Grade 2

Cluster 2: Properties of Solids, Liquids, and Gases

Overview

When students examine materials in the world around them, they become aware of the similarities and differences in their characteristics, such as the ways materials look, feel, sound, or change. In Grade 2, students begin to develop an understanding of matter by investigating properties of solids and liquids. Gases are also introduced through an examination of the properties of air. Students investigate ways in which solids and liquids interact, and identify how the properties of solids and liquids determine their uses. Students observe how water can be made to change from one state to another and back again. Students also encounter changes of state in the study of the water cycle in *Grade 2, Cluster 4, Air and Water in the Environment*. Teachers are encouraged to help students make connections between these learning experiences.

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
2-2-01 Use appropriate vocabulary related to their investigations of solids, liquids, and gases. Include: solid, liquid, substance, property, mass/weight, dissolve, gas, changes of state, water vapour, freeze, melt, condense, evaporate, boil, float, sink, buoyancy. GLO: C6, D3, D4	➢ Introduce, explain, use, and reinforce vocabulary throughout this cluster.
2-2-02 Identify substances, materials, and objects as solids or liquids. GLO: D3 **2-0-6c**. Place materials and objects in a sequence or in groups using one or two attributes, and describe the system used. (Math SP-III.0.2) GLO: C2, C3, C5	➢ **Solid or Liquid?** Give students a collection of solids and liquids and ask them to sort and label the items. Have students re-sort the items several times, according to different rules. Following the sorting, have students share their sorting rules with the class. The teacher should lead a discussion modelling the use of the terms "solid" and "liquid" and identifying how to sort according to these categories. Show students another substance, material, or object and challenge them to identify whether it would belong in the solid or liquid group. Have them explain their thinking.
2-2-03 Investigate and compare properties of familiar solids. Include: have mass/weight, take up space, maintain their shape. GLO: C2, D3, E1 **2-0-4a**. Follow simple directions, and describe the purpose of steps followed. GLO: C2 **2-0-5b**. Use, with guidance, tools to observe, measure, and construct. *Examples: ruler, metre stick, pan balance, magnifying glass, bathroom scale, thermometer...* (Math SS-VIII.1.2) GLO: C2, C3, C5 **2-0-5e**. Record observations using written language, drawings, and, with guidance, charts. (ELA 4.1.2, 4.2.5) GLO: C2, C6	➢ **Investigating Solids** Have students explore solids in science centres, recording their observations in their science journals. The centres should contain a variety of solids. **Centre 1: Do Solids Have Mass/Weight?** Provide a balance scale. Have students investigate the mass/weight of several solids by using non-standard units. The student sheet for this centre should include the following questions for reflection: • What did you discover about the solids as you used the balance scale? • What did you learn about solids at this centre? **Centre 2: Do Solids Take Up Space?** Provide several containers (e.g., clear plastic cups, small jars, beakers, etc.) marbles, water, a variety of solids, and masking tape or a water soluble marker.

(continued)

TEACHER NOTES	SUGGESTIONS FOR ASSESSMENT
Caution: Remind students that they should not be tasting the solids or liquids used in the class unless they have specific instructions from their teacher to do so. Proper procedures for safety, materials management, and clean-up need to be established early.	
Be sure to provide a variety of easily identifiable substances for the initial classifying. For the sorting following the class discussion, provide challenging items such as sand, salt, plasticine, marbles, etc.	
Clear directions need to be provided for centre activities. Centre 2, in particular, requires very clear, step-by-step directions. These should use a combination of words and pictures. In Grade 2, students are not differentiating between mass and weight (as per K-4 Mathematics). These terms can be used interchangeably.	**Learning Log Entry: Solids** Have students complete the following in their learning logs after completing the investigations on solids. Two things I learned about solids are 1. _____. 2. _____. Look for ❑ an indication of the student's understanding of key concepts in order to provide direction for further teaching

