

Grade **2** Liquids and Solids

TEACHER'S GUIDE

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Liquids and Solids

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Let's Do Science, Newfoundland and Labrador

Grade 2 Unit 2: Liquids and Solids Teacher's Guide

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Welcome to the *Liquids and Solids Unit*

In this unit, students develop their understanding of liquids and solids 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 liquids and solids 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 Aloud

The Read Aloud text allows you to introduce and engage students with science concepts. *Perfect Snow* by Barbara Reid is a delightful story that introduces the concept of familiar liquids and solids, and how they interact.



Anchor Video

The Anchor Video: *Liquids and Solids*, found on the Teacher's Website, introduces students to essential questions about the properties of liquids and solids, what happens when we combine and mix them, and how they can be made into useful materials. The video gives a number of examples to activate students' thinking and to promote questions.



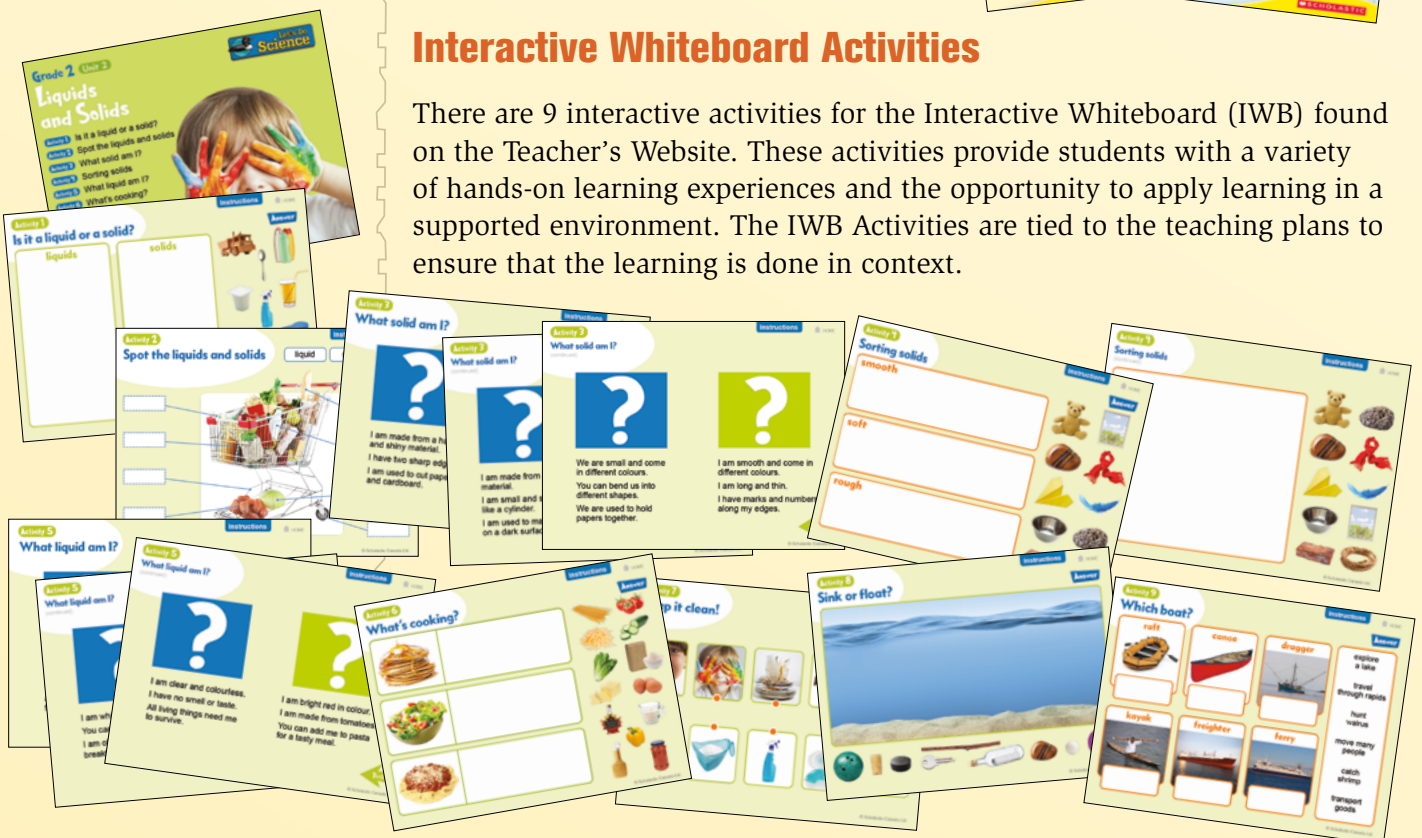
Posters

Two classroom posters—*What Is the Inquiry Process?* and *What Is the Design Process?*—will support students as they follow the steps for guided and open inquiries and learn to use the design process to create a solution to a problem.



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 *Liquids and Solids*.



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 *Liquids and Solids*

Teaching Plans	Specific Curriculum Outcomes	Components	Materials	Literacy Place Connections
What Is a Liquid? What Is a Solid? Students investigate various objects in order to identify them as either liquids or solids.	Skills [GCO 2] • 1.0	• IWB Activity 1 • Science Card 1 • BLM <i>Examples of Liquids and Solids</i> • IWB Activity 2 • Anchor Video: <i>Liquids and Solids</i>	• sticky notes • students' Science Folders • students' Science Journals • digital camera (optional) • a "mystery box" containing various liquids and solids, such as a block of wood, glue stick, crayon, cotton ball, piece of tin foil, ketchup packet, travel-size hand sanitizer, juice box, snack-size tube of yogurt, liquid-filled stress ball	
How Can We Describe Solids? Students explore and describe various solids, then group their descriptive words into categories (properties).	Skills [GCO 2] • 12.0 • 10.0 STSE/K [GCO 1/3] • 23.0	• Science Card 2 • IWB Activity 3 • BLM <i>Properties of Solids</i> • IWB Activity 4	• strips of paper • various small solids (e.g., cotton balls, sheets of tin foil, sheets of paper, plastic baggies, crayons, blocks of wood, erasers, drinking straws, modelling clay, gummy bears) • students' Science Folders • students' Science Journals • several chunks of modelling clay or chocolate • several mugs, shallow foam trays, and small baggies • kitchen scale	

Teaching Plans	Specific Curriculum Outcomes	Components	Materials	Literacy Place Connections
How Can We Describe Liquids? Students explore and describe various liquids, then sequence liquids according to a variety of properties.	Skills [GCO 2] • 12.0 • 10.0 STSE/K [GCO 1/3] • 23.0	• IWB Activity 5 • BLM <i>Sequencing Liquids</i> • Science Card 3 • Science Card 4	• several clear plastic containers of various shapes and sizes • 250–500 ml of coloured water • clear mug, shallow foam tray, and small baggie • Properties of Solids Anchor Chart • small clear plastic cups, such as medicine cups • 250 ml each of several liquids (e.g., glue, milk, vinegar, juice, cooking oil, chocolate sauce, hand lotion, shampoo) in clear plastic cups • various containers (e.g., mugs, bowls, test tubes, square pans) • students' Science Journals • 3 clear containers of same size and shape, containing 100 ml of apple juice, hair conditioner, and molasses (separately) • sticky notes • students' Science Folders • a variety of liquids (e.g., bottle of glue, litre of milk, bottle of vinegar, bottle of cooking oil, bottle of chocolate syrup, hand lotion in dispenser or bottle, bottle of shampoo, bottle of water, hand soap in dispenser, jar of honey, bottle of ketchup, container of maple syrup) • ml measuring spoons • one large piece of stiff cardboard for every 3–4 students; one side should be covered with parchment paper • several foil pans	

Continued on next page...

Planning Guide for *Liquids and Solids* (continued)

Teaching Plans	Specific Curriculum Outcomes	Components	Materials	Literacy Place Connections
What Happens When We Combine Liquids and Solids? Students investigate the ways in which familiar liquids and solids can interact with one another.	Skills [GCO 2] • 7.0 • 14.0 STSE/K [GCO 1/3] • 24.0	• <i>Perfect Snow</i> (Read Aloud) • Science Card 5 • Science Card 6 • BLM <i>Results Table</i>	• snow • bottle of oil-and-vinegar dressing containing rosemary/basil and black pepper pods • beakers of water (one per group) • eyedroppers of water (one per group) • small portions of cooking oil, maple syrup, chocolate syrup, food colouring, ground black pepper, flour, grapes, and dry cereal (one portion of each per group) • small blocks of wood (two per group) • cotton balls (two per group) • pieces of cardboard (two per group) • pieces of tissue (two per group) • plastic blocks (two per group) • sugar cubes (two per group) • Styrofoam packing “peanuts” (two per group) • tin foil (one sheet per group) • digital camera (optional) • sensory bottle (plastic water bottle filled with oil and coloured water, with one or more solids such as glitter, plastic confetti, sea shells, pebbles, beads, or fish tank gravel) • plastic water bottles pre-filled with an oil-and-water mixture (one per pair of students) • glitter, plastic confetti, sea shells, pebbles, beads, fish tank gravel, etc. • small spoons • hot glue gun	<i>An Early Worm Got Out of Bed</i> (“The Muddy Puddle,” pages 16–17, Shared Reading—Active Learning Kit)

Teaching Plans	Specific Curriculum Outcomes	Components	Materials	Literacy Place Connections
How Do Liquids and Solids Change When We Mix Them? Students explore the ways in which familiar liquids and solids can change when they are mixed with one another.	Skills [GCO 2] • 16.0 STSE/K [GCO 1/3] • 25.0	• Science Card 7	• glass of water • bottle of food colouring • various mixing tools • sticky notes • safety goggles for all students • small cups (30) • three pitchers of water • small quantities of bubble bath liquid, cooking oil, instant coffee, drink mix, baking powder, vitamin C tablets, compressed soil discs, and various other liquids and solids (e.g., bar of soap, crackers, tissue, dried fruit, salt, sugar, sand, kitty litter, honey, glue, chocolate syrup) • digital camera (optional) • students' Science Folders • aprons for all students • plastic table coverings and/or paper towels • large box of cornstarch • water • 1 large bowl • 1 small bowl • measuring cups and spoons • empty, clear plastic water or soda bottles (one per group) • uninflated balloons (one per group) • small funnels or spouted containers (one per group) • white vinegar • baking soda	<i>3-2-1 Blast Off!</i> (Shared Reading—Sequencing Strategy Unit)

Continued on next page...

