotted wood, cracked concrete, tattered or faded fabric). The scavenger hunt should be confined to a particular area around the school. Give each student or small group a list of clues about items to find. The clues should describe how the object/material has been affected by weather. For example, the clue for fabric might be "The wind and rain have worn me out." Alternatively, provide a numbered map, and have students find the weathered object/material at each stop on the map. Students may take a picture or make a drawing of the weathered objects and materials they find. Ask students to explain what conditions caused the weathering of each of the objects and materials.

Fading Away

Hold up a piece of coloured construction paper and wonder aloud if the weather can affect paper. Allow students to respond and record their predictions on a chart. Ask:

- **How can we test these predictions? What should we do to the paper?**

Allow students to come up with suggestions, and follow up on any that are reasonable. For example, students might tape a piece of construction paper in a sunny window, or sprinkle water on a piece to model rainfall. Students can sketch or take pictures of the results of their investigations. Invite students to share their results and make conclusions about how weather can affect paper. Remind students to store the pictures in their Science Folders.



Protection From the Weather

Now that students have observed how various weather conditions can affect objects and materials, invite them to generate questions about how they could protect these items. Provide prompts such as:

- **How can objects be protected from rust?**
- **How can we keep objects and materials dry?**
- **How can we protect against sun damage?**

Gather a variety of materials for students to investigate different ways to protect objects and materials from the effects of particular weather

conditions (moisture and sun/heat damage). Small groups of students can choose objects or materials to investigate and make a plan for testing their items. If students need more assistance, the investigations could be completed for one test at a time with the whole group.

Moisture:

- **Rust** – Students can test common versus galvanized nails in water. Encourage students to investigate various coatings to reduce or prevent rusting of the nails.
- **Warping and rotting** – Students can compare untreated craft sticks with sticks that have been painted, stained, or treated.
- **Water repellant** – Students can test how water repellant untreated leather is vs leather that has been treated with a protective spray. Or, students may choose to test plain fabric vs fabric that has been treated with a wax coating.

Sun or heat damage:

- **Sun damage** – Students can test to compare dark- vs light-coloured construction paper to model degrees of plastic and fabric colour fading.
- **Sun and heat damage** – Students can test untreated leather and plastic vs pieces treated with Armor All or another protectant to model damage to cars.



While students are investigating, encourage them to think about new questions they have about protecting objects and materials from the weather. These questions can be recorded on sticky notes or cards and attached to the I Wonder Wall. Invite each group to share with the class what they learned about protecting objects and materials from different weather conditions.

CONSOLIDATE

Weathered Objects

Revisit the small objects that have been kept outside since the beginning of the unit. Ask:

- **Do any of the objects show signs of weathering?**
- **What weather conditions may have caused the changes?**

Bring the objects back to the classroom several more times over the course of the school year and invite students to examine them for change. You may wish to have students take digital pictures to show the progression of weathering. Discuss what could have been done to protect the objects from the weather.

EXPLORE MORE

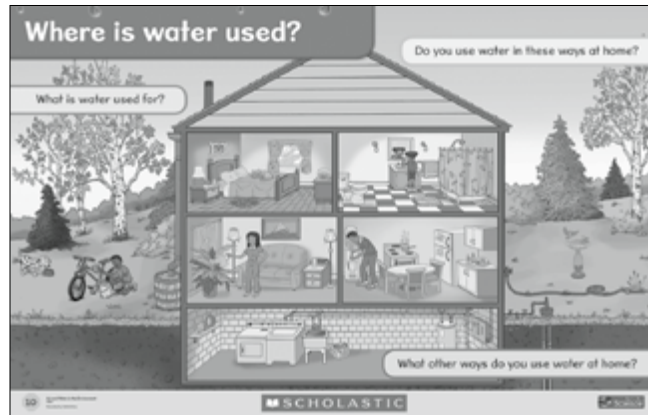
Extreme Weather Conditions

Share with students pictures or articles about a recent extreme weather event in your region (e.g., an ice storm, severe thunderstorm, hurricane, or flooding). If you experienced the event personally, share your memories of it. If not, you might invite someone from the community who remembers the event or have an expert, such as a meteorologist, visit the classroom to add insight. Ask class members if they have ever had experiences with a really big storm. Give students the opportunity to share. Start and keep a KWLN chart on the topic of extreme weather.