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
	❶ Have students fill one container with water to the line indicated and then add one of the solids to the container of water, observing what happens to the level of the water. ❷ Have students totally fill a small container with water and then pour it into another container to measure (non-standard) how much water the container held. Students then put marbles into the original container and pour the measured water back in an attempt to re-fill it. Students measure to see how much water they were able to put in the container and how much was left over. The student sheet for this centre should include the following questions for reflection: • What happened to the water level when you added the solid? • Why did the container hold less water when you added the marbles? • What did you learn about solids at this centre? Note: The property related to maintaining shape is addressed by outcomes 2-2-04 and 2-2-05. ➢ **Summarizing the Properties of Solids** With students, discuss what they learned during their centre activities. Students can refer back to their observation and reflection sheets. Together, develop a list of properties of solids from the findings. Post this informational text where students can refer to it.
2-2-04 Investigate and compare properties of familiar liquids. Include: have mass/weight, take up space, have no definite shape. GLO: C2, D3 **2-2-05** Identify similarities and differences among properties of familiar solids and liquids. GLO: D3, E1 **2-0-4e**. Respond to the ideas and actions of others in building their own understandings. (ELA 1.1.2) GLO: C5, C7 **2-0-5a**. Make, with guidance, observations that are relevant to a specific question. GLO: A1, A2, C2 (continued)	➢ **Investigating Liquids** Use the list of properties for solids to focus students' investigations of liquids. Provide students with a variety of familiar liquids such as water, milk, detergent, and syrup or oil. Have students work with liquids to answer the focus question for each centre. **Centre 1: Do Liquids Have Weight/Mass?** Provide a balance scale and non-standard units for weighing. Have students investigate the mass/weight of the liquids. Make sure students either weigh the empty container before adding a liquid or provide two of each container so that they can compare the empty container with the full container by placing them on either side of the scale. (Having lids will prevent spills.) (continued)

Teacher Notes

There are a variety of ways for the students to use non-standard measurement to determine the amount of water the container held (Math Link). To make a special measuring container, students use masking tape or a water-soluble marker to mark off the water level. Alternatively, smaller containers, or "cups," can be used, with students having to count how many "cups" of water the container held.

Detailed measurements are not required with this centre activity. Students simply need to see that the original container could not hold as much water when it also contained the marbles.

Suggestions for Assessment

Self-Assessment: Centres

Answer Yes or No. (Teachers may choose to read these to students.)

1. I followed the directions at each centre.
2. I used the materials appropriately.
3. I recorded my observations.
4. I labelled all diagrams.
5. I answered the questions after finishing each activity.
6. I worked cooperatively.

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will... **2-0-5b**. Use, with guidance, tools to observe, measure, and construct. *Examples: ruler, metre stick, pan balance, magnifying glass, bathroom scale, thermometer...* (Math SS-VIII.1.2) GLO: C2, C3, C5 **2-0-7e**. Describe, in a variety of ways, what was done and what was observed. *Examples: concrete materials, captioned drawings, oral language...* (ELA 4.1.2, 4.2.5) GLO: C6	The student sheet for this centre should include the following questions for reflection: • What did you discover about the liquids as you used the balance scale? • What did you learn about liquids at this centre? **Centre 2: Do Liquids Take up Space?** Have students completely fill a container with marbles. Have them add water to the container until it reaches the top. Have students predict whether they can add water to other solids in containers (e.g., blocks, sugar cubes, etc.). Have them test their predictions. The student sheet for this centre should include the following questions for reflection: • Why were you still able to add water when the container seemed to be full with marbles? • What did you learn about liquids at this centre? **Centre 3: Do Liquids and Solids Maintain their Shape?** Provide a variety of differently shaped containers. Have students put liquids into the containers and observe what happens to the shape of the liquid. (The liquid takes the shape of the container.) Have students repeat this pouring task using a medium-sized solid, such as a block or marble. (The solids do not take the shape of the container.) The student sheet for this centre should include the following questions for reflection: • What happened to the shape of the liquids when you put them in different containers? • What happened to the shape of the solids when you put them in different containers? • What did you learn about liquids and solids at this centre? ➢ **Summarizing the Properties of Liquids** Discuss with students what they learned during their centre activities. Students can refer to their observation and reflection sheets. Together, develop a list of properties common to all liquids. Add a property to the solids list related to solids' maintaining their shape. Post this informational text where students can read it.

(continued)

Teacher Notes

Film canisters used to hold liquids for this investigation must be totally full. Have students fill the canisters so that excess liquid spills out when the lid is put on. Students are most likely to see a difference in mass/weight with liquids such as syrup or oil as compared to water or rubbing alcohol.

Suggestions for Assessment

Learning Log Entry: Liquids

Have students complete the following phrase:

Three things I learned about liquids are

1. _____.
2. _____.
3. _____.