Planning Guide for *Liquids and Solids* (continued)

Teaching Plans	Specific Curriculum Outcomes	Components	Materials	Literacy Place Connections
How Can We Mix Liquids and Solids to Make Useful Things? Students explore how to create useful mixtures of liquids and solids.	Skills [GCO 2] • 16.0 STSE/K [GCO 1/3] • 26.0	- Science Card 8 <i>The Little Knight Who Battled the Rain</i> (Read Aloud, Unit 1) - Science Card 9 - IWB Activity 6 - BLM <i>Recipe Card</i>	- package of gelatin dessert mix - electric kettle - several large clear bowls - measuring cups and spoons - stirring tools - ingredients, containers, and tools to make a variety of items that come with instructions (e.g., orange juice or lemonade from concentrate, chocolate milk, pudding or custard, chip dip, or brownies, cakes, and cookies) - flour, salt, cold and hot water, food colouring, saucepan or bowl, whisk or rotary beater	<i>Mr. Fix-It</i> (Guided Reading, Level K)
How Can We Use Liquids and Solids to Keep Our World Clean? Students investigate how to use liquids and solids to keep our world clean.	Skills [GCO 2] • 27.0 • 19.0 STSE/K [GCO 1/3] • 28.0	- Science Card 10 - IWB Activity 7	- honey, paint, cereal in milk, mud, glitter - various surfaces or containers (e.g., foil trays, pieces of cardboard) - materials with varying degrees of absorbency (e.g., towels, newspaper, paper towels, tissue paper, J-cloths, felt, baby wipes) - ingredients to make homemade cleaners (e.g., baking soda, water, vinegar, olive oil, sea salt, peppermint or citrus essential oil, eggs, lemon juice) - small mixing bowls and tools, measuring spoons and cups - empty spray bottle - old toothbrushes - dish tubs (one per small group) - water - vegetable oil - small items to which oil would adhere (e.g., rubber ducks, small rocks, feathers) - various commercial cleaning products (glass cleaner, dish soap, laundry detergent) - students' Science Journals	<i>Keep Us Clean</i> (Guided Reading, Level J)

Teaching Plans	Specific Curriculum Outcomes	Components	Materials	Literacy Place Connections
What Materials Float? What Materials Sink? Students use the inquiry process to investigate the buoyancy of different self-chosen solids. Students record their predictions and results on a graph.	Skills [GCO 2] • 19.0 • 21.0	• <i>What Is the Inquiry Process?</i> poster • Science Card 11 • IWB Activity 8	• bottle of oil-and-vinegar dressing from <i>What Happens When We Combine Liquids and Solids?</i> (see page 35) • 3–4 samples each of marbles, cotton balls, sugar cubes, blocks of wood, plastic blocks, Styrofoam trays, sponges, gummy candies, and soda crackers • tubs of water (one per pair + one extra for demonstration) • students' Science Journals • small amounts of various items, such as paper clips, crayons, craft sticks, jelly beans, coins, bars of soap, lumps of clay, rocks, plastic toys, ice cubes, feathers, cans of diet cola, cans of regular cola, pumice stones, peeled oranges, unpeeled oranges, and pieces of string • digital camera (optional) • large box of salt • stirring tools • toy plastic buckets (one per pair) • ½ dozen raw eggs (if permitted)	
Design Challenge: Build a Boat Students use the design process to build a boat capable of supporting a specific number of coins.	Skills [GCO 2] • 30.0 • 31.0 • 32.0 STSE/K [GCO 1/3] • 29.0	• Science Card 12 • IWB Activity 9 • <i>What Is the Design Process?</i> poster • BLM TAG <i>Feedback</i> (one per group)	• tin foil • several coins of the same size (10 per group) • students' Science Journals • digital camera or tablets (optional) • large tub of water • various buoyant materials and adhesives (e.g., craft sticks, stiff cardboard, straws, Styrofoam, tape, glue)	

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 explore objects related to liquids and solids.

The Curiosity Centre could have

- a variety of liquids and solids for students to explore (except by taste, which should be done under adult supervision), such as cotton balls, sheets of tin foil, plastic baggies, crayons, blocks of wood, erasers, drinking straws, modelling clay, glue, milk, vinegar, cooking oil, hand lotion, shampoo, apple juice, hair conditioner, molasses, as well as gummy bears, juice, and chocolate sauce, if there are no allergy concerns
- a variety of mixtures or combinations of liquids and solids for students to examine and use as a resource for drawing, such as a lava lamp, snow globe, bottle of oil-and-vinegar salad dressing

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 liquids and solids. 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. Allergy concerns must be considered before adding any item to the centre.

2. Science Journals and Folders



Check that students are recording appropriately in their Science Journals, ensuring that they date each entry and record ideas using sketches with labels, lists of words, or sentences. Continue to encourage them to add new questions or ideas to their Journals as often as they like.

Remind students that they should store completed BLMs, drawings, graphs, etc. that are related to the *Liquids and Solids* unit in their Science Folders.

3. Word Wall



Add any relevant science terminology to the Word Wall throughout the unit. Urge students to use the terms as often as possible as they work through the unit.

4. I Wonder Wall



Continue to 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 liquids and solids 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 Liquids and Solids in the Additional Resources section of this guide (page 76).

What Is a Liquid? What Is a Solid?



Focus: Students investigate various objects in order to identify them as either liquids or solids.

Specific Curriculum Outcomes

Students will be expected to:

- 1.0 pose questions that lead to exploration and investigation [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- ask questions to help them identify items as either liquids and solids
- list several examples of liquids and solids

NOTES:

Attitude Outcome Statements

Encourage students to:

- show interest in and curiosity about objects and events within the immediate environment [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]

Getting Organized

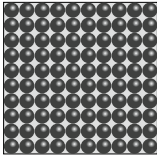
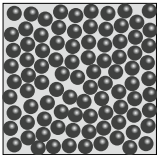
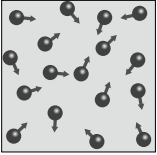
Components	Materials	Before You Begin	Vocabulary
• IWB Activity 1 • Science Card 1 • BLM <i>Examples of Liquids and Solids</i> • IWB Activity 2 • Anchor Video: <i>Liquids and Solids</i>	• sticky notes • students' Science Folders • students' Science Journals • digital camera (optional)	• Prepare a "mystery box" containing various liquids and solids, such as a block of wood, glue stick, crayon, cotton ball, piece of tin foil, ketchup packet, travel-size hand sanitizer, juice box, snack-size tube of yogurt, liquid-filled stress ball.	• liquid • solid

Safety

- Ensure students understand that they are not to taste any of the items from the mystery box or around the classroom.

Science Background

- Liquid and solid are just two of the possible states (or forms) of matter. Other states include gas, plasma, and Bose-Einstein condensate.
- The state or form of any given type of matter depends on how close together the particles are. Water in the form of ice, for example, has particles that are much closer together than water in the form of condensate.

State of Matter	Arrangement of Particles	Movement of Particles	Takes the Shape of a Container?	Expands to Fill a Container?
Solid		low	no	no
Liquid		medium	yes	no
Gas		high	yes	yes

ACTIVATE



Mystery Box

Write the words “liquid” and “solid” on the Word Wall. Ask students if they have ever heard these words. Ask:

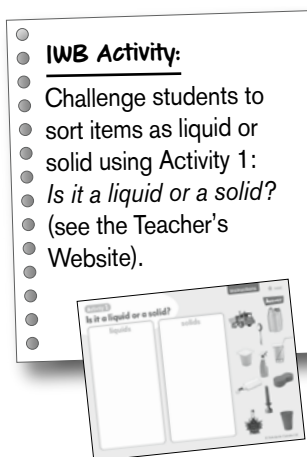
- What do you think a liquid is? Can you think of an example?
- What do you think a solid is? Can you think of an example?

As students brainstorm, record any descriptive words on chart paper or the IWB, such as “runny” and “hard.”

Introduce a mystery box that contains various liquids and solids (e.g., a block of wood, glue stick, crayon, cotton ball, piece of tin foil, ketchup packet, travel-size hand sanitizer, juice box, snack-size tube of yogurt, liquid-filled stress ball). Invite students to take turns pulling items out of the box. As each item is pulled out of the mystery box, ask:

- Is this a liquid, a solid, or a mystery?

Have students pass each item around and examine it as they discuss the question. Remind students not to use their sense of taste to investigate the items.



CONNECT



Liquid or Solid?

Have students examine Science Card 1 and take turns identifying the items in the photos. As each item is identified, write its name (e.g., tomato, basket) at the top of a sticky note and post it on or beside the Science Card.



Invite students to discuss each item and whether it is a liquid or a solid. Encourage students to generate questions to help them decide. Record their questions on the I Wonder Wall. If necessary, model with questions such as:

- What makes something a liquid?
- How do we know something is a solid?
- Are all liquids runny? Are all solids hard?

As students make a decision about each item, invite someone to come up and write an “L” or an “S” on the item’s sticky note. Students can also write a “?” on the sticky note to indicate it is a mystery. (Students may find some items difficult to classify, for example, students may classify vegetables as solids but they contain liquid or moisture.)

CONSOLIDATE

Examples of Liquids and Solids

Examples of Liquids	Examples of Solids



Examples of Liquids and Solids

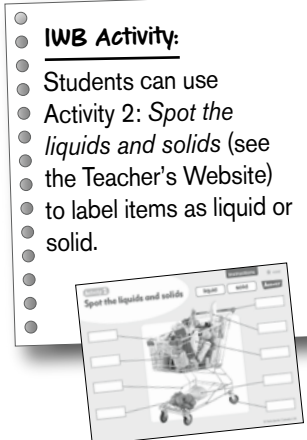
Provide a copy of BLM *Examples of Liquids and Solids* for each student and have them fill in the BLM by writing or drawing some of the liquids and solids they identified from the mystery box and Science Card 1. Have students store their completed BLMs in their Science Folders.



Anchor Video

Play the Anchor Video: *Liquids and Solids* which is located on the Teacher’s Website. Set a focus for viewing by asking students to think about what makes something a liquid or a solid. You may choose to pause the video to allow students to answer questions or to discuss any questions which students may have. Ask students to identify the images in the video as liquid or solid and add these to their Examples of Liquids and Solids list.

After playing the video, work with students to formulate broad definitions for “liquid” and “solid.” Record each definition on chart paper and post it on the wall. Have students record these definitions in their Science Journals.



EXPLORE MORE

Classroom Search

Invite students to search the classroom: half of them can look for liquids while the other half looks for solids. Students can then create a digital or hand-drawn collage of images showing the items they discovered.

Examples of Liquids and Solids

Name: _____

Examples of Liquids	Examples of Solids

How Can We Describe Solids?



Focus: Students explore and describe various solids, then group their descriptive words into categories (properties).

Specific Curriculum Outcomes

Students will be expected to:

- 23.0 explore properties of familiar liquids and solids [GCO 1/3]
- 12.0 communicate while exploring and investigating [GCO 2]
- 10.0 sequence or group materials and objects [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- describe a solid using words related to its properties
- group solids according to their properties

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

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 learnings; and to use their imaginations [GCO 8]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 2 • IWB Activity 3 • BLM <i>Properties of Solids</i> • IWB Activity 4	• strips of paper • various small solids (e.g., cotton balls, sheets of tin foil, sheets of paper, plastic baggies, crayons, blocks of wood, erasers, drinking straws, modelling clay, gummy bears) • students' Science Folders • students' Science Journals • several chunks of modelling clay or chocolate • several mugs, shallow foam trays, and small baggies • kitchen scale	• Prepare sets of five items with different colours, shapes, sizes, textures, hardness, flexibility, and weight. You will need one set for every two students in the class.	• property • properties • texture • flexibility • weight

Safety

- Ensure students are not allergic to any substances being investigated.
- Remind students not to taste any solids they are exploring.

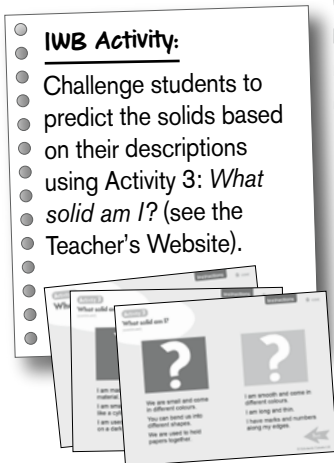
Science Background

- To identify, describe, and classify matter, we refer to its properties, or characteristics.
- The physical properties of matter include its colour, shape, size, texture (feel), hardness, flexibility (ability to bend), odour, and taste. Mass, volume, and density (the quantity of mass per unit of volume) are also physical properties of matter. These properties can be observed without changing the state of the matter.