After the discussion and/or class visit, ask students what else they would like to know about extreme weather events. Record suggestions on the KWLN chart. Divide the class into groups of three to four students. Direct each group to choose one question from the KWLN chart they would like to research. Provide access to relevant books and Websites. Allow students to choose how they will present their findings to the rest of the class; for example, as an oral presentation, a poster, or a dramatic skit. After each group has made their presentation, add any new information or make revisions to the KWLN chart. Encourage students to add any new questions to the I Wonder Wall.



Air, Water, and People



Focus: Students will explore how water is used and obtained in their homes and local community, and construct and label pictographs to communicate some of their findings.

Specific Curriculum Outcomes

Students will be expected to:

- 20.0 explore how water is used, obtained, and distributed in personal, local and regional environments [GCO 1/3]
- 21.0 construct and label concrete-object graphs or pictographs [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- survey water use in their home and create a labelled pictograph to communicate the results
- describe the source(s) of water for their community

NOTES:

Attitude Outcome Statements

Encourage students to:

- be sensitive to the needs of other people, other living things, and the local environment [GCO 4]

Cross-Curricular Connections

Math

It is expected that students will:

- construct and interpret concrete graphs and pictographs to solve problems [2SP2]

English Language Arts

Students will be expected to:

- create texts collaboratively and independently, using a variety of forms for a range of audiences and purposes [GCO 9]

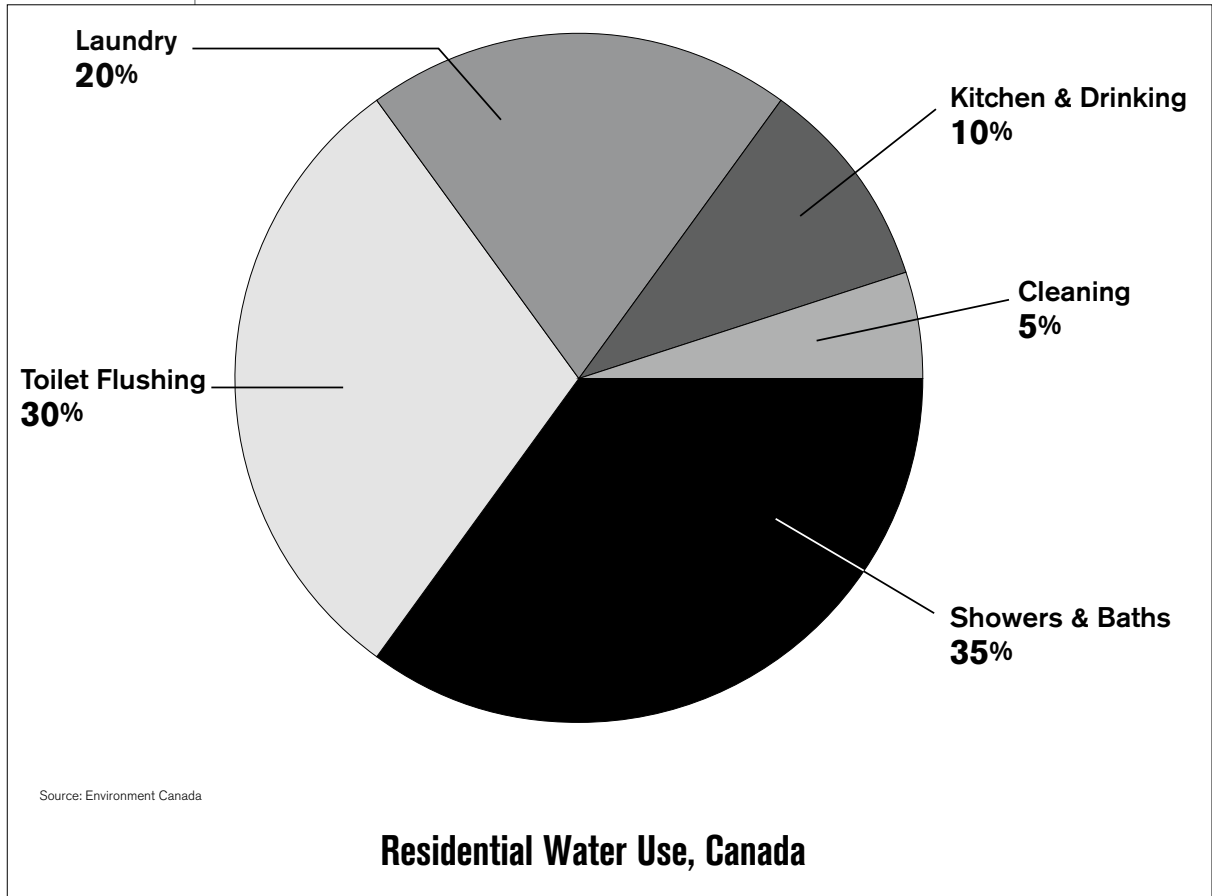
Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 10 • IWB Activity 7 • BLM <i>Our Water Use</i> • IWB Activity 8	• students' Science Folders • students' Science Journals		• rainwater • snow • ice • run off • stream • river • lake • pond • ocean • well • pipes • tap • water supply • surface water