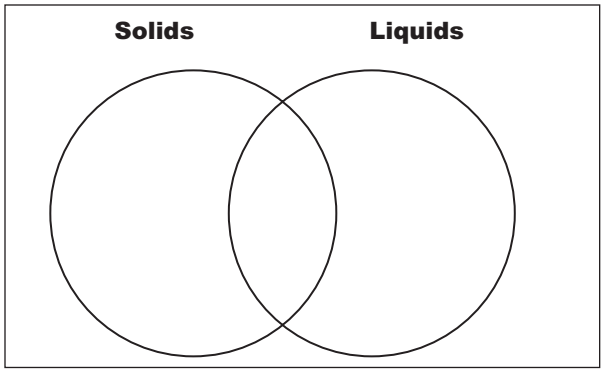
Look for

- ❑ an indication of the student's understanding of key concepts in order to provide direction for further teaching

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	

➢ **Comparing Solids and Liquids**

Use a Venn diagram to compare the properties of liquids and solids. Print the information from the informational text posted in the classroom on individual cards or strips of paper. One fact is recorded on each strip. Use different-coloured paper for solids and liquids. Have students work with a partner to use a Venn diagram for comparing solids and liquids.



Provide the following slips of paper for students to place on the Venn diagram.

have mass	keep their shape	
change shape	take up space	

2-2-06 Distinguish between solids that dissolve in water and those that do not.

Examples: sugar dissolves in water, whereas sand does not...

GLO: D3, E1

2-0-1b. Make predictions based on observed patterns or on collected data. (ELA 1.1.1, 1.2.1) GLO: A1, C2

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

➢ **Predict and Test**

Provide students with several different types of solids, including those that are powdered, crystallized, or granular (sugar, salt, drink crystals, sand). Have the students predict whether each solid will dissolve in water and then test to see if their predictions are correct. Before testing, some guidelines will need to be determined. As a class, decide whether stirring is permitted, and if so, how much. Predictions and observations should be recorded on a chart.

Teacher Notes	Suggestions for Assessment
Including solids such as bouillon cubes and hard candy (things that will dissolve over time) can add another dimension to the activity. Students may leave solids that did not appear to dissolve in the water for several hours, or overnight, and observe them again. At this age, students will likely have some familiarity with the term "dissolve." For this grade, the term should be understood to mean "mixes in completely," or seems to "disappear."	

PRESCRIBED LEARNING OUTCOMES
Students will...
2-2-07 Explore interactions of familiar liquids with different surfaces, powdered solids, and other liquids, and describe how these interactions determine their uses. GLO: A5, B1, C1, C2
2-0-5a. Make, with guidance, observations that are relevant to a specific question. GLO: A1, A2, C2 **2-0-5e**. Record observations using written language, drawings, and, with guidance, charts. (ELA 4.1.2, 4.2.5) GLO: C2, C6 **2-0-9b**. Express enjoyment when sharing and discussing science-related experiences from daily life. GLO: C5

SUGGESTIONS FOR INSTRUCTION

➢ Investigating Liquids

Provide students with a variety of familiar liquids such as oil, water, milk, vinegar, catsup, and syrup. Students will explore these liquids and their interactions at individual centres. Each station should have the same core set of liquids, allowing for on-going comparisons. The student sheets at each centre could include the headings: What did you do? What did you see?

Centre 1: Interaction with Different Surfaces

Have students explore the interaction of each liquid with wood (a wooden spoon or paint stir stick). Students dip the wood into each liquid, using a separate spoon for each liquid. Students observe what happens when they remove the wood (sticks, runs off). Have students place a small spoonful of each liquid onto samples of different surfaces (e.g., linoleum, glass plate, paper plate, bread). Students should carefully tilt the surface and observe what happens to the liquids. Students record their observations on the student sheet provided at the centre.

Centre 2: Interaction with Powdered Solids

Have students explore the interactions of liquids and solids by mixing a given amount of powered drink mix with each liquid. Provide stirring tools. Have students place equal amounts of each liquid in clear plastic cups, then add an equal amount (a small scoop or spoonful) of the powder to each liquid. They should observe what happens, and then stir gently five times and observe again. Students record their observations on the student sheet provided at the centre.

Centre 3: Interaction with other Liquids

Have students explore the interactions of each liquid with food colouring. Have students add a drop of food colouring to each liquid and observe what happens (without stirring). Have students predict what would happen if the mixture were stirred. Students test to determine if their predictions were correct. Next, have students add a spoonful of oil to each liquid, stir, and observe what happens. Students record all their observations on the student sheet provided at the centre.