Possible Misconceptions

- Students may find it easy to identify certain substances as solids or liquids, based on the physical properties they observe. Some matter (e.g., toothpaste, hair gel, playdough) may have properties of both solids and liquids, however, and thus be more difficult to classify. This is because liquid and solid are not opposite states of matter—all matter actually exists along a continuum.

ACTIVATE



Describing Solids

Ask students to describe each object shown on Science Card 2. If necessary, prompt them by asking:

- What does the object look like?
- What might the object feel like?

You may also provide samples of the objects shown to allow students to explore physical sensory learning objects.

On strips of paper, record any words students use that describe properties (e.g., blue, square, small, rough, hard, bendy, heavy).

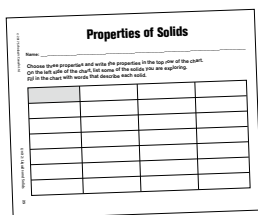
Then, spread the word strips on a table or the floor and ask students how they might sort or group them (e.g., “blue” and “red” are both colours). Write the categories they generate on chart paper (colour, shape, size, texture, hardness, flexibility, weight), prompting as necessary. Explain that these categories are properties, or ways to describe how something feels or looks. By describing an object’s properties, we can tell someone else about the object even if we don’t know what it is. Add the words “property,” “properties,” “texture,” “flexibility,” and “weight” to the Word Wall.

CONNECT

Observing Properties

Invite students to choose partners. Give each pair a small collection of various solids (e.g., items from the Curiosity Centre such as a cotton ball, tin foil, sheet of paper, plastic baggie, crayon, block of wood, eraser, drinking straw, modelling clay, gummy bear). Students can manipulate each solid and observe its colour, shape, size, texture, hardness, and flexibility.

Have each pair choose three properties from the chart paper and write them on the top row of BLM *Properties of Solids*. Then invite them to record several solids on the left side of the chart. Students then record three properties for several solids in their collection (e.g., the cotton ball is white, round, and soft). Have students store their completed BLMs in their Science Folders.



IWB Activity:

Students can sort solids using Activity 4: *Sorting solids* (see the Teacher's Website).



Sorting by Property

Have each pair of students join another pair and combine their objects. Then have the two pairs sort their objects according to various properties (e.g., all of the round objects, all of the flexible objects). Students can draw and label the groups of objects.

CONSOLIDATE



Properties of Solids Anchor Chart

Have students use their observations and their BLMs to generate points for a class Properties of Solids Anchor Chart (e.g., “solids have a colour, shape, and size”; “solids have a certain amount of hardness, roughness, and flexibility”). Record the Anchor Chart on chart paper or the IWB, and have students copy the chart into their Science Journals.

Provide pairs of students with chunks of modelling clay or chocolate. Ask:

- **Is this material a solid? How do you know?**

Invite students to transfer their chunks of modelling clay/chocolate from one container to another, such as from a mug to a shallow foam tray to a baggie. Ask:

- **What happens to this solid when you put it in a different container? Does its shape change, depending on the shape of the container?**
- **Can you change the shape of this solid?**

Invite students to change the shape of the modelling clay/chocolate by breaking it into pieces (e.g., crushing it inside a baggie). Ask:

- **When you break this solid apart, are all the pieces still modelling clay/chocolate? Are all the pieces still solids?**

Use a kitchen scale to weigh a large chunk of modelling clay/chocolate. Have students record the weight. Then invite a volunteer to break the chunk into smaller pieces, and weigh the pieces. Have students record the weight and observe that it is the same as the original weight. Ask a volunteer to break the pieces into even smaller pieces, and weigh them, noting that the weight is still the same.

Invite students to use their observations of the modelling clay/chocolate to add points to the class Anchor Chart, such as “solids do not change shape on their own” and “solids have a certain weight.” Make sure students add these points to the chart they have copied into their Science Journals. Invite students to record any questions they may have on the I Wonder Wall.



EXPLORE MORE

Barrier Game

Have pairs or small groups play a solids barrier game. Students/groups face one another, with a book standing between them, blocking their view of one another. Each side is given a set of the same four objects and a sheet of paper divided into four quadrants. One side places its objects on its sheet of paper, and then tells the other side which object should go where on its sheet of paper. The rule is that students must not use the names of the objects—they can only describe the objects' properties (e.g., “Put the blue, hard, rough solid in the top left corner. Put the red, flexible, smooth solid in the middle.”). Once both sides have their objects in the same places on their sheets of paper, they can switch roles and play again with different objects.

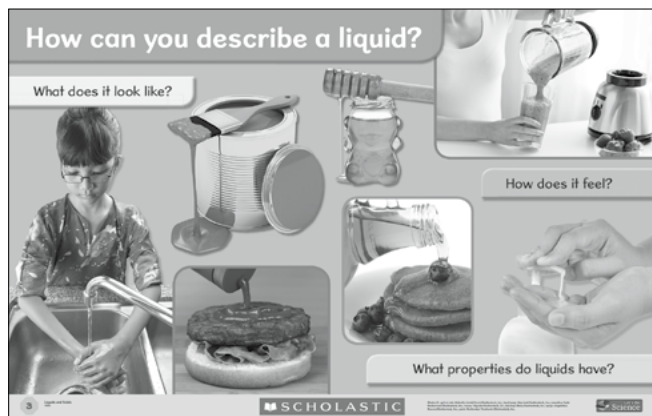
Note: If students need help with positional vocabulary, see the Unit 3: *Relative Position and Motion* Guide.

Properties of Solids

Name: _____

Choose three properties and write the properties in the top row of the chart.
On the left side of the chart, list some of the solids you are exploring.
Fill in the chart with words that describe each solid.

How Can We Describe Liquids?



Focus: Students explore and describe various liquids, then sequence liquids according to a variety of properties.

Specific Curriculum Outcomes

Students will be expected to:

- 23.0 explore properties of familiar liquids and solids [GCO 1/3]
- 12.0 communicate while exploring and investigating [GCO 2]
- 10.0 sequence or group materials and objects [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- describe a liquid using words related to its properties
- sequence liquids according to a variety of properties

NOTES:

Attitude Outcome Statements

Encourage students to:

- willingly observe, question, and explore [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
• IWB Activity 5 • BLM <i>Sequencing Liquids</i> • Science Card 3 • Science Card 4	• several clear plastic containers of various shapes and sizes • 250–500 ml of coloured water • clear mug, shallow foam tray, and small baggie • Properties of Solids Anchor Chart • small clear plastic cups, such as medicine cups • 250 ml each of several liquids (e.g., glue, milk, vinegar, juice, cooking oil, chocolate sauce, hand lotion, shampoo) in clear plastic cups • various containers (e.g., mugs, bowls, test tubes, square pans) • students' Science Journals • 3 clear containers of same size and shape, containing 100 ml of apple juice, hair conditioner, and molasses (separately) • sticky notes • students' Science Folders • a variety of liquids (e.g., bottle of glue, litre of milk, bottle of vinegar, bottle of cooking oil, bottle of chocolate sauce, hand lotion in dispenser or bottle, bottle of shampoo, bottle of water, hand soap in dispenser, jar of honey, bottle of ketchup, container of maple syrup) • ml measuring spoons • one large piece of stiff cardboard for every 3–4 students; one side should be covered with parchment paper • several foil pans	• Display the Properties of Solids Anchor Chart from <i>How Can We Describe Solids?</i> (see pages 18–23). • Set out the clear plastic containers, the coloured water, and the ball/block.	• behave • behaviour • flow • swirl • sequence • viscous • viscosity • colourless • transparent • transparency

Safety

- Ensure students are not allergic to any substances being tested.
- Remind students not to taste any of the substances they are investigating.

Science Background

- Students may observe that some solids actually “pour” or “flow” in the same way as liquids do (e.g., salt pouring from a box, sand flowing from a bucket). A collection of many small particles of solid materials (such as sand) can pour like liquids but each individual particle maintains its shape.
- In addition to the physical properties of colour, odour, and taste, liquids also have differing degrees of viscosity, or resistance to flow. Viscosity depends on the measure of internal friction in a liquid. Liquids having high viscosity are thicker and stickier in consistency than liquids with low viscosity. High viscosity liquids flow more slowly.

Possible Misconceptions

- Students may think that the amount of liquid in one container can change if it is poured into another container. For example, if the liquid in a coffee mug is poured into a tall, narrow flower vase, students may believe that there is more water in the vase than there was in the mug.
- When describing the colour of water, vinegar, and similar liquids, students may use words such as “clear.” Explain that this is actually a measure of the liquid’s transparency and that the word they should use is “colourless.”

ACTIVATE

Observing Liquids

Display several clear plastic containers in a variety of shapes and sizes. Invite student volunteers to come up one at a time and pour a measured amount of coloured water from one container to another. The rest of the class should observe how the liquid behaves in each case.

Then invite a few students to transfer an amount of liquid from a clear mug to a shallow foam tray to a baggie. Ask students to recall what happened during the previous teaching plan when they transferred modelling clay/chocolate into these same containers. Ask:

- **What happens to the shape of the liquid when it goes from one container to another?**
- **How is this different from how the solid behaved?**
- **What are some ways that liquids are different from solids?**

Elicit from students that liquids change to take the shape of the container they are in, but solids do not; and that liquids flow, but solids do not. (See the Science Background section for a clarification of solids that seem to “flow.”) Begin a Properties of Liquids Anchor Chart on chart paper or the IWB, with the first two points being “liquids change to take the shape of



IWB Activity:

- Students can use
- Activity 5: *What liquid am I?* (see the Teacher's Website) to predict the liquids based on their descriptions.

their container” and “liquids flow or pour.” Invite students to record any questions they may have on the I Wonder Wall.

Describing Liquids

Refer students to the Properties of Solids Anchor Chart created in *How Can We Describe Solids* (see pages 18–23). Review the properties of solids, and then ask students which of these properties they might be able to observe in liquids (e.g., colour, texture). Pencil in a question mark beside each of the properties they mention. Tell students that they will have the opportunity to check their predictions and discover some other properties of liquids.

CONNECT



Observing Properties

Group students into small groups and provide each group with four small clear plastic cups containing samples of different liquids (e.g., glue, milk, vinegar, juice, cooking oil, chocolate sauce, hand lotion, shampoo). Have each group investigate its liquids by observing colour, smell, and behaviour. Encourage students to pour each liquid slowly into various containers (e.g., mug, bowl, test tube, square pan) and observe how it flows. Students may wish to take notes in their Science Journals.

Note: See the Possible Misconceptions section on page 26 for how to help students differentiate between a lack of colour in a liquid and a high degree of transparency.

Sequencing Liquids

Perform a “swirl test” with equal quantities of apple juice, hair conditioner, and molasses, in separate clear containers of the same size and shape. Have students observe how easy or difficult it is to swirl, or move, each liquid, and then work as a class to order, or sequence, the three liquids from easiest to most difficult to swirl. When the class has agreed on the sequence, label each container “1,” “2,” or “3” with sticky notes. Draw a continuum/two-headed arrow on chart paper and label it with the names of the liquids in order. (Match the format of BLM *Sequencing Liquids* on page 30.)

Ask students for other ideas for ordering or sequencing liquids, and write their responses on chart paper (e.g., from thickest to thinnest, from fastest-to slowest-flowing, from easiest to hardest to see through). Ask each group to choose one method (including from easiest to hardest to swirl) and to sequence their liquids from the *Observing Properties* activity accordingly. Students should label their liquids with numbered sticky notes. Once a group’s



sequence has been checked and approved, students can fill in the continuum on BLM *Sequencing Liquids*, adding pictures of their liquids in the sequence they determined. Invite students to share their results with the class. Remind students to store their completed BLMs in their Science Folders.