Science Background

- Only about 3% of the water on Earth is fresh water. This includes ice, surface water (in lakes, rivers, and the like) and ground water. Ground water is found in the spaces between materials in Earth's upper layer. About 70% of Canadians (66% of those in Newfoundland and Labrador) rely on surface water for their supply. The remainder comes from ground water. Wells are common in many rural communities that lack sufficient infrastructure to develop other sources.

- Typical water use by Canadians at home is shown below.



Possible Misconceptions

- Unless they do not use a municipal supply, students are unlikely to have considered where the water in a faucet comes from.

ACTIVATE

Sources of Water

Brainstorm or review with students the different sources that provide people with water, for example, lakes, rivers, streams, creeks, ponds, oceans, and wells. Tell students that there is also water underground which they can't see. Explain that this water, called "groundwater," is found in spaces under the earth. This water is often directed to the municipal water supply. Ask:

- **How does the water get to your house?** (Students may say that water is pumped in or comes through the pipes.)

How Do We Use Water?

Ask students to tell you about any ways they used water today before they came to school. Make a list as students respond. Then, ask them if they have used water today in school, and add these responses to the list. Share Science Card 10 with the class. Ask students to describe the various ways that water is being used in the illustration. List students' responses, then ask:



- **IWB Activity:**
- Have students
- sequence activities
- according to the
- amount of water
- required for each
- activity using IWB
- Activity 7: *How much water?* (see the Teacher's Website).

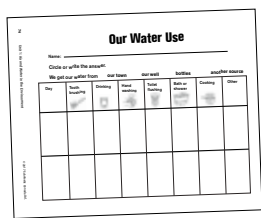


- **Are there any ways that your family uses water that are not shown in the picture? Tell me about them.** (Record any uses not shown on the Science Card.)
- **Are there any other ways that people use water that you know about? What are they?**

As a class, brainstorm uses of water. Use the unit KWLN chart to record students understanding and questions.

CONNECT

Water at Home



We get our water from		Hot water	Hot water	Hot water	Hot water	Hot water	Hot water	Hot water
Shower	Bath	Washing	Washing	Washing	Washing	Washing	Washing	Washing



Tell the class that they are going to find out more about how their family uses water at home by conducting a survey. Briefly explain what a survey is. Provide students with BLM *Our Water Use*. The BLM provides a space for recording the source of water at home. Instruct students to ask an adult to help them identify the source of their water at home. Students use the rest of the BLM to track, using tally marks, some common household uses of water in their household over a weekend or in one day. Students may need their family members to help them track some uses. Tally your own water use, too.

Review or demonstrate to students how to construct a pictograph using the data on your tally sheet. Then, have each student construct a pictograph of the data on water use collected from their home. Invite them to draw pictures like those on BLM *Our Water Use* or to invent their own. Have students store completed BLMs in their Science Folders.

CONSOLIDATE

How We Used Water

Have students share the pictographs of their home water consumption by posting them in the classroom. Ask students to compare their results to those of their peers. Ask:

- **Does everyone use water for the same purposes?**
- **Does everyone use the same amount of water?**

Have students make record their conclusions in their Science Journals. Incorporate students' responses in the KWLN chart.