TEACHER NOTES	SUGGESTIONS FOR ASSESSMENT
	Paper and Pencil Matching: Investigating Liquids Answer the following questions: 1. Why is syrup good for pancakes? 2. Why is water good for drink mixes? 3. Which liquid would you use to polish your wooden furniture? Why? Look for reference to results of **Investigating Liquids** centres.

Prescribed Learning Outcomes	Suggestions for Instruction
Students will...	
2-2-08 Identify liquids used in the home, and describe how they are used. *Examples: milk for drinking and cooking, detergent for cleaning...* GLO: B1	➢ **Survey: Liquids at Home** As a take-home assignment, have students make a list of different types of liquids found in their homes along with their uses. Name of liquid — How it is used vanilla — for flavour when baking syrup — topping for pancakes/waffles Have students compile their results on a class chart. If possible, have them include pictures (from flyers and labels) of the liquids/containers. ➢ **What's Best?** Have students identify which of the liquids from their station explorations would be suited to particular uses. Have students imagine that all of the liquids taste the same, allowing them to focus on the physical characteristics of the liquid and its possible use. Use the following format to help students identify suitable liquids and explain their choices (Link to 2-2-07). 1). _____ would be useful for a topping for pancakes because it _____ . 2) _____ would be useful for mixing with grape crystals for a drink because it _____.
2-0-1a. Ask questions that lead to investigations of living things, objects, and events in the immediate environment. (ELA 1.2.4, 3.1.2, 3.1.3; Math SP-I.1.2) GLO: A1, C2, C5 **2-0-4i**. Recognize international symbols and the Canadian Safety Association signage, which provide information on the safety of substances. Include: flammable, explosive, corrosive, poisonous. GLO: C1 **2-0-5a**. Make, with guidance, observations that are relevant to a specific question. GLO: A1, A2, C2 **2-0-5e**. Record observations using written language, drawings, and, with guidance, charts. (ELA 4.1.2, 4.2.5) GLO: C2, C6	
2-2-09 Compare different materials with respect to their capacity to absorb liquids, and describe how this capacity determines their uses. GLO: B1, C2, D3	➢ **Investigating Absorbency** Use the following questions to introduce the investigation: • Do all materials absorb water? • Which materials absorb water the fastest? • Which materials absorb the most water? • How can we find these answers? Provide students with a variety of different materials such as bond paper, paper towels, cotton, linen, wood, sponge, and plastic. Have students test the absorbency of each using an eyedropper and water. Have students count how many drops the material will absorb before the drops appear to stay on the surface. Students use a tally sheet to record the amount of water in drops absorbed.
2-0-1a. Ask questions that lead to investigations of living things, objects, and events in the immediate environment. (ELA 1.2.4, 3.1.2, 3.1.3; Math SP-I.1.2) GLO: A1, C2, C5 **2-0-3d**. Identify tools and materials to be used, and explain their choices. GLO: C2, C3, C4 **2-0-5a**. Make, with guidance, observations that are relevant to a specific question. GLO: A1, A2, C2 **2-0-5e**. Record observations using written language, drawings, and, with guidance, charts. (ELA 4.1.2, 4.2.5) GLO: C2, C6	
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TEACHER NOTES	SUGGESTIONS FOR ASSESSMENT
Have students use Blackline Master 1: Scientific Inquiry Recording Sheet : Grades 1 and 2. The term **absorb** indicates that the water is soaked up to the point where you can no longer see the water drops. Guide students to consider practicality in addition to absorbency when deciding which material is best for soaking up a spill. Discussions such as those related to the pros and cons of paper versus cloth towels should be encouraged.	**Paper and Pencil Task: Investigating Absorbency** Provide students with the following scenario. Someone in the kindergarten class has spilled water on the table. They want to clean it up quickly so that it does not wet the floor/carpet. The children do not know which material they should use. What would you tell them? Explain your choice. Look for ❑ identification of appropriate material ❑ reference to the exploration