CONSOLIDATE

Liquids Anchor Chart

Have each group explain how it sequenced its liquids. Record any new points on the Properties of Liquids Anchor Chart (e.g., “liquids pour or flow at different speeds,” “some liquids are thicker or thinner than others,” “some liquids are more see-through than others”). Take this opportunity to introduce vocabulary such as “viscous/viscosity” (how easily a liquid flows) and “transparent/transparency” (how easily we can see through a liquid). Add these words to the Word Wall, along with “sequence.”

Revisit the Properties of Solids Anchor Chart and have students confirm or reject their predictions from the *Describing Liquids* activity. Copy any points from this chart to the Liquids Anchor Chart (e.g., “liquids have a colour”). Students should copy the completed Anchor Chart into their Science Journals. Students can add new questions they may have to the I Wonder Wall.

Display Science Card 3 and ask students to identify the seven liquids shown (water, hand soap, honey, strawberry smoothie, ketchup, maple syrup, paint). Write the name of each liquid on a sticky note and place it on the card. Invite students to describe the properties of each liquid. If necessary, prompt by asking:

- What does it look like?
- How do you think it feels?

Discuss how the descriptions of each liquid support the properties of liquids as noted on the Properties of Liquids Anchor Chart.

Viscosity Race

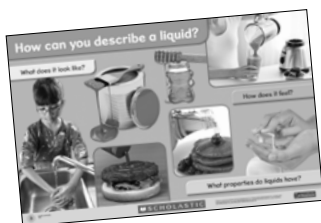
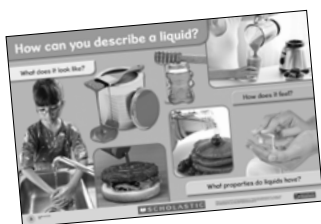
Invite students to examine Science Card 4. Ask:

- What do you think is happening in the picture?
- What materials were needed to hold the race?

Tell students that the picture is showing a “Viscosity Race” (review the meaning of “viscosity” as needed) with a variety of liquids (water, hand soap, maple syrup, and ketchup). Ask:

- Which liquid do you think won the race? Why?
- Does the winner have the highest viscosity or the lowest viscosity?

Group students into different small groups. Display a variety of liquids (e.g., glue, milk, vinegar, juice, cooking oil, chocolate sauce, hand lotion, shampoo, and any of the liquids shown on Science Card 3). Have each small group choose



four liquids to race. Provide measuring spoons and small clear plastic cups for students to measure out equal amounts (30 ml) of their chosen liquids.

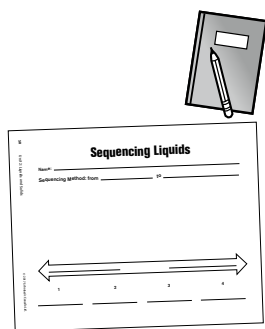
Note: This activity may require a volunteer to assist students and provide supervision as needed.

Make sure students understand that the winner of the race should be the liquid with the lowest viscosity, or the lowest amount of thickness/stickiness. Have each group discuss among themselves which liquid they predict will win their race and record their prediction on a sticky note. If group members disagree, they should write each prediction on a sticky note with the name(s) of the members making the prediction.

Assist each group in setting up a piece of parchment-paper-covered cardboard with the bottom edge resting in a foil pan. The cardboard should be propped up solidly on an angle. Once all groups are set up for their race, have two students in each group stand behind their piece of cardboard, holding one of the four cups of liquids in each hand. Remind students that the liquid that reaches the foil pan first is the winner.

Count down from three to have all groups tip their cups at the same time. Students should observe and record their group's results, and then assign a "Viscosity Value" from 1–4 to each liquid (with 4 being the highest viscosity, or the slowest racer). Have students record the results of their group's race in their Science Journals by drawing an illustrated viscosity continuum. (Students could alternatively fill out another copy of BLM *Sequencing Liquids*.)

This process can be repeated with all of the 1s to see which liquid in the class is the overall winner, or has the lowest viscosity of all.



EXPLORE MORE

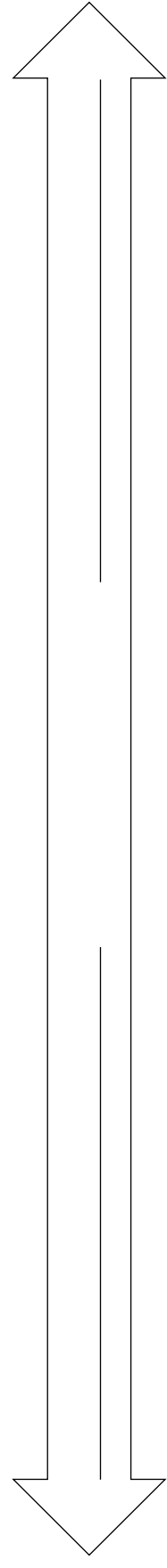
What Liquid Am I?

Divide students into two groups. Give one group a slip of paper with the name of a liquid written on it. Have students in this group describe the properties of the liquid to the other group, without mentioning the name of the liquid. The other group must guess the liquid based on the clues. Once the liquid has been identified, have groups change roles.

Sequencing Liquids

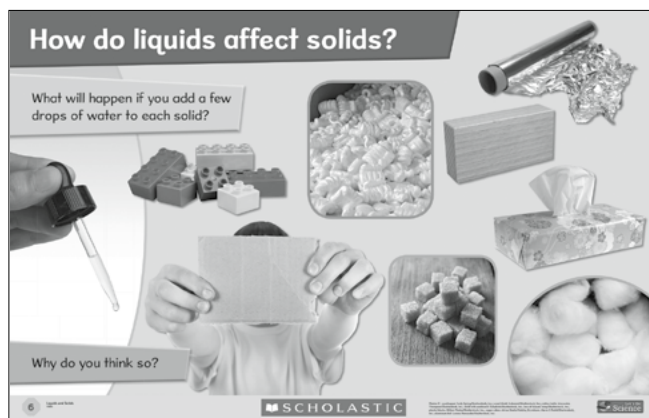
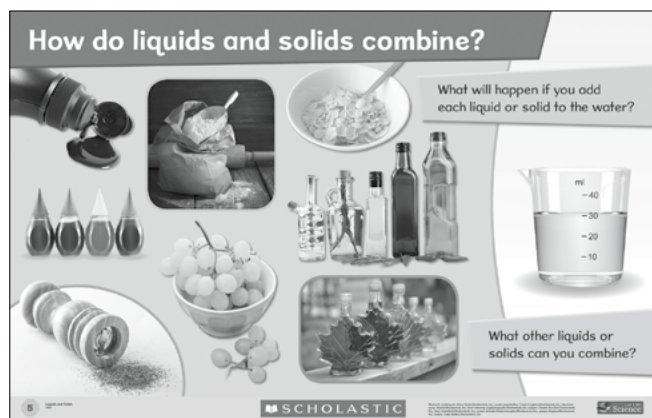
Name: _____

Sequencing Method: from _____ to _____



1 2 3 4

What Happens When We Combine Liquids and Solids?



Focus: Students investigate the ways in which familiar liquids and solids can interact with one another.

Specific Curriculum Outcomes

Students will be expected to:

- 24.0 investigate the interactions of familiar liquids and solids [GCO 1/3]
- 7.0 make and record observations and measurements [GCO 2]
- 14.0 communicate procedures and results [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- predict the ways that specific liquids and solids will interact with one another

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:

- 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
• <i>Perfect Snow</i> (Read Aloud) • Science Card 5 • Science Card 6 • BLM <i>Results Table</i> Literacy Place: • <i>An Early Worm Got Out of Bed</i> (“The Muddy Puddle,” pages 16–17, Shared Reading—Active Learning Kit)	• snow • bottle of oil-and-vinegar dressing containing rosemary/basil and black pepper pods • beakers of water (one per group) • eyedroppers of water (one per group) • small portions of cooking oil, maple syrup, chocolate syrup, food colouring, ground black pepper, flour, grapes, and dry cereal (one portion of each per group) • small blocks of wood (two per group) • cotton balls (two per group) • pieces of cardboard (two per group) • pieces of tissue (two per group) • plastic blocks (two per group) • sugar cubes (two per group) • Styrofoam packing “peanuts” (two per group) • tin foil (one sheet per group) • digital camera (optional) • sensory bottle (plastic water bottle filled with oil and coloured water, with one or more solids such as glitter, plastic confetti, sea shells, pebbles, beads, or fish tank gravel) • plastic water bottles pre-filled with an oil-and-water mixture (one per pair of students) • glitter, plastic confetti, sea shells, pebbles, beads, fish tank gravel, etc. • small spoons • hot glue gun	• Arrange for an Elder or Indigenous Knowledge Keeper to visit the class to describe the perfect snow for building a traditional snow house. • Combine 3 parts olive oil and 1 part balsamic vinegar in a bottle. Add a sprig of rosemary or basil and some black pepper pods. Do not shake the bottle—the oil and vinegar should remain separated. • Create a sensory bottle by filling a plastic water bottle with oil and coloured water, and adding one or more solids such as glitter, plastic confetti, sea shells, pebbles, beads, or fish tank gravel.	• combined • combination • interact • interaction • dense • density • predict • prediction • results • results table • sink • float • absorb • dissolve

Safety

- Remind students not to taste any of the substances they are investigating.
- You may choose to have students wear aprons and/or gloves while they are combining liquids and solids.
- Students are not to handle the hot glue gun.

Science Background

- Because of variables such as density, absorbency, and buoyancy, simply combining various liquids and solids will yield several observable results, including floating, sinking, absorbing, and dissolving. No stirring or agitation is required for students to observe these results.

ACTIVATE

Read Aloud: *Perfect Snow*



Summary

An overnight snowfall sets the stage for two boys to anticipate recess and the endless possibilities of “perfect” snow.

Before Reading

Begin by asking students if snow is a liquid or a solid. Explain that snow is made of individual ice crystals. Lead students to conclude that individual snowflakes are solids. Then show students the cover of the book and ask:

- **What is “perfect” snow?**
- **What can you do with perfect snow?**
- **What do you think these boys are doing?**

Involve students in a Think-Pair-Share strategy. After providing time for students to ponder the questions, have them turn to the person next to them and share their thinking. After students have had a chance to share their thinking with a partner, invite a few students to share their ideas with the class.

Ask students to listen as you read to discover why the boys think this snow is perfect and what they do with the perfect snow.

During Reading

As you read the story to students, pause frequently to discuss the text and illustrations. Prompts for discussion could include:

- **Why do you think the boys are happy to see snow?**

- **What does it mean when the text says, “Jim packed a handful”?** (He pressed the snow together to make it stick together.)
- **When Jim says that conditions are perfect to build a snow fortress, what do you think he means? What “conditions” is he talking about?**
- **Scott says that the snow is perfect to build the World’s Greatest Snowman. What made the snow perfect?**
- **Why do Jim and Scott decide to work together?** (There’s not enough snow for all the kids to build separate things.)
- **What do the kids do to the snow when they’re building with it?** (They pack it and pile it high.)
- **Was it a good idea to combine a snow fort with the snowmen?**
- **What happens to the perfect snow when it rains during the night?**
- **What do you think “slush” is? What might it be perfect for?**

After Reading

Prompts for discussion could include:

- **What properties made the snow perfect for building a snowman fort?** (It was wet. It was heavy. It packed together well.)
- **Would other snow have worked?**

If possible, have students gather snow from outside. Ask them to describe the snow’s properties. Ask:

- **Is it wet or dry?**
- **Does it pack together or fall apart?**



Tell the students they are going to work in small groups to investigate the snow and to test whether they can make the snow “perfect” by adding water. Students can gather the materials they need and use them to carry out the investigation. Students can record their observations in their Science Journals. Prompt by asking:

- **What will happen if you mix the snow with a little water? With a lot of water?**
- **What will happen to fluffy, dry snow?**
- **What will happen to heavy, wet snow?**

Explain to students that perfect snow for building is called packing snow. This is wet, heavy snow that falls when the temperature is close to freezing (0°C). These warmer snowflakes have more moisture which acts like a ‘glue’ to hold the flakes together when pressure is applied to pack it. When the air is very cold (below freezing), the snow is fluffy and dry and doesn’t stick together. If you pack snow that is too wet (slush), it packs too hard and becomes lumps of ice.