Then, as a class, use the pictographs to sort the activities by how often they were done for the overall class. Record the sorting results in a central place. Ask:



- What could we do to use less water?
- Do you think it is important to conserve water? Why?

Revise the KWLN chart with new information or questions.

Conserving Water

Challenge students to suggest how they could reduce water waste at home and at school. Prompt them to look at the results of the water use survey when they are brainstorming. Students can communicate their ideas as a poster or Webpage that can be shared with the school.

EXPLORE MORE

IWB Activity:

- Alternatively, students could use IWB
- Activity 8: *How do we use water at school?* (see the Teacher's Website) to track students' water use through the day.



How Do We Use Water in My Classroom?

Create a tally sheet of common ways that students use water throughout the day at school: e.g., going to the bathroom, washing their hands, or getting a drink of water. Post the tally sheet in a central location, such as on the door, and have students add a tally mark to the sheet each time they carry out one of these activities, over a period of two or three days. If necessary, use a fresh tally chart each day. As a class, create a pictogram from the data. Ask:

- Does anything on the graph surprise you?
- Was anything more or less what you expected?
- Can you use this information to suggest ways we can reduce water use at school?

Our Water Use

Name: _____

Circle or write the answer.

We get our water from our town our well bottles another source

Day	Tooth brushing 	Drinking 	Hand washing 	Toilet flushing 	Bath or shower 	Cooking 	Other

Pollution



Focus: Students will explore the causes and effects of air and water pollution, and suggest personal actions they can take to reduce pollution.

Specific Curriculum Outcomes

Students will be expected to:

- 22.0 explore ways to protect and improve the quality of air and water in the environment [GCO 1/3]

Performance Indicators

Students who achieve these outcomes will be able to:

- plan and carry out actions as a class that may reduce pollution, and explain the importance of pollution control

NOTES:

Attitude Outcome Statements

Encourage students to:

- be sensitive to the needs of other people, other living things, and the local environment [GCO 4]

Cross-Curricular Connections

Social Studies

Students will be expected to:

- demonstrate an understanding of how individuals and groups have contributed to change [2.1.2]
- describe how people's interactions with their environment have changed over time [2.4.2]
- demonstrate an understanding of sustainable development and its importance to our future (local, national, and global) [2.4.3]

Math

It is expected that students will:

- construct and interpret concrete graphs and pictographs to solve problems [2SP2]

English Language Arts

Students will be expected to:

- select, read, and view with understanding a range of literature, information, media, and visual text [GCO 4]
- respond critically to a range of texts, applying their understanding of language, form, and genre [GCO 7]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 11 • IWB Activity 9 • Science Card 12	• bottle of dirty water • bottle of clean water • students' Science Journals	• Collect a sample of polluted water or mix soil with tap water in a bottle. • Find videos of air and water pollution associated with human activities. (optional) • Gather resources (e.g., books and Websites) related to pollution. • Make arrangements to visit a local water treatment facility, or invite a worker from the facility or an expert on water pollution to visit the class. • Invite an Elder or an Indigenous Knowledge Keeper to discuss how air or water pollution has affected their traditional way of life.	• pollution • polluted

Science Background

- In Canada, Newfoundland and Labrador has the lowest levels of the six most common air pollutants: sulphur oxides, nitrogen oxides, volatile organic compounds, ammonia, carbon monoxide, and particulate matter.

Air Pollutants	Sources
sulphur oxides, nitrogen oxides, and carbon monoxide	- oil and gas industry - transportation industry - other industries (includes mining) - fossil fuel use for heating and electricity production - burning of firewood
volatile organic compounds	- same sources as above for sulphur oxides, nitrogen oxides, and carbon monoxide - paint and solvent use - agriculture - off-road vehicles
ammonia	- agriculture; livestock waste and decomposing plant matter
particulate matter	- burning firewood - construction - dust from roads (paved and unpaved)

- Sources of water pollution include: industrial discharges or spills, untreated sewage, agricultural runoff, leaks in fossil fuel storage tanks or pipelines, storm water overflows, deposition of airborne pollutants (e.g. sulphur oxides dissolving in water to form acid rain), and plant and animal decomposition.
- In Newfoundland and Labrador, boil water advisories are usually issued as a result of contamination of the water supply with Giardia. Giardia is a parasite that enters the water supply by contaminated wildlife using a surface water source, and cannot be killed by other disinfection methods, such as water chlorination.