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
2-0-6c. Place materials and objects in a sequence or in groups using one or two attributes, and describe the system used. (Math SP-III.0.2) GLO: C2, C3, C5 **2-0-7a**. Propose an answer to the initial question based on their observations. (Math SP-IV.2.2) GLO: A1, A2, C2 **2-0-7d**. Connect new experiences, ideas, and information with prior knowledge and experiences. (ELA 1.2.1, 2.1.2) GLO: A2 **2-0-8a**. Recognize that learning can come from careful observations and investigations. (ELA 3.3.4) GLO: A1, A2, C2	Students should also make other observations both during and after each test (e.g., I could see the wetness spreading; the material fell apart when I picked it up). Have students use their data to place the materials in order from most to least absorbent. Considering both absorbency and the other characteristics they observed, have each group recommend which material they would use to clean up a spilled glass of water. Have them explain their choices. ➢ **Writing Riddles** Have students work in groups to write a riddle based on one of the materials tested. This could be made into a "lift the flap" book. A sample of the actual material could be placed under the flap. The following captions could be used: • I am an absorbent material. • I soak up liquid quickly. • I can hold a great deal of liquid. • I come in a roll. • I am often found in the kitchen. • What am I? (paper towel)
2-2-10 Describe useful materials that are made by combining solids and liquids. *Examples: a drink made from crystals and water, a cake made from cake mix and water, glue made from flour and water...* GLO: B1, D3 **2-0-4h**. Follow given safety procedures and rules. GLO: C1	➢ **Practical Products from Solids and Liquids** Provide opportunities for students to bake cookies or bannock and/or mix their own beverages from powdered crystals. Encourage description and discussion of the process. ➢ **Art Connection: Papier Mâché** Have students mix flour or wallpaper paste with water for papier mâché projects. Papier mâché can be used in the development of masks, jewellery, sculpture, etc.
2-2-11 Explore to determine that there is a substance around us called air. GLO: A2, C2, D3, D5 **2-2-12** Recognize that air is composed of several gases *Examples: carbon dioxide, oxygen, nitrogen, water vapour...* GLO: D3 (continued)	➢ **Observing Air in the Environment** **Setting the context:** Hold up a lunch bag in front of the class. As you remove items from the bag, challenge students to identify the objects as solids or liquids. After emptying the bag, ask students what is still left inside. Tell them they will be investigating this third type of material. (continued)

TEACHER NOTES	SUGGESTIONS FOR ASSESSMENT
	Observation Skills Checklist: Air The student ❑ asks questions related to air and air composition ❑ makes relevant observations ❑ proposes answers to questions related to air ❑ uses a variety of sources to access information The student records observations using ❑ words ❑ drawings ❑ other

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
2-0-2a. Access information using a variety of sources. *Examples: elders, simple chapter books, concept books, CD-ROMs, Internet...* (ELA 1.1.2, 3.2.2 Math SP-II.1.2; TFS 2.1.1) GLO: C6 **2-0-4i**. Recognize international symbols and the Canadian Safety Association signage, which provide information on the safety of substances. Include: flammable, explosive, corrosive, poisonous. GLO: C1	Have students undertake the following experiences: • take a few deep breaths while placing their palms on their chest • observe a balloon as it is inflated • blow into a plastic bag or drag the open bag through the air and seal the bag • try to pour water into a jar via a funnel through its lid (use plasticine or a few drops of wax from a candle to seal the hole in the lid around the funnel). Have students use the following questions for reflection: • What did you feel in your chest? Why? • Why did the balloon increase in size? • What is inside the bag? • Why couldn't you pour water into the jar? (The jar was already full of air and there was no place for the air to go.) • If you cannot see air, how do we know it is all around us? (Link to Air & Water in the Environment 2-4-02, 2-4-03) ➢ **What Is Air?** Consolidate students' prior knowledge regarding the composition of air. (Link to Air & Water in the Environment 2-4-06, 2-4-07 for a discussion of water vapour.) Have students listen to, read, or view books, videos, and CD-ROMs. Include information and discussion on carbon monoxide detectors in homes or the use of oxygen for medical treatment. ➢ **Composition of Air: Demonstrations** Complete the following demonstrations for students, ensuring that there is adequate opportunity for sharing and discussing observations. **Demonstration 1: Oxygen** Demonstrate the presence of oxygen in the air by placing a candle in a shallow pan filled with water. Light the candle. Place an empty clear glass jar over the candle. (The jar should be approximately one litre in size to provide enough oxygen to draw in the water.) As the flame goes out ask students to notice what is happening to the water in the jar. Discuss their observations.

(continued)

Teacher Notes

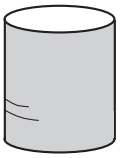
The term **air** is often used to describe the gas found all around us. Air is actually a combination of several gases. Many students will already be familiar with the names of some **common gases**. Approximately 78% of air is composed of nitrogen, 22% is oxygen, with minute quantities of carbon dioxide, ammonia, methane, sulfur dioxide, helium, and hydrogen. It is not important for students to know all of the gases that make up air. Students need to understand that when we talk about air we are talking about a mixture of gases, not a single gas.