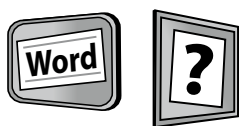
Perfect Snow for a Snow House

You might invite an Elder or an Indigenous Knowledge Keeper to visit the class to describe the perfect type of snow for building a traditional snow house.

Oil and Vinegar

Show students a bottle of oil-and-vinegar dressing containing a sprig of rosemary or basil and some black pepper pods. Have them examine the bottle and help them identify what liquids and solids have been combined. Encourage students to observe and discuss how these liquids and solids are interacting in the bottle (the black pepper pods sink to the bottom, and the oil floats on top of the vinegar). Encourage students to brainstorm why these interactions occur. Explain that

- the oil is less dense than the vinegar, so it floats; and
- the pepper pods are more dense than both the oil and vinegar, so they sink.
- “Density” is how tightly the particles in a substance are packed together.



Add the words “dense” and “density” to the Word Wall. Invite students to add any questions they may have to the I Wonder Wall.

CONNECT

Predicting Results

Display Science Cards 5 and 6, and explain that they show how different liquids and solids might be combined. Ask students to identify each liquid and solid shown on the cards. Then invite a few students to take turns choosing a combination suggested on the cards (such as adding some black pepper to a beaker of water) and predicting the result of the combination. List any verbs that students use on the left side of a sheet of chart paper or on the IWB, such as “mix (dissolve),” “soak up (absorb),” “float,” and “sink.” Title the list Combination Results.



CONSOLIDATE

Combination Class

Distribute a copy of BLM *Results Table* to each student and then have students form small groups. Ask each group to choose a total of five combinations from Science Cards 5 and 6 to investigate. Groups should record their combinations in the first column on their BLMs, and then record their prediction of the result of each combination, using words from the Combination Results list.

Note: Students may choose to combine items with water, or they can combine solids with solids, non-water liquids with solids, or non-water liquids with one another.

Provide each group with a beaker of water, an eyedropper of water, and samples of the liquids and solids they have chosen to investigate. Then have

Results Table			
Combination Number	Prediction	Actual Result	Prediction

groups combine each of their chosen pairs of substances, either drawing or digitally photographing first the separate substances and then the combined substances. Have groups describe their observations of their actual results on their BLMs. Students will then determine and record whether their predictions were supported or rejected.

Note: Students should not actively mix pairs of substances, but simply observe what happens when they are combined. Mixing substances will be done in the following teaching plan.

Bring the class back together and revisit the list of Combination Results. Ask groups to name combinations that they now know fit into each category (for example, pepper floats on water, a sugar cube soaks up (absorbs) water). Record each combination to the right of the appropriate result. Add the words “dissolve,” “absorb,” “float,” and “sink” to the Word Wall.



Literacy Place Connection:

Read or revisit “The Muddy Puddle” from *An Early Worm Got Out of Bed* (Shared Reading). Ask:

- What liquid and solid combine to make mud?
- Is mud a liquid or a solid? Why do you think so?

EXPLORE MORE

Sensory Bottles

Show students a sensory bottle. Shake the bottle vigorously and have students observe the results (the solids float and drift in the liquid). Explain that sensory bottles can be used by people as a tool to relax and relieve stress.

Tell students they are going to make their own sensory bottles, and further explore how different solids react in liquids. Have students partner up, and ask each pair to choose a bottle pre-filled with an oil-and-water mixture. Provide small spoons and a variety of small solids (glitter, plastic confetti, sea shells, pebbles, beads, fish tank gravel, etc.) and invite each pair to choose and add a small amount of a few different solids to their bottle. Encourage each pair to discuss and explain their choice of solids. When bottles are complete, attach the lids with a hot glue gun.



More Combinations

Place Science Cards 5 and 6 at the Curiosity Centre and invite students to choose some of the materials shown on the cards (or other materials) to combine, predict what will happen, and then test the combinations. Students can record their predictions and results in their Science Journals.

Results Table

Name: _____

Combination Tested	Predicted Result	Actual Result	Prediction Supported?

How Do Liquids and Solids Change When We Mix Them?



Focus: Students explore the ways in which familiar liquids and solids can change when they are mixed with one another.

Specific Curriculum Outcomes

Students will be expected to:

- 25.0 investigate changes that result from the interaction of materials and describe how their characteristics have changed [GCO 1/3]
- 16.0 use appropriate tools [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- describe some ways that liquids and solids can change characteristics when they are mixed together
- identify mixtures as reversible or irreversible

NOTES:

Attitude Outcome Statements

Encourage students to:

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

Cross-Curricular Connections

Art

Students will be expected to:

- explore a range of art materials, processes, and vocabulary to develop art making skills [1.3.4]

English Language Arts

Students will be expected to:

- communicate information and ideas effectively and clearly, and to respond personally and critically [GCO 2]
- 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 7 Literacy Place: • <i>3-2-1 Blast Off!</i> (Shared Reading—Sequencing Strategy Unit)	• glass of water • bottle of food colouring • various mixing tools • sticky notes • safety goggles for all students • small cups (30) • three pitchers of water • small quantities of bubble bath liquid, cooking oil, instant coffee, drink mix, baking powder, vitamin C tablets, compressed soil discs, and various other liquids and solids (e.g., bar of soap, crackers, tissue, dried fruit, salt, sugar, sand, kitty litter, honey, glue, chocolate syrup) • digital camera (optional) • students' Science Folders • aprons for all students • plastic table coverings and/or paper towels • large box of cornstarch • water • 1 large bowl • 1 small bowl • measuring cups and spoons • empty, clear plastic water or soda bottles (one per group) • uninflated balloons (one per group) • small funnels or spouted containers (one per group) • white vinegar • baking soda	• Set up three mixology areas, each stocked with 10 small cups, a pitcher of water, and various mixing tools.	• mix • mixture • reversible • irreversible

Safety

- Remind students not to taste any of the substances they are mixing.
- You may choose to have students wear safety goggles, aprons, and/or gloves while they are combining liquids and solids.

Science Background

- A mixture is the combination of two or more substances that results in a reversible or irreversible change to the substances. Some substances combine so evenly that you can't tell them apart (e.g., salt water). Other substances stay separate, even when you combine them (e.g., gravel in water). Some substances, such as oil and vinegar, look like they are evenly combined when they are first mixed, but eventually become separated.

ACTIVATE

Water Colours

Tell students that you are going to show them how the coloured water in the previous teaching plan's sensory bottles was made. First, show students a glass of water and a bottle of food colouring. Ask them to describe some of the properties of each, including colour and viscosity. Then, add a drop of food colouring to the glass of water, but do not mix it yet. Ask students to observe what happens when the water and food colouring are simply combined. Then, stir the water gently and have students describe how the food colouring and the water change when they are mixed (the original colour of the food colouring becomes less intense). Have students predict what will happen if you mix in a few more drops of food colouring (the water's colour will become deeper), and then proceed with the addition of more drops to support or reject their prediction.

Let's Make a Volcano

Have students use various resources to research how to make a volcano out of papier mâché, using baking soda and vinegar (or another combination) to simulate an eruption. Choose a set of instructions from their research, gather the necessary materials, and build a volcano as a class. Discuss how the liquids and solids were combined to create the papier mâché. Then ask:

- **How did the liquid and solid change when they were combined inside the volcano?**

CONNECT



Mad Mixology

Display Science Card 7. Ask students to take turns identifying a mixture and predicting what two liquids or solids were mixed together (water and bubble bath liquid; water and an effervescent tablet, such as vitamin C; water and oil; water and instant coffee; water and soil; water and drink mix; lettuce and other vegetables). Note their predictions on sticky notes and affix them to the card. Ask:

- [illegible]



Have students form three groups. Provide each group with safety goggles, small cups, a pitcher of water, and mixing tools. Then provide one group with small quantities of bubble bath liquid, cooking oil, and various other liquids (e.g., honey, glue, chocolate syrup). Provide a second group with small quantities of instant coffee, drink mix, baking powder, and various other granular and powdered solids (e.g., salt, sugar, sand, kitty litter). Provide a third group with small quantities of vitamin C tablets, compressed soil discs, and various other liquids and solids (e.g., bar of soap, crackers, tissue, dried fruit).

Have each group decide on a method for recording the mixtures they create and how each substance changed after it was mixed. For example, groups can use any combination of notes, drawings, and digital photos, noting their observations before, during, and after each mixture. They can also create their own version of *BLM Results Table* (see page 38). Have students store their completed notes, drawings, photos, and/or tables in their Science Folders.

Remind students that they should mix each of their materials with water and record the changes that result. Once a group has supported or rejected a prediction posted on Science Card 7, students can either add a check mark to the sticky note or correct the prediction. Invite students to add any questions they may have to the I Wonder Wall.

[illegible]

- What was the result of combining this liquid and solid?
- How did the materials change when they were mixed?

The combination of the seltzer tablet and vinegar creates carbon dioxide. The pressure which builds up as this carbon dioxide gas is produced “fuels” the rocket.

Stay or Stray

42

Bring students back together and discuss whether any of their mixtures are reversible, or could be “un-mixed.” Help students to realize that once mixed, some combinations of liquids and solids cannot be returned to their original state—they are irreversible or not reversible.

Slime!

Assist students in making “slime” with cornstarch, water, and food colouring. They will need approximately 2 parts cornstarch to 1 part water.

Students should wear aprons during this activity, and cover their mixing area with plastic or paper towels. First, have students add a few drops of food colouring to a small bowl of water and stir gently. Then, have them pour about half of the coloured water into a large bowl containing the cornstarch and mix the two with a spoon. More water can be added as needed, a little at a time, as students continue mixing. If too much water is added, more cornstarch can be added. The goal is to create a substance that flows easily but that can also be formed into a ball when pressure is applied. Once students have created their slime, invite them to decide if it is a liquid or a solid, and to explain their reasoning.

Note: This activity may require a volunteer to provide supervision and assistance as needed.

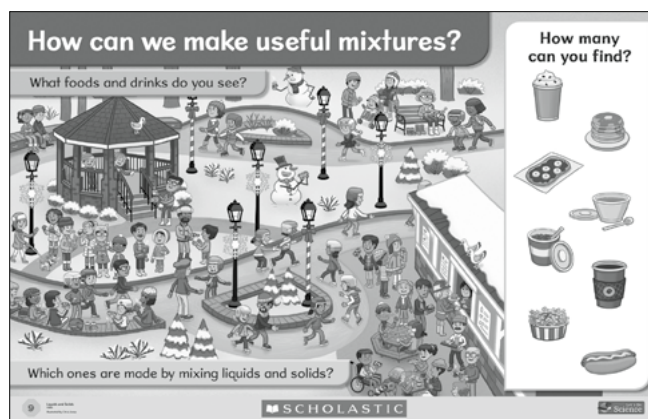
EXPLORE MORE

Fizzy Balloons

Use this activity to reinforce students’ understanding of the baking soda–vinegar reaction that made the papier mâché volcano “erupt.” Give each small group of students an empty, clear plastic water or soda bottle and an uninflated balloon. (All students should wear safety goggles during this activity.) Have each group use a small funnel or spouted container to pour $\frac{1}{3}$ cup of vinegar into their bottle. Then ask one student in each group to stretch open the mouth of the balloon while another student adds 1 teaspoon of baking soda into it. Students should make sure all the baking soda goes into the main part of the balloon, and that none remains near the balloon’s mouth. Students can then carefully attach the mouth of the balloon to their bottle, making sure none of the baking soda spills inside.