Possible Misconceptions

- It is unusual for students to have thought about pollution at this age or formed any misconceptions. Many people believe that air pollution or pollution in general is a major contributor to climate change. The reality is that most climate change is due to elevated levels of carbon dioxide in the atmosphere. This greenhouse gas absorbs and retains heat from the sun, raising the temperature on Earth.

ACTIVATE

Water Pollution

Bring in a bottle of dirty water (collect a sample from the environment, or mix soil in with tap water) and a bottle of clean water. Pass the bottles around and ask students which they would like to drink, bath in, or give to



a pet. Introduce the terms “pollution” and “polluted” and add them to the Word Wall. Ask:

- **How are people, animals, and/or plants affected by the pollution?**

When students have finished offering suggestions, lead them to an awareness of how important it is to their lives to have clean water.

CONNECT



What Does Pollution Do?

Share Science Card 11 with the students. In addition, you might watch videos of air and water pollution associated with human activities. Prompt discussion of the implications of pollution on humans and wildlife by asking questions such as:

- **Would you like to use this water? Why?**
- **Would you like to breathe this air? Why?**
- **Do you think water pollution would affect animals and fish? How?**
- **How do you think air pollution affects animals and/or plants?**

Divide the class into small groups. Have each group choose an aspect of pollution that interests them, and then write a specific question to which they can find an answer. Students can record their question in their Science Journals. Provide resources such as books and Websites, and instruct students to search for information related to the question they posed. When research is complete, students can share their research with their classmates by giving a class presentation, or creating a Webpage or poster.



Clean It Up!

Take students on a field trip to a local water treatment facility. Alternatively, have a worker from such a facility or an expert on water pollution visit the class. As a class, brainstorm questions students would like answered. After the trip/visit, discuss with students why using water wisely is important. Review the pictographs students created in *Water at Home* (see page 72) and help them to interpret the graphs to analyze their water consumption at home. Prompt deep thinking by wondering aloud about water use and water pollution. For example, you might say:

- **I wonder why I can't use all the water I want if we clean it up afterward?**
- **I wonder what happens to the stuff that they take out of the water?**
- **I wonder why we sometimes have to boil our water?**

Have the class create a bulletin board presentation summarizing what they learned during their trip/the visit. Revise and add to the unit KWLN chart whenever possible.

What Causes Pollution?

Divide the class into small groups. Direct the groups to brainstorm ways in which water and air might become polluted. Provide materials for students

IWB Activity:

- Students can use
- IWB Activity 9: *Helpful or harmful?* (see the
- Teacher's Website) to
- identify activities that
- are helpful or harmful
- to the environment.



to record their ideas. When the groups have finished brainstorming, come together as a class and invite each group to share their ideas. Create a class list of ideas in a central location.

Have the class vote on which idea is most interesting to them. Write this in a large format and post it in the classroom (e.g. air pollution comes from cars). Then, divide the class into small groups and have the students conduct research to find out if pollution actually happens the way they think it does. Provide resources and time for students to conduct research to check the validity of their ideas. Remind students to keep records of what they find, and that they will be expected to share their information with the rest of the class.

After the groups have shared their findings, return to the statement you posted. Ask students if their idea was completely correct, a bit correct, or not correct at all. Have them explain their choice. Then, invite them to revisit their statement and revise it, based on what they learned.

CONSOLIDATE



Let's Keep It Clean!

Invite an Elder or an Indigenous Knowledge Keeper to discuss how air or water pollution has affected their traditional way of life.

Share Science Card 12 with the class. Discuss the questions on the card as a class. Then, ask students to suggest ways they, as a class, might act to reduce pollution and, therefore, protect our environment. Then, work with the class to create a plan to carry out their idea. For example, students might start a recycling program, reduce the use of paper, or walk to school more often. Students could create a poster campaign to encourage others in the school or community to take action to reduce pollution.

EXPLORE MORE

What If?

Challenge students to draw, build a model, or relate a story in order to communicate their ideas of how their community would be affected if we do not act in ways that protect our water and air. Provide materials, books, and online resources for students to use as needed.