Fire requires **oxygen** to burn. When the oxygen is used up the flame goes out. The water level in the jar will also rise as the oxygen is used up.

Suggestions for Assessment

Paper and Pencil Task: Air

Have students answer the following questions:



1. John says that this glass is empty.
   Is he correct? Explain your thinking.

_____
_____
_____

2. Ann wants to use the small glass to fill the tall cylinder with air. Will this work? Explain.

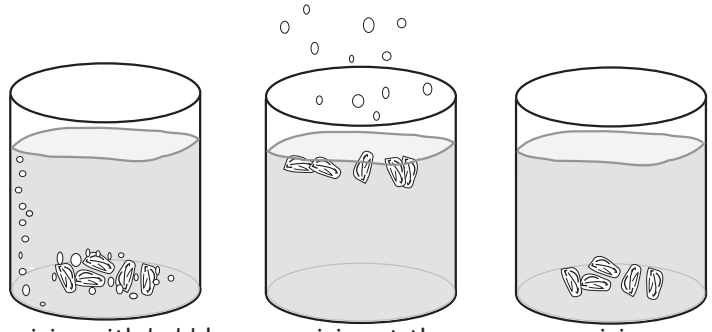
_____
_____
_____
_____

In question 1, the student should indicate that the glass is not empty. It is filled with air. In question 2, the student should indicate that it is not possible to do this. Both the glass and cylinder are already filled with air. Air as a gas does not "pour," nor does it have any definite shape.

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	

Demonstration 2: Carbon Dioxide

Use a carbonated drink such as ginger ale and some raisins to demonstrate the presence of carbon dioxide. Carefully pour ginger ale into a clear glass. Try to preserve as much of the carbonation as possible. Drop in a few raisins. Ask students to observe the movement of the raisins. Have students explain their observations.



2-2-13 Identify properties of gases.

Include: occupy the space not taken up by solids and liquids, have no definite shape.

GLO: D3

2-0-6b. Discuss data and generate new questions from displayed data. (Math SP IV.1.2) GLO: A1, A2, C2, C5

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

2-0-7d. Connect new experiences, ideas, and information with prior knowledge and experiences. (ELA 1.2.1, 2.1.2) GLO: A2

➢ **Investigating Gases**

Set up centres to investigate the properties of gases.

Centre 1: Does Air Take up Space?

Have students put a crumpled piece of paper towel in the bottom of a transparent glass. (Make sure the paper stays in place when the glass is inverted.) Have them invert the glass, and, keeping it as straight as possible, place it carefully into a container of water. Students hold the glass steady while counting to ten. Students lift the glass out of the water without tipping it and observe the paper towel.

The student sheet for this centre should include the following question for reflection:

- Why did the paper towel stay dry?

(continued)

Teacher Notes	Suggestions for Assessment
The carbon dioxide gas from the drink sticks to the raisins and causes the raisins to rise to the surface. As the gas escapes into the air at the surface of the water, the raisins sink.	
Air takes up the space in the glass and does not allow the water to enter and wet the towel.	

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
	Centre 2: Does Air Have a Definite Shape? Provide a variety of containers — boxes, bags, etc. Have students fill each container with air and try transferring the air/gas from one container to another in whatever manner they determine. The student sheet for this centre should include the following questions for reflection: • Was it easy to fill the container with air/gas? • Did it matter what shape the container was? Large? Small? Long? Narrow? • If you were able to transfer the air/gas from a small container to a large one, would the large container be partially full? Would the smaller container be completely empty? Why? ➢ **Summarizing the Properties of Gases** With students, make a class list of the properties of gases discovered through their explorations. Post this information where students can reread it.
2-2-14 Explore to determine how water can be made to change from one state to another and back again. Include: addition or removal of heat. GLO: C2, D3, D4, E3 **2-0-4h**. Follow given safety procedures and rules. GLO: C1 **2-0-5b**. Use, with guidance, tools to observe, measure, and construct. *Examples: ruler, metre stick, pan balance, magnifying glass, bathroom scale, thermometer...* (Math SS-VIII.1.2) GLO: C2, C3, C5 **2-0-5c**. Estimate and measure the passage of time related to minutes and hours. (Math SS-VI.1.2) GLO: C2, C3, C5	➢ **Investigating Changing States of Water** Set up investigations that allow students to explore changing the states of water. Make connections to Cluster 4, Air and Water in the Environment, outcomes 2-4-06 and 2-4-07. **Investigation 1: Liquid to Solid** Have students take the temperature of the water before placing it in a freezer (or outside). Have students take and record the temperature every half hour. When the ice is frozen solid, have students complete the following statement: As the water froze, its temperature went _____ . (up or down) **Investigation 2: Solid to Liquid** Have students take the temperature of a container of ice cubes before the investigation. Set the ice cubes in various locations within the classroom. Have students take and record the temperature of the water as the ice melts. When the ice has fully melted, have students complete the following statement: As the ice melted, the temperature of the water went _____ . (up or down)