When all groups have reached this stage, ask one student in each group to hold the mouth of the balloon securely on top of the bottle, while another student tips the balloon up, allowing the baking soda to pour into the bottle. Students will see their balloons inflate because of the reaction between the baking soda and the vinegar.

How Can We Mix Liquids and Solids to Make Useful Things?



Focus: Students explore how to create useful mixtures of liquids and solids.

Specific Curriculum Outcomes

Students will be expected to:

- 26.0 explore ways to use combinations of liquids and solids to make useful materials [GCO 1/3]
- 16.0 use appropriate tools [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- identify several useful mixtures of liquids and solids
- follow a simple recipe to create a useful mixture

NOTES:

Attitude Outcome Statements

Encourage students to:

- appreciate the importance of accuracy [GCO 4]

Cross-Curricular Connections

Art

Students will be expected to:

- explore a range of art materials, processes, and vocabulary to develop art making skills [1.3.4]

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, and learnings; and to use their imaginations [GCO 8]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Science Card 8 • <i>The Little Knight Who Battled the Rain</i> (Read Aloud, Unit 1) • Science Card 9 • IWB Activity 6 • BLM <i>Recipe Card</i> Literacy Place: • <i>Mr. Fix-It</i> (Guided Reading, Level K)	• package of gelatin dessert mix • electric kettle • several large clear bowls • measuring cups and spoons • stirring tools • ingredients, containers, and tools to make a variety of items that come with instructions (e.g., orange juice or lemonade from concentrate, chocolate milk, pudding or custard, chip dip, or brownies, cake, and cookies) • flour, salt, cold and hot water, food colouring, saucepan or bowl, whisk or rotary beater	• Set out a large clear bowl, a whisk or fork, a measuring cup, and the package of gelatin dessert mix. Fill the electric kettle with water and identify the closest outlet. • Arrange for an Elder or an Indigenous Knowledge Keeper to visit the class to discuss traditional recipes and, if possible, to demonstrate making a recipe.	• recipe • ingredient

Safety

- You may choose to have students wear aprons and/or gloves while they are combining liquids and solids.

ACTIVATE



Useful Mixtures

Ask students to recall aloud some of the mixtures they created in *How Do Liquids and Solids Change When We Mix Them?* (see pages 39–43). Record the mixtures on chart paper or the IWB. Then ask students to identify the mixtures that are useful in some way (e.g., instant coffee, drink mix, expanded soil discs).

Display Science Card 8 and ask students to identify useful mixtures of liquids and solids being used in the illustrations (brushing teeth—toothpaste and water, washing the dog—shampoo and water, cooking—vegetables and broth, cleaning—cleaning agents and water, painting—watercolour paints and water). Provide prompts such as:

- What activities do you see?
- Who is using a mixture of liquids and solids?
- How are these mixtures useful?

Revisit *The Little Knight Who Battled the Rain* (Read Aloud, Unit 1) and discuss what useful mixture the Little Knight created to help save the people of his village (chocolate cake).

Then display Science Card 9 and ask students to identify the foods and drinks that are made by mixing liquids and solids (hot chocolate, pancakes, beaver tails pastry, soup, chili, coffee, poutine, and hotdogs). Ask:

- What foods and drinks do you see?
- Who is using a mixture of liquids and solids?
- How are these mixtures useful?

Challenge students to find the large images within the illustration.

CONNECT

Gelatin Dessert

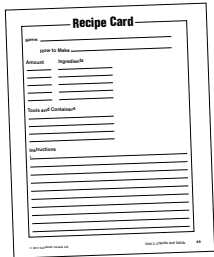
Display a package of gelatin dessert mix and show students where the instructions are. Explain that, to make a mixture of liquids and solids turn out the way we want, we must combine the correct amount of each substance. Instructions, or recipes, tell us what liquids and solids to combine, and what amounts to use.

Modelling how to follow the instructions on the package and measure accurately, make the gelatin dessert for students, using a large clear bowl and a whisk or spoon. At various stages, stop and ask for students' observations of the liquid (hot water) and the solid (gelatin powder), including their taste, texture, and colour. Make sure students are observing the changes that occur in each substance as it is mixed with the other. Invite students to record any new questions on the I Wonder Wall.

IWB Activity:

- Students can identify items needed to make several different recipes using Activity 6: *What's cooking?* (see the Teacher's Website).





Recipe Cards

Tell students they are going to put together a class recipe book. Add the words “recipe” and “ingredient” to the Word Wall and review their definitions with students. Provide ingredients, containers, and tools to make a variety of items that come with instructions on the package (e.g., orange juice/lemonade from concentrate, chocolate milk made with cocoa powder or chocolate syrup, instant pudding/custard, chip dip). If you have access to an oven, items can also include brownies, cakes, and cookies.

Have small groups of students choose one item and read the instructions on the package. They can then gather any necessary containers, tools, and other ingredients. Each group will fill out BLM *Recipe Card* while making the food item. Encourage groups to add drawings to their BLM. As students work, remind them how important it is to follow the package instructions and to measure accurately.

Note: This activity may require a volunteer to provide supervision and assistance as needed.

Traditional Recipes

Invite an Elder or Indigenous Knowledge Keeper to visit the class and discuss traditional recipes for making foods such as Bannock or Caribou Stew. If possible, the visitor can demonstrate making the recipe and students can record it on BLM *Recipe Card*.

CONSOLIDATE

Recipe Book

Bring students back together and have them share their completed BLM *Recipe Cards*. Then have the class discuss and decide how to sort and order the cards to create a recipe book (e.g., “just add water” items followed by “just add milk” items; simplest to most complicated; breakfast to lunch to dinner to dessert). Once the order has been decided, students can gather the BLM *Recipe Cards*, make a Table of Contents and front and back covers. Multiple copies can be made for students to take home.

EXPLORE MORE

Flour Finger Paint

With students’ assistance, prepare a batch of finger paint using the following recipe. Invite students to share why they think this is a useful mixture. When the paint is ready to use, have students create small paintings of their favourite food recipe.

Recipe for Flour Finger Paint:

- 1 cup flour
- 1 tablespoon salt
- 1 $\frac{1}{4}$ cup hot water
- 1 $\frac{1}{2}$ cup cold water
- food colouring

Combine flour and salt in a saucepan or bowl and add cold water. Beat with a whisk or rotary beater until smooth. Add hot water and boil until mixture is thick. Beat until smooth. Keep in refrigerator and add food colouring as needed.



Literacy Place Connection:

Read or revisit *Mr. Fix-It* (Guided Reading, Level K). Prompts for discussion could include:

- Once Mr. Fix-It had fixed the broken lamp, what liquids did he combine?
- Why was it important for him to mix the paint colours?

Discuss whether this mixture resulted in a reversible or irreversible change.

Recipe Card

Name: _____

How to Make _____

Amount

Ingredients

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Tools and Containers

Instructions

1.

How Can We Use Liquids and Solids to Keep Our World Clean?



Focus: Students investigate how to use liquids and solids to keep our world clean.

Specific Curriculum Outcomes

Students will be expected to:

- 27.0 identify problems to be solved [GCO 2]
- 28.0 apply their knowledge of liquids and solids to maintain a clean and healthy environment [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:

- identify what liquids and solids to use for cleaning various messes
- describe how to use liquids and solids to help keep their world clean

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

English Language Arts

Students will be expected to:

- respond critically to a range of texts [GCO 6]
- 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 Literacy Place: • <i>Keep Us Clean</i> (Guided Reading, Level J)	• honey, paint, cereal in milk, mud, glitter • various surfaces or containers (e.g., foil trays, pieces of cardboard) • materials with varying degrees of absorbency (e.g., towels, newspaper, paper towels, tissue paper, J-cloths, felt, baby wipes) • ingredients to make homemade cleaners (e.g., baking soda, water, vinegar, olive oil, sea salt, peppermint or citrus essential oil, eggs, lemon juice) • small mixing bowls and tools, measuring spoons and cups • empty spray bottle • old toothbrushes • dish tubs (one per small group) • water • vegetable oil • small items to which oil would adhere (e.g., rubber ducks, small rocks, feathers) • various commercial cleaning products (glass cleaner, dish soap, laundry detergent) • students' Science Journals	• Create a number of contained spills (such as honey, paint, cereal in milk, mud, and glitter) on various surfaces and/or in various containers (e.g., foil trays, pieces of cardboard). • For each small group of students, fill a dish tub with water mixed with vegetable oil. Submerge various small items in the water (e.g., rubber ducks, small rocks, feathers).	• custodian • germs

Safety

- You may choose to have students wear aprons and/or gloves while they are exploring different cleaning products.

Science Background

- Cleaning products work because they contain some kind of detergent. The surface active agents, or surfactants, in detergents are composed of particles that are attracted to both water (or another liquid solvent) and dirt or grease. These particles help spread the solvent over the stain, attach to the dirt, and then help the solvent take the dirt away.
- We use different cleaning products for different stains because a stain can be made up of proteins, fats, starches, inorganic matter, petroleum, etc., so the product must contain the correct ingredients to break up the stain (i.e., enzymes, acids, or other petroleum-based substances). We may also need a product that contains an abrasive, if the stain is difficult to remove.

Possible Misconceptions

- Students might think that simply using water is enough to clean their teeth, body, clothes, or dishes. Water particles do not attach to dirt or grease particles, however, so some kind of detergent (toothpaste, soap, laundry detergent, dish soap) must be mixed with the water to remove the dirt or grease.

ACTIVATE

Custodians of the World

Ask students what kinds of things we clean at home (e.g., teeth, bodies, hair, bedrooms, clothes, furniture, floors, windows, pets, dishes). Ask them what kinds of things the school custodian cleans. Then invite students to imagine that they have been given jobs as the Custodians of the World. Ask them to brainstorm what problems they might have in this job. Students may respond with some of the following:

- **How do we clean certain things?**
- **Can we use one type of cleaner for everything?**
- **How do things get dirty?**
- **How does our environment get dirty?**
- **Can we clean our air? How?**
- **Why do some people not have clean water to drink? How can we help?**
- **How can we keep things from getting dirty?**

Record the problems that students identify.

Keep Our World Clean!

Display Science Card 10 and invite students to examine the photos and discuss the questions. Add to the list created above as students identify new problems, such as:

- **Is there a difference between solid and liquid messes?**
- **How can we clean oil spills that affect wildlife and our oceans?**



- How can we keep our environment from getting dirty?
- How can we stop germs from spreading?

Tell students that they will be exploring liquids and solids to try to solve some of these problems.



Literacy Place Connection:

Read or revisit *Keep Us Clean* (Guided Reading, Level J). Discuss with students how useful combinations of liquids and solids, such as soap and water, can help people to stay clean and healthy.

CONNECT

IWB Activity:

Challenge students to match each item or mess with the liquid or solid they would use to clean it using Activity 7: *Keep it clean!* (see the Teacher's Website).



Clean It!