WRAPPING UP THE UNIT



Revisit any remaining questions posted on the I Wonder Wall and have students discuss answers in small groups or with a partner. If there are questions which cannot be answered at the time, these can remain on the I Wonder Wall for students to research independently. Discuss what the students have learned about the three states of water; moisture in the environment, in materials, and in living things; changing air conditions; and ways to protect and improve the quality of air and water in the environment.

Specific Curriculum Outcomes Checklist

Name: _____ Date: _____

Rating: 1 – not evident; 2 – with assistance; 3 – mostly on own; 4 – on own consistently

Specific Curriculum Outcomes	Rating and Observations
1.0 pose questions that lead to exploration and investigation [GCO 2]	
2.0 communicate using scientific terminology [GCO 2]	
3.0 explore how air surrounds us, takes up space, and is felt as wind when it moves [GCO 1/3]	
4.0 explore characteristics of the three states of water [GCO 1/3]	
5.0 investigate changes that occur when the three states of water are heated or cooled [GCO 1/3]	
6.0 predict based on an observed pattern [GCO 2]	
7.0 make and record observations and measurements [GCO 2]	
8.0 explore evidence of moisture in the environment, in materials, and in living things [GCO 1/3]	
9.0 propose an answer to an initial questions or problem and draw a simple conclusion [GCO 2]	
10.0 sequence or group materials and objects [GCO 2]	
11.0 explore changes in the location, amount, and form of moisture [GCO 1/3]	
12.0 communicate while exploring and investigating [GCO 2]	
13.0 investigate conditions that affect changes in the location, amount, and form of moisture [GCO 1/3]	
14.0 communicate procedures and results [GCO 2]	
15.0 explore changes in air conditions in indoor and outdoor environments, and describe and interpret these changes [GCO 1/3]	
16.0 use appropriate tools [GCO 2]	
17.0 explore the effects of weather on objects and materials [GCO 1/3]	
18.0 investigate ways to protect objects and materials under different conditions [GCO 1/3]	
19.0 select and use materials to carry out their own explorations and investigations [GCO 2]	
20.0 explore how water is used, obtained, and distributed in personal, local and regional environments [GCO 1/3]	
21.0 construct and label concrete-object graphs or pictographs [GCO 2]	
22.0 explore ways to protect and improve the quality of air and water in the environment [GCO 1/3]	

My Inquiry

Name: _____

My question:

My plan:

My results:

My conclusion:

How I will share what I learned:

Student Self-Assessment of Inquiry Process

Name: _____

Rating Scale  = Great  = Good  = Needs to be better

Step 1			
I asked a question.			
I made a plan.			
Step 2			
I followed my plan.			
I recorded my results.			
Step 3			
I thought about my results.			
I made a conclusion.			
Step 4			
I shared what I learned.			

Teacher Assessment of Inquiry Process

Name: _____ Date: _____

	1	2	3	4
Initiating and Planning				
• poses a question that leads to exploration or investigation				
• makes a prediction based on an observed pattern				
• makes a simple plan				
• selects and uses materials				
Performing and Recording				
• carries out the plan/follows a simple procedure				
• uses appropriate tools				
• makes observations				
• records observations and measurements				
• identifies and uses a variety of sources of information and ideas				
• follows safety procedures and rules				
Analyzing and Interpreting				
• sequences or groups materials and objects				
• constructs and labels concrete-object graphs or pictographs				
• proposes an answer to the initial question and draws a simple conclusion				
• poses new questions that arise from what was learned				
Communicating and Teamwork				
• communicates while exploring and investigating				
• communicates using scientific terminology				
• communicates procedure and result				
• responds to ideas and actions of others and acknowledges their ideas and contributions				

Comments:

Inquiry Process Rubric

	Level 1	Level 2	Level 3	Level 4
INITIATING AND PLANNING	talks about things that are of interest makes guesses about the outcome of an inquiry with prompting, offers ideas for a procedure with prompting, identifies some materials which could be used to carry out the plan	asks simple questions about objects and events that are observable makes simple predictions about the outcome of an inquiry, but they may be hoped-for outcomes contributes ideas for a procedure, but they may not be complete identifies some materials which could be used to carry out the plan	uses observations to ask questions to investigate, but questions are not always realistic makes simple predictions about the outcome of an inquiry based on prior observations provides ideas for a simple procedure selects and uses materials to carry out the plan	uses observations and prior knowledge to ask questions to investigate makes thoughtful predictions about the outcome of an inquiry based on prior observations and knowledge provides clear, sequential steps for a simple procedure selects and uses appropriate materials to carry out the plan and explains reasons for choice
PERFORMING AND RECORDING	carries out the plan/ follows a simple procedure with prompting with prompting, uses some appropriate tools with assistance makes simple observations using senses with prompting, records observations and measurements gets information from a teacher-chosen source needs help to follow safety procedures and rules	carries out the plan/ follows most of a simple procedure selects and uses common tools makes some relevant observations using senses records observations and measurements which may be incomplete identifies some relevant information from familiar sources needs occasional prompting to follow safety procedures and rules	carries out the plan/follows a simple procedure selects and uses some appropriate tools makes relevant observations using appropriate senses records observations and measurements accurately identifies relevant information from sources of the same type follows most safety procedures and rules	carries out the plan/ follows a simple procedure, making adjustments as necessary selects and uses all appropriate tools makes relevant, detailed observations using appropriate senses records observations and measurements accurately in a variety of ways identifies relevant information from a variety of sources follows all safety procedures and rules and explains why they are needed

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Inquiry Process Rubric (Continued)

	Level 1	Level 2	Level 3	Level 4
ANALYZING AND INTERPRETING	sequences or groups materials and objects based on simple teacher-chosen attributes with prompting, constructs a concrete-object graph or pictograph describes what happened with prompting, identifies some new questions but they may not be about this inquiry	sequences or groups materials and objects based on a few simple attributes constructs a concrete-object graph or pictograph but title and labels may be missing or inappropriate draws a simple conclusion based on observations, but may not link conclusion to the initial question identifies some simple new questions on the topic of this inquiry	sequences or groups materials and objects based on multiple attributes constructs a concrete-object graph or pictograph with appropriate title and labels draws a conclusion based on observations which link to the initial question identifies some new questions on the topic of this inquiry that could be investigated	accurately sequences or groups materials and objects based on multiple attributes constructs a concrete-object graph or pictograph with appropriate title and labels to accurately reflect results draws a conclusion based on observations and states if it supports or refutes their prediction identifies new questions on the topic of this inquiry and suggests how they could be investigated
COMMUNICATING AND TEAMWORK	willingly asks for help and accepts help from other group members understands some scientific terminology but rarely uses it with prompting, describes the result and some of the procedures listens to others and learns from their observations	makes suggestions to group members as to what should be done understands simple scientific terminology, but does not always use it correctly communicates basic information about the result and most of the procedures listens to others and learns from their observations, and draws on their language use	communicates with group members, sometimes with problems usually uses scientific terminology appropriately communicates most of the information about the result and procedures considers and responds to the ideas of others and learns from their observations and descriptions	communicates and works effectively with group members consistently uses scientific terminology appropriately accurately communicates the information about the result and procedures considers and responds to the ideas of others and applies the observations and descriptions to their own ideas and understandings

Additional Resources

Non-fiction Books

- About Habitats: Polar Regions*, by Cathryn Sill (Peachtree Publishers, 2015)
- Extreme Weather* [Discovery Kids Series] (Parragon Books, 2013)
- Eyewitness Explorer: Nature Ranger* [Eyewitness Explorer Series] (DK Kids, 2015)
- Make a Splash!: A Kid's Guide to Protecting Our Oceans, Lakes, Rivers, & Wetland*, by Catherine Berger Kaye (Free Spirit Publishing, 2012)
- National Geographic Kids: Polar Bears* by Laura Marsh (National Geographic, 2013)
- Polar Bears*, by Mark Newman (Henry Holt and Co., 2010)
- Raindrops Roll*, by April Pulley Sayre (Beach Lane Books, 2015)
- Why Does It Happen: Tornadoes, Hurricanes and Typhoons* [Children's Weather Books] (Baby Professor, 2015)