(continued)

TEACHER NOTES	SUGGESTIONS FOR ASSESSMENT
	Learning Log Entry: Gases Have students complete the following phrase: Three things I learned about gases are 1. _____ 2. _____ 3. _____ Look for ❑ an indication of the student's understanding of key concepts in order to provide direction for further teaching
Only red alcohol thermometers should be used for the investigations. As the water freezes, students should observe that a layer of ice forms on top first. Discuss how this relates to safety on ice in the fall. A layer of ice on top is not an indication that a body of water is frozen throughout and safe to walk on.	

Prescribed Learning Outcomes	Suggestions for Instruction
Students will...	
	Investigation 3: Liquid to Gas Use a kettle or pot to boil water. Take the temperature of the water prior to heating (students can do this) and at the boiling point (the teacher should do this). Have students carefully observe what is happening (they should see steam). Using oven mitts and a very cold serving spoon or ladle, hold the spoon over the steam so that student see the condensation and realize that the water changed to vapour and then back to liquid on the spoon. Have students observe the temperature change from the time the water was first heated to the point where it began to boil. As the water was heated, its temperature went _____ . (up or down)
2-2-15 Recognize that the states of solids and liquids remain constant in some circumstances, but may change in other circumstances. *Examples: liquids may freeze when temperature drops, solids may melt when heated, solids remain solid when broken...* GLO: D3, E3 **2-0-2a**. Access information using a variety of sources. *Examples: elders, simple chapter books, concept books, CD-ROMs, Internet...* (ELA 1.1.2, 3.2.2 Math SP-II.1.2; TFS 2.1.1) GLO: C6 **2-0-2b**. Match information to research needs. (ELA 3.2.3, 3.3.3) GLO: C6, C8	➢ **A Change or Not a Change?** Have students identify the pictures that indicate a change of state. Have them explain their thinking. Examples of pictures could include the following: • breaking a crayon • pouring milk into a glass • sharpening a pencil • leaving an ice cream cone in the sun • putting juice into an ice-cube tray in the freezer
2-2-16 Describe ways humans dispose of solids and liquids to maintain a clean and healthy environment. *Examples: take used car oil and old paints to collection sites, recycle newspapers...* GLO: B5 **2-0-4e**. Respond to the ideas and actions of others in building their own understandings. (ELA 1.1.2) GLO: C5, C7 **2-0-9a**. Willingly consider other people's views. GLO: C5, C7	➢ **Where Does It Go?** Bring in a bag of recyclable solids such as newspapers, tin cans, plastic bottles, cardboard, and glass containers. Have students in small groups identify at least two methods for disposing of the items. Students should answer the following questions for reflection and share their answers with the class: • Is there more than one way to dispose of the same item? • What is good about throwing things in the garbage? What is bad? • What is good about sending things to be recycled? What is bad? Examples: convenience, cleanliness, time, lack of places to take recyclables, landfill sites are becoming too full…

(continued)

TEACHER NOTES	SUGGESTIONS FOR ASSESSMENT
Caution: Take steps to ensure safety of both teacher and students when boiling water.	
	Student Journal Entry: Where Does It Go? Have students answer the following questions: 1. Tom has a can of old paint. He wants to throw it out. What should he do? Why? 2. Sarah has a box of glass bottles. She wants to throw them out. What should she do? Why? Look for ❑ disposing of paint at a community disposal centre ❑ recycling of glass in some way