Display a series of contained spills of various liquids and solids, such as honey, paint, cereal in milk, mud, and glitter on various surfaces and/or in various containers (foil trays, pieces of cardboard, etc.). Provide students with several types of materials with varying degrees of absorbency (e.g., towels, newspaper, paper towels, tissue paper, J-cloths, felt, baby wipes). Working with one spill at a time, invite students to discuss with an elbow partner which material they think would be most effective at cleaning up the spill, and why. Volunteers can take turns testing their predictions until the spill is cleaned up.

Homemade Cleaners

Explain to students that many of the products we use to clean our bodies, our homes, and our world contain ingredients that can make us sick and that are harmful to the environment. Invite students to help you create a variety of cleaning products using all-natural and non-toxic ingredients, such as the following:

- A paste made with baking soda and water for scrubbing rust, mildew, and hard-water stains
- A water-vinegar solution in a spray bottle for cleaning glass (3 tbsp vinegar per 2 cups water)
- An olive oil-vinegar solution for cleaning wood furniture (1 part oil to 1 part vinegar)
- A toothpaste made with 4 tsp baking soda, 2 tsp sea salt (finely ground), 4 drops peppermint or citrus pure essential oil, and enough water for desired consistency
- A shampoo made with 2 eggs, 3 tsp baking soda, 2 tsp olive oil, and 2 tsp lemon juice

Students can measure, pour, and mix the ingredients for any of the products above, with supervision. Invite partners to experiment with any of the first four products, providing them with cloths, paper towels, crumpled newspaper (for glass cleaning), and so on, as appropriate.

CONSOLIDATE

Oil Spill



Have students predict the best way to clean up an oil spill, based on their investigations of cleaners. Provide small groups with tubs of water mixed with vegetable oil and ask them to find the best way to clean off the items that have been submerged in the water (e.g., rubber ducks, small rocks, feathers). Groups should have access to the materials from the previous activities, as well as to commercial cleaning products such as glass cleaner, dish soap, laundry detergent, and so on. Have groups record their results in their Science Journals.



Revisit the list of problems created at the beginning of the teaching plan and ask students which ones they feel they have solved. Encourage them to research solutions to the ones they haven't solved. Invite students to add any new questions to the I Wonder Wall.

EXPLORE MORE

How Do We Stop Germs From Spreading?



Have students brainstorm ways we can use liquids and solids to keep from spreading germs to others when we are sick. For example, we can use a tissue or our sleeve to cover our nose and mouth when we sneeze or cough. We can wash our hands very well with soap. Some people take cough syrup to keep them from coughing. Some people wear a mask over their nose and mouth to keep their germs from spreading or from catching someone else's germs. Students can work in small groups to create posters illustrating these strategies, and post them around the classroom or school. Add the word "germ" to the Word Wall.

What Materials Float? What Materials Sink?



Focus: Students use the inquiry process to investigate the buoyancy of different self-chosen solids. Students record their predictions and results on a graph.

Specific Curriculum Outcomes

Students will be expected to:

- 19.0 select and use materials to carry out their own explorations and investigations [GCO 2]
- 21.0 construct and label concrete-object graphs or pictographs [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- list several solids that float in water and several that sink
- create concrete-object graphs and pictographs to represent exploration results

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

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:

- speak and listen to explore, extend, clarify, and reflect on their thoughts, ideas, feelings, and experiences [GCO 1]
- 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
• <i>What Is the Inquiry Process?</i> poster • Science Card 11 • IWB Activity 8	• bottle of oil-and-vinegar dressing from <i>What Happens When We Combine Liquids and Solids?</i> (see pages 31–38) • 3–4 samples each of marbles, cotton balls, sugar cubes, blocks of wood, plastic blocks, Styrofoam trays, sponges, gummy candies, and soda crackers • tubs of water (one per pair + one extra for demonstration) • students' Science Journals • small amounts of various items, such as paper clips, crayons, craft sticks, jelly beans, coins, bars of soap, lumps of clay, rocks, plastic toys, ice cubes, feathers, cans of diet cola, cans of regular cola, pumice stones, peeled oranges, unpeeled oranges, and pieces of string • digital cameras (optional) • large box of salt • stirring tools • toy plastic buckets (one per pair) • ½ dozen raw eggs (if permitted)	• Fill several tubs with water.	• dense • density • concrete-object graph • pictograph

Safety

- Remind students not to taste any of the substances they are investigating.

Science Background

- The weight of an object is the measure of gravitational force acting on that object. The buoyancy of an object placed in liquid is the measure of the upward force of the liquid acting on that object. When the upward force acting on an object in liquid is greater than the downward force of gravity (or its weight), the object floats, and vice versa.
- Objects that are less dense than the liquid they are in will float. Objects that are more dense than the liquid they are in will sink.
- Salt water is more dense than unsalted water. Therefore, an object that sinks in unsalted water (because it is more dense than the water) may float in salt water, if the salt water is more dense than the object.

Possible Misconceptions

- Students may think that if an item is small, it will float, and if an item is large, it will sink. This is because they believe that the size of an object is what determines its buoyancy.
- Students may also think that objects have a greater chance of floating if they are placed in more water. For example, they may believe that a pebble that sinks in a glass of water may float when placed in a pond.

ACTIVATE



Density Review

Display (or ask students to recall) the bottle of oil-and-vinegar dressing from *What Happens When We Combine Liquids and Solids?* (see pages 31–38). Review why the oil and vinegar are separated and why the pepper pods are at the bottom of the bottle. Review the meaning of the words “dense” and “density” on the Word Wall (how tightly the particles in a substance are packed together). Tell students that the density of an object can help us predict whether a solid will float or sink in a liquid.

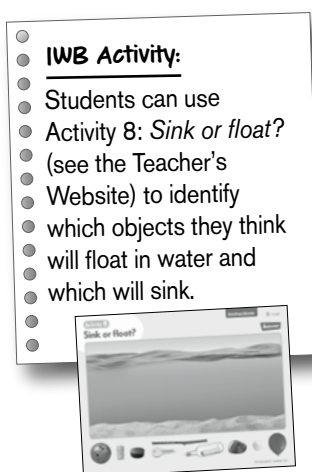
CONNECT



Inquiry Process

Review the steps on the *What Is the Inquiry Process?* poster. Tell students they are going to follow these steps to answer the questions

- What solids float in water?
- What solids sink in water?



Invite students to add their own questions about buoyancy and solids to the I Wonder Wall. Then ask students to formulate a plan for answering these questions. (They will probably suggest testing a variety of solids to see if they float or sink.) Tell them you are going to model how to use the inquiry process, and then they will use it to do their own investigations.

Making Graphs

Display Science Card 11 and discuss with students if they predict these objects will sink or float in water. Model asking questions about the objects on the card, such as:

- **Do sponges float? Do they sink when they get wet?**
- **What about gummy candies? How dense are they?**

Make a large concrete-object graph to show the predictions of which items will float and which will sink. Create a T-chart on a sheet of chart paper, with the headings “Float” and “Sink.” Provide a sample of each item on Science Card 11 (marbles, cotton balls, sugar cubes, blocks of wood, plastic blocks, Styrofoam trays, sponges, gummy candies, and soda crackers) and have students place the samples on either side of the T-chart, according to the class’s predictions.

Then, gather students around a tub of water. Tell them you are now going to explore your questions and record the results. Ask students to help you gently place samples of each item shown on Science Card 11 in the water one at a time and observe what happens. Model drawing each item on a sheet of paper and noting whether it sank or floated.

Invite students to discuss the results of your inquiry and to make conclusions. Then, to share the results of what you have learned, help the class reconfigure the concrete-object graph by moving samples to the correct side according to the inquiry results. Students can copy this final graph (as a pictograph) into their Science Journals.

CONSOLIDATE

Student Inquiry

Tell students it is their turn to use the inquiry process to explore floating and sinking. Display a variety of items, such as paper clips, crayons, craft sticks, jelly beans, coins, bars of soap, lumps of clay, rocks, plastic toys, ice cubes, feathers, cans of diet cola, cans of regular cola, pumice stones, peeled oranges, unpeeled oranges, and pieces of string. Student pairs can spend a few minutes generating one or more questions based on these items, making a plan to answer the question(s), and deciding how they will record their results (e.g., on paper, with a digital camera).

Once you have approved students’ question(s), plan, and recording method, provide each pair with a tub of water and allow them to select the items they want to investigate. As each pair investigates, make sure they are recording their results. Students can then draw a pictograph in their Science Journals to show what they learned.

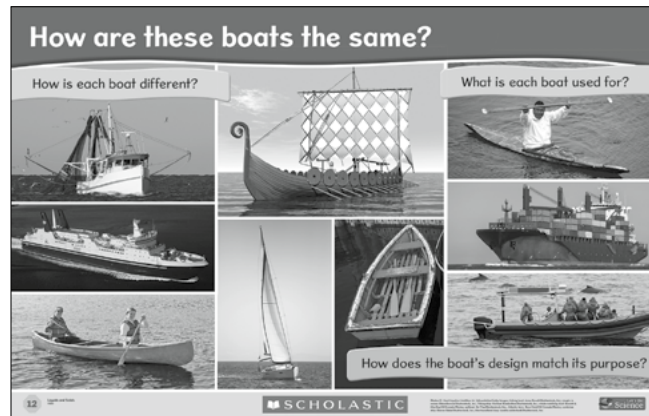


EXPLORE MORE

Just Add Salt

Students can use smaller containers (such as toy plastic buckets) to investigate how the results of their inquiry change if they use salt water instead of fresh water, and if they then add more salt to the salted water. If there are no allergies among students, provide raw eggs for them to test in both unsalted and salt water, in addition to their original items.

Design Challenge: Build a Boat



Focus: Students use the design process to build a boat capable of supporting a specific number of coins.

Specific Curriculum Outcomes

Students will be expected to:

- 29.0 demonstrate an understanding of sinking and floating objects by solving a related practical problem [GCO 1/3]
- 30.0 identify and use a variety of sources of science information and ideas [GCO 2]
- 31.0 respond to the ideas and actions of others and acknowledge their ideas and contributions [GCO 2]
- 32.0 compare and evaluate personally constructed objects [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- use the design process to build a boat that will carry a specific number of coins
- offer feedback on designs during a gallery walk
- acknowledge and respond to other people's ideas

NOTES:

Attitude Outcome Statements

Encourage students to:

- work with others in exploring and investigating [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- interact with sensitivity and respect, considering the situation, audience, and purpose [GCO 3]
- 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 12 • IWB Activity 9 • <i>What Is the Design Process?</i> poster • BLM TAG Feedback (one per group)	• tin foil • several coins of the same size (10 per group) • students' Science Journals • digital camera or tablets (optional) • large tub of water • various buoyant materials and adhesives (e.g., craft sticks, stiff cardboard, straws, Styrofoam, tape, glue)	• You might arrange for a boat builder familiar with building NL skiffs or Indigenous kayaks or canoes to visit the class. • Prepare large, uniformly sized sheets of tin foil (one per group). • Ensure that the Curiosity Centre or Reading Centre is stocked with several books about boats and boat building. You may wish to cue tablets to approved Websites showing various boat designs.	• design process

Science Background

- The ability of an object to carry extra weight and still maintain buoyancy depends on its design, its materials, and the distribution of the extra weight.

ACTIVATE

How Is It Made?

Ask students to recall previous investigations they have done and what items they have found that float. Record their answers on chart paper under the heading Things that Float.

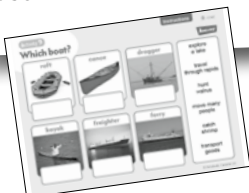
Display Science Card 12 and ask students to discuss the boats on the card. Ask:

- How are these boats the same?
- How are they different?