Picture Books

- Oil Spill!* by Melvin Berger (HarperCollins, 1994)
- The Lorax* by Dr. Seuss (Random House Books for Young Readers, 1971)
- Where Do Polar Bears Live?* Sarah L. Thomson (HarperCollins, 2009)
- Why Are the Ice Caps Melting?: The Dangers of Global Warming* by Anne Rockwell (HarperCollins, 2006)
- Why Should I Save Water?* by Jen Green (Barron's Educational Series, 2005)

Websites for Students

- American Museum of Natural History Ology: Water
<http://www.amnh.org/explore/ology/water>
- BBC Science Clips: Solids and Liquids
http://www.bbc.co.uk/schools/scienceclips/ages/8_9/solid_liquids.shtml
- EekOWorld: Air and Water
http://pbskids.org/eeoworld/index.html?load=air_water
- Hypothesis: Evaporation
<http://www.knowledgekids.ca/videos/hippothesis/evaporation-s0-e8>
- Hypothesis: Fog
www.knowledgekids.ca/videos/hippothesis/fog-s0-e3
- Hypothesis: Why Do Icicles Melt
<http://www.knowledgekids.ca/videos/hippothesis/icicles-s0-e15>
- Kids Geo: Condensation
www.kidsgeo.com/geography-for-kids/0107-condensation.php
- Kids Geo: Evaporation
www.kidsgeo.com/geography-for-kids/0102-evaporation.php
- Tree House Weather Kids: How Do We Measure the Wind
<http://extension.illinois.edu/treehouse/airpressure.cfm?Slide=8>

Websites for Teachers

TVO Kids: The Green Squad: Water for Everyone

<http://www.tvokids.com/shows/greensquad>

TVO Kids: Finding Stuff Out: Water

<http://www.tvokids.com/shows/findingstuffout>

TVO Kids: Project Ice

www.tvokids.com/videos/projectice

AAAS SciLinks: Water3—Melting and Freezing

<http://sciencenetlinks.com/lessons/water-3-melting-and-freezing/>

Canadian Geographic: How to reduce water pollution by conserving water at home

www.canadiangeographic.ca/magazine/so03/indepth/knowledgetoolbox.asp

Earth Rangers

www.earthrangers.org/bring-back-the-wild-curriculum-resources/

EekWorld

<http://pbskids.org/eeekoworld//parentsteachers/lessons.html>

eSchool Today: Water

<http://eschooltoday.com/science/needs-of-living-organisms/living-things-need-water-to-survive.html>

How Stuff Works: How Food Preservation Works

<http://science.howstuffworks.com/innovation/edible-innovations/food-preservation.htm>

How Stuff Works: Science Projects for Kids—Air Pressure

<http://lifestyle.howstuffworks.com/crafts/other-arts-crafts/science-projects-for-kids-air-pressure.htm>

National Centre for Home Food Preservation

http://nchfp.uga.edu/publications/nchfp/factsheets/food_pres_hist.html

National Geographic: Condensation

<http://education.nationalgeographic.org/encyclopedia/condensation/>

National Geographic: Evaporation

<http://education.nationalgeographic.org/media/learning-about-evaporation/>

National Geographic: Frost

<http://education.nationalgeographic.org/encyclopedia/frost/>

NL Turn Back the Tide: At Home

www.turnbackthetide.ca/at-home/water/water.shtml#.VrIQMvkrLIU

PBS Kids Plum Landing: Evaporation

http://pbskids.org/plumlanding/educators/activities/evaporation_station_ed.html

Weather Watchers

<https://sites.google.com/site/weatherwatchers65/home/>

Weather Wiz Kids

www.weatherwizkids.com/

Dear parents and caregivers,

We are about to start an exciting new unit in science where we will be exploring air and water in the environment. Through a variety of hands-on explorations and investigations, your child will be developing an understanding of concepts such as changes in air conditions; moisture in the environment, in materials, and in living things; and the effects of weather on objects and materials. As well, your child will be challenged to consider ways of protecting and improving the quality of air and water in the environment.

You can talk to your child at home about how your family prepares for changing weather conditions and explain the water supply for your home (e.g., well or city supply). You can also help your child to conduct a survey of your family's water usage at home.

To ensure a wide range of experiences and make connections between this topic and your child's world, he/she may choose to bring one or more personal items to school for exploration during in-class activities. These items will be returned home once explorations are completed. To determine whether the item(s) is appropriate please contact me, your child's teacher.

Sincerely,