PRESCRIBED LEARNING OUTCOMES	SUGGESTIONS FOR INSTRUCTION
Students will...	
	➢ **Research: The Recycling Process** Have students work with a partner to a) select a recyclable solid and research what happens to it when it goes through the recycling process, or b) research the disposal of liquids such as car oil or paint. ➢ **Guest Speaker/Field Trip** Invite a guest to speak about the recycling of specific solids or liquids, or go on a field trip to a recycling depot if one is available in the area.
2-2-17 Predict and test to determine whether a variety of materials float or sink in water. GLO: C2, D3 **2-2-18** Demonstrate ways to make sinking materials float and floating materials sink. GLO: B1, C3 **2-0-1b**. Make predictions based on observed patterns or on collected data. (ELA 1.1.1, 1.2.1) GLO: A1, C2 **2-0-4g**. Verbalize questions, ideas, and intentions during classroom activities. GLO: C6	➢ **Float or Sink?** Provide a variety of objects made of different materials (e.g., wood, plastic, rubber, styrofoam, metal, etc.). Have students predict if the material will float or sink. Have students record their predictions and then test to see if their predictions were accurate. ➢ **Changing Buoyancy** Challenge students to find ways to make sinking things float or floating things sink. Use the objects from **Float or Sink?** as well as some others. Examples: plasticine sinks when it is in one ball but floats when it is flattened out (the surface area is increased); a tin-foil boat floats but when additional weight is added it will sink; a pencil will float if carefully placed horizontally on the surface of the water but will sink if dropped in horizontally…

TEACHER NOTES	SUGGESTIONS FOR ASSESSMENT
	Performance Task: Changing Buoyancy Provide students with a large container of water (aquarium, basin) and a ping pong ball. Ask students to make the ping pong ball sink. Observe. **Scoring Rubric** **4** Student is able to solve the problem independently and is able to clearly communicate his/her thinking. **3** Student is able to solve problem with some assistance. Communication of thinking is clear. **2** Student makes several attempts to solve the problem but is unable to make the ball sink. Communication of thinking is partially clear. **1** Student makes an attempt to solve the problem but is unable to make the ball sink. Communication of thinking is unclear.

PRESCRIBED LEARNING OUTCOMES
Students will...
2-2-19 Use the design process to construct an object that is buoyant and able to support a given mass/weight. GLO: C3
2-0-1c. Identify practical problems to solve in the immediate environment. GLO: C3 **2-0-3a**. Brainstorm, with the class, possible solutions to a practical problem; and in small groups, reach consensus on a solution to implement. (ELA 1.2.3, 2.2.2) GLO: C3, C7 **2-0-3b**. Create, with the class, a plan to solve a problem or meet a need. *Examples: identify simple steps to follow, prepare a drawing of the object to be constructed...* (ELA 1.2.3) GLO: C3, C7 **2-0-3c**. Develop, as a class, limited criteria to evaluate an object or device based on its function and aesthetics. GLO: C3, C7 **2-0-3d**. Identify tools and materials to be used, and explain their choices. GLO: C2, C3, C4 **2-0-4b**. Construct an object or device to solve a problem or meet a need. GLO: C3 **2-0-4c**. Test an object or device with respect to pre-determined criteria. GLO: C3, C5 **2-0-4d**. Identify and make improvements to an object or device with respect to pre-determined criteria. GLO: C3 **2-0-7b**. Propose a solution to the initial problem. GLO: C3 **2-0-7c**. Identify new problems that arise. GLO: C3

SUGGESTIONS FOR INSTRUCTION

➢ **Design Project**

Sample Context: Jack Be Nimble wants to make a floating candle. The candle has a mass of 50 grams. Jack Be Nimble asks you to help him design a device to hold the candle. Possible evaluation criteria could include the following:

- holds 50 grams without sinking or allowing any water onto the candle
- is made from flame-proof materials
- is pleasing to look at
- is easy and safe to use

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

Teacher Notes

The teacher may choose to provide a selection of small candles and ask the students to decide on the type of material they wish to use for the candle holder. Small bowls can be used for the water source. Alternatively, the teacher can provide the materials to be used. In either case, common household materials should be used.

Students will need to address the issue of fireproofing (or preventing melting) in their designs. Lining containers with foil is a good solution.

Marbles or coloured stones are useful for placing in the water as a decoration. This could be a project that is taken home as a gift for a special occasion.

Suggestions for Assessment

Design Project Checklist: Buoyant Objects

The student

- ❑ identifies the problem
- ❑ contributes to brainstorming
- ❑ contributes to the creation of a plan
- ❑ helps to develop criteria
- ❑ constructs buoyant object
- ❑ tests object based on criteria
- ❑ makes improvements

Student Self-Assessment of Product

My object met the following criteria: (example)

- ❑ held 50 g without sinking
- ❑ made from flame-proof materials
- ❑ nice to look at
- ❑ easy to use
- ❑ safe to use

I can improve my object by _____

_____.

After I made the changes, my object _____

_____.

NOTES