IWB Activity:

- Challenge students to use IWB Activity 9: *Which boat?* (see the Teacher's Website) to identify how each boat is used and which features of each boat make it work for that use.



Talk about what the boats are used for and what materials they might be made of. Then ask how much weight each boat is meant to carry (a little or a lot). Finally, discuss how each boat's design might affect how much weight they can carry. Tell students that they are going to be using the design process to create their own boat for a specific purpose.

Special Boats

Invite a boat builder familiar with NL skiffs or Indigenous kayaks or canoes to visit the class and discuss the uses of these boats and the features of the boats that make them suitable for their purpose.

CONNECT

Design Process



Review the steps on the *What Is the Design Process?* poster. Ask students to imagine that they have the following problem: they are stuck on a desert island. The only material they have is tin foil. Ask students for ideas about how to escape from the island (they will probably suggest making a boat with the foil).

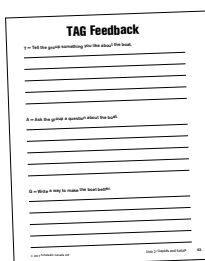
Divide students into small groups and give each group a large sheet of foil and 10 same-size coins. Explain that the coins represent the weight of the people in the group, and that the boat they build must be able to carry that weight without sinking. Inform students that they will only be given one sheet of foil for their first attempt. Prompt their thinking with questions such as:

- What shape will you make your boat?
- Where will you place the coins? Why?
- How much tin foil will you use?

Give groups time to discuss their boat design and to gather various sources of information and ideas. Sources could include books from the Curiosity Centre or Reading Centre and approved Websites. Have each group decide on a design, draw their model boat in their Science Journals, and then build it. Encourage students to record their process, either with drawings or digital photos or videos.



CONSOLIDATE



Gallery Walk

Have groups do a Gallery Walk to examine other students' first attempts. Each group should travel together, moving clockwise around the room. At its first stop, have each group fill out a copy of BLM *TAG Feedback* and leave the completed sheet for the designers. Students should be encouraged to take notes on any ideas they want to incorporate into their own design.

Groups can then return to their boat, finalize their design, and test their boat in a large tub of water. Groups should record their observations and thoughts during the test. After each test, ask the group:

- **What did you learn from testing?**
- **How can you improve your design?**

Students can redesign and retest as necessary.

EXPLORE MORE

More Boats

Provide students with tin foil and additional materials (e.g., craft sticks, stiff cardboard, straws, Styrofoam, tape, glue) and have them work in partners to design another boat, using foil plus at least one other material. Students should follow the design process when constructing this boat, as well.

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 that cannot be answered at the time, these can remain on the I Wonder Wall for students to research independently. Discuss what students have learned about liquids and solids; how they can be described; what happens when they are combined; and how we can use them to make useful things and to keep our world clean.

TAG Feedback

T = Tell the group something you like about the boat.

A = Ask the group a question about the boat.

G = Write a way to make the boat better.

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
23.0 explore properties of familiar liquids and solids [GCO 1/3]	
24.0 investigate the interactions of familiar liquids and solids [GCO 1/3]	
25.0 investigate changes that result from the interaction of materials and describe how their characteristics have changed [GCO 1/3]	
26.0 explore ways to use combinations of liquids and solids to make useful materials [GCO 1/3]	
27.0 identify problems to be solved [GCO 2]	
28.0 apply their knowledge of liquids and solids to maintain a clean and healthy environment [GCO 1/3]	
29.0 demonstrate an understanding of sinking and floating objects by solving a related practical problem [GCO 1/3]	
30.0 identify and use a variety of sources of science information and ideas [GCO 2]	
31.0 respond to the ideas of others and acknowledge their ideas and contributions [GCO 2]	
32.0 compare and evaluate personally constructed objects [GCO 2]	
1.0 pose questions that lead to exploration and investigation [GCO 2]	
7.0 make and record observations and measurements [GCO 2]	
10.0 sequence or group materials and objects [GCO 2]	
12.0 communicate while exploring and investigating [GCO 2]	
14.0 communicate procedures and results [GCO 2]	
16.0 use appropriate tools [GCO 2]	
19.0 select and use materials to carry out their own explorations and investigations [GCO 2]	
21.0 construct and label concrete-object graphs or pictographs [GCO 2]	

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

My Design

Name: _____

The problem:

My solution and my plan:

How I will test my solution:

How my solution worked:

How I will share my solution and what I learned:

Student Self-Assessment of Design Process

Name: _____

Rating Scale  = Great  = Good  = Needs to be better

Step 1			
I identified the problem.			
I chose a solution and made a plan.			
Step 2			
I built my solution.			
Step 3			
I tested my solution.			
I evaluated my solution.			
Step 4			
I shared my solution and what I learned.			

Teacher Assessment of Design Process

Name: _____ Date: _____

	1	2	3	4
Initiating and Planning				
• identifies a problem to be solved				
• thinks of a possible solution to the problem and makes a simple plan				
• selects and uses materials				
Performing and Recording				
• carries out the plan/follows a simple procedure				
• uses appropriate tools				
• makes and records observations and measurements				
• constructs a prototype				
• follows safety procedures and rules				
Analyzing and Interpreting				
• proposes an answer to the initial problem				
• compares and evaluates personally-constructed objects				
• poses new questions that arise from what was learned				
Communicating and Teamwork				
• communicates while exploring and investigating				
• communicates using scientific terminology				
• communicates the procedure and result				
• responds to ideas and actions of others and acknowledges their ideas and contributions				

Comments:

Design Process Rubric

	Level 1	Level 2	Level 3	Level 4
INITIATING AND PLANNING	works on a problem set by the teacher or group suggests a solution to the problem and, with prompting, offers ideas about procedure with prompting, identifies some materials which could be used to carry out the plan	identifies a problem to solve but it may not be practical suggests a solution to the problem and makes a simple plan identifies some materials which could be used to carry out the plan	identifies a practical problem to solve suggests several possible solutions to the problem and chooses one; makes a simple plan selects and uses appropriate materials to carry out the plan	identifies a practical problem to solve and gives some criteria for solving it suggests several possible solutions to the problem that address the criteria; chooses the best solution and makes a simple plan selects and uses appropriate materials to carry out the plan and explains reasons for choice
PERFORMING AND RECORDING	with prompting, carries out the plan/follows a simple procedure with prompting, uses some appropriate tools with assistance makes simple observations using senses; with prompting, records observations and measurements constructs a prototype but does not follow the plan 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 constructs a prototype according to the plan but the device may not be useable 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 constructs a usable prototype according to the plan 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 constructs a usable prototype according to the plan with modifications for improvement follows all safety procedures and rules and explains why they are needed

Design Process Rubric (Continued)

	Level 1	Level 2	Level 3	Level 4
ANALYZING AND INTERPRETING	with prompting, says whether or not a solution works with prompting, makes simple suggestions for changes to improve the device/solution with prompting, identifies some new questions but they may not be on the same topic	says whether a solution works in terms of some simple criteria suggests some practical changes to improve the device/solution identifies some new questions on the same topic	evaluates and explains the effectiveness of a solution in terms of simple criteria suggests and makes practical changes to improve the device/solution identifies some new questions that arise from the solution	evaluates and explains the effectiveness of a solution in terms of a broad range of criteria makes effective changes to improve the device/solution identifies new questions that arise from the solution and suggests how they could be solved
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 solution 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 solution 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 solution 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 solution 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

- 100 Science Experiments* by Georgina Andrews, Kate Knighton, and Stella Baggott (Usborne, 2010)
- Bill Nye the Science Guy's Great Big Book of Tiny Germs* by Bill Nye (Disney-Hyperion, 2005)
- Boat* by Eric Kentley (Dorling Kindersley, 2000)
- Change It!: Solids, Liquids, Gases, and You* by Adrienne Mason (Kids Can Press, 2006)
- Cook Me a Story: A Treasury of Stories and Recipes Inspired by Classic Fairy Tales* by Bryan Kozlowski (Walter Foster Jr, 2016)
- Does It Absorb or Repel Liquid?* by Paula Smith, Susan Hughes, and Cynthia O'Brien (Crabtree, 2014)
- Does It Sink or Float?* by Susan Hughes (Crabtree, 2014)
- Is It Hard or Soft?* by Helen Mason (Crabtree, 2014)
- Is It Transparent or Opaque?* by Susan Hughes (Crabtree, 2014)
- Liquids and Solids* by Ellen Lawrence (Bearport Publishing, 2015)
- Many Kinds of Matter: A Look at Solids, Liquids, and Gases* by Jennifer Boothroyd (Lerner, 2011)
- Mixing and Separating* by Chris Oxlade (Heinemann, 2009)
- Will It Float or Sink?* (Rookie Read-About Science) by Melissa Stewart (Children's Press, 2006)

Picture Books

- Bartholomew and the Oobleck* by Dr. Seuss (Random House, 1949)
- Elliot Bakes a Cake* by Andrea Beck (Kids Can Press, 2000)
- Elliot's Shipwreck* by Andrea Beck (Kids Can Press, 2000)
- Germs, Germs, Germs* by Bobbi Katz (Cartwheel Books, 1996)
- Joe-Joe the Wizard Brews Up Solids, Liquids, and Gases* by Eric Braun (Picture Window Books, 2012)
- Lulu's Lemonade* by Barbara deRubertis (The Kane Press, 2001)
- The Magic School Bus Ups and Downs: A Book About Floating and Sinking* by Joanna Cole (Scholastic, 1997)
- Washing the Willow Tree Loon* by Jacqueline Briggs Martin (Simon and Schuster, 1995)
- What's the Matter in Mr. Whiskers' Room?* by Michael Elsohn Ross (Candlewick, 2007)
- Whiz Kids: Tell Me How Ships Float* by Shirley Willis (Franklin Watts, 1999)
- Who Sank the Boat?* by Pamela Allen (Puffin UK, 1990)

Websites for Students

YouTube Video – States of Matter: Matter Chatter
<https://www.youtube.com/watch?v=C33WdI64FiY>

BBC: School Science Clips – Solids and Liquids
http://www.bbc.co.uk/schools/scienceclips/ages/8_9/solid_liquids_fs.shtml

BBC: School Science Clips – Reversible and irreversible changes [may require adult support]
http://www.bbc.co.uk/schools/scienceclips/ages/10_11/rev_irrev_changes.shtml

TVO Kids – Solids and Liquids [See videos such as: How Will Different Liquids Affect an Egg Shell; Measuring Solids and Liquids; Volume, Mass and Density; and Gastra Blast]
<http://www.tvokids.com/search?search=liquids>

Websites for Teachers

IdeaPark – Webs of Wonder [requires registration]
<http://www.exploreideapark.org/WebsofWonder.aspx>

Let's Talk Science
<http://www.letstalkscience.ca/programs-resources/activities/item/what-happens-when-we-mix-liquids.html>

BrainPOP Educators
<https://educators.brainpop.com>

Dear parents and caregivers,

We are about to start a new unit in science in which we will be exploring familiar liquids and solids through a variety of hands-on activities and investigations.

You can talk to your child at home about liquids and solids. Walk with your child around your home and help him or her to identify different solids (including furniture and clothing) and liquids (including condiments in your refrigerator and cleaning products). Encourage your child to describe the characteristics or properties of each item.

You can plan some activities with your child to focus on liquids and solids, for example,

- go on a scavenger hunt together to find the most see-through liquid, the most flexible solid, or the least viscous (runny) liquid in your home
- ask your child to help you clean various things around your home by suggesting what liquids and solids could be used

You can also invite your child to help you prepare food by reading the recipe aloud and adding or mixing ingredients. Discuss how each ingredient looks both before and after it is combined with other liquids or solids.

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,