

Title of Unit: States of Matter

Grade Level: 2

Timeframe: 11 lessons @ 45 minutes each, or 5 ½ weeks with 2 lessons per week

Nature of the Students:

There are 24 students in the class, with 17 boys and 7 girls. Most of the students are quite socially active, yet manage to stay on track because their current teacher has done a good job in training them to. There is one child with autism, three undesignated children with learning disorders, and one child with an undiagnosed social disorder.

Common Misconceptions:

- Matter is *only* solid and visible – it does not come in other forms
- Smaller pieces of a once-larger chunk of matter are no longer the same *type* of matter
- A large container will appear to have less water than a small container, even if they both have the same amount of water in them
- Solids vanish or disappear when they dissolve
- Matter must be visible, therefore gas is not a matter
- Matter can only change form if *people* manipulate it in some way

Resources:

Lawson, Jennifer (1999). *Hands-on Science: Level Two*. Winnipeg, Manitoba: Peguis Publishers.

Pan Canadian Science Place, (2004). *Matter, Matter Everywhere*. Toronto, Ontario: Scholastic Canada Ltd..

Purpose of the Unit:

- Identify the properties of solids, liquids, and gases
- Investigate changes to the properties of matter when it is heated or cooled
- Investigate the interactions of liquids and solids
- Identify the properties of water that make it a unique liquid

Prior Knowledge of the Students:

Kindergarten:

- observational skills – using their sense to observe, describe, and identify objects/materials
- properties of material – looking at such things as texture, shape, weight, size

Grade One:

- process skills – communicate observations in different mediums (speech, writing, and graphing/pictures)
- daily and seasonal changes – potentially have seen water and matter in different states, situations, places in the world

Unit integration with other subjects:

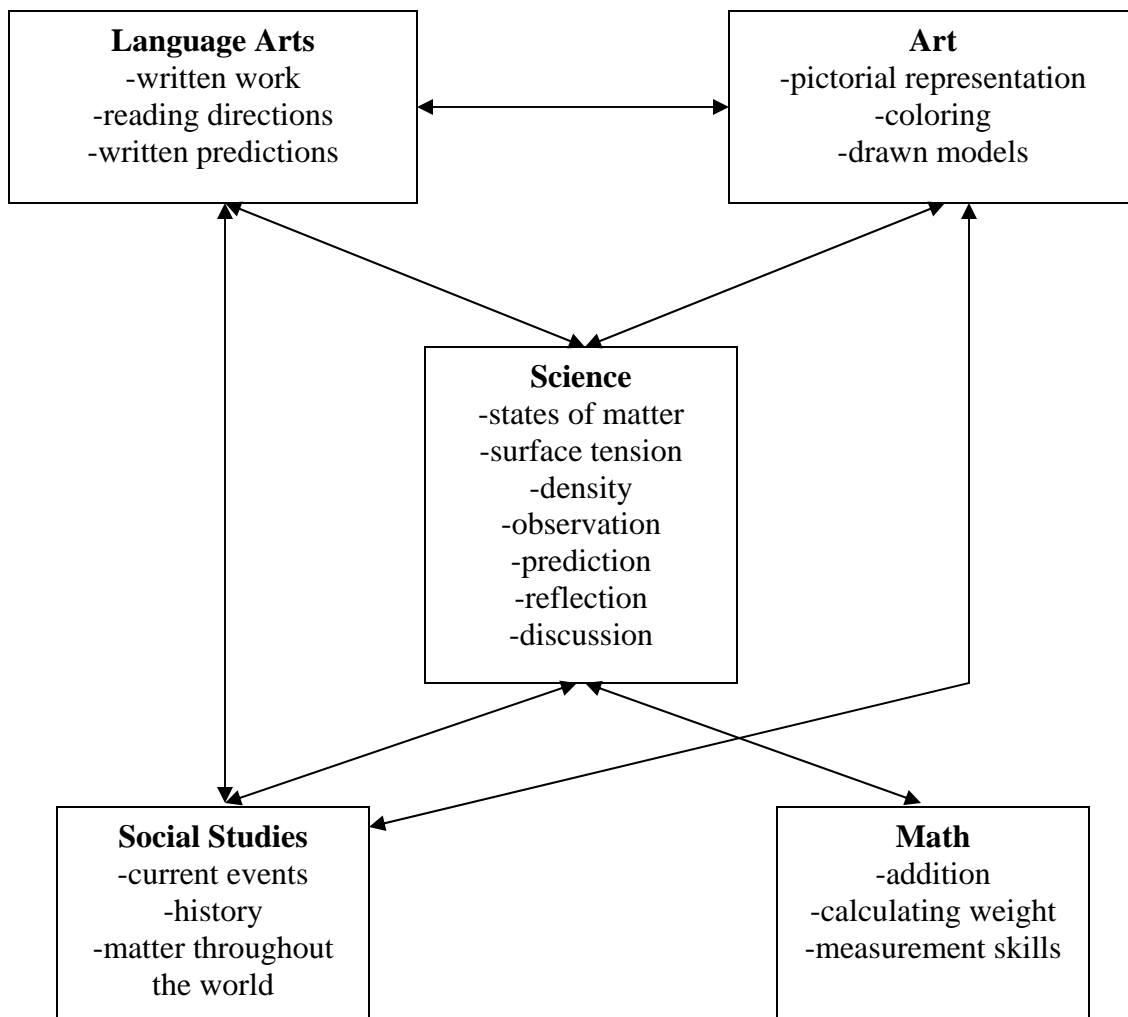
In many of the lessons within the unit students are asked to write a description, brainstorm ideas, or copy down definitions from the board. This directly relates to the objectives of primary educators to meet the literacy expectations of students this age. Brainstorming is also a graphic organiser that helps teach students how to organise information and form thoughts and opinions.

The unit also will touch upon the geography/social studies aspect of the grade 2 curriculum as some of the lessons will require examples of real-life places, situations, and events. These lessons could be a great opportunity for students to get involved in learning the “daily events” that happen throughout Canada and the world.

Size and weight are also covered within the unit which will help in their addition and measuring skills for mathematics.

Finally, there is a lot of opportunity for students to engage in art and colouring and drawing and attempting to replicate with a pencil and paper what they see with their eyes. They will hopefully learn a few skills and be encouraged to include plenty of fine details in their representations which could help them in future artistic endeavours.

Concept Map:



Materials: All materials are listed in a lesson-per-lesson format.

Assessment and Evaluation:

Evaluation of student growth happens on a lesson-by-lesson basis. I believe that it is important for the teacher to look at each lesson and find out if they were successful in achieving their stated directives – if they didn't succeed on one aspect that could affect the ability of the student's to use what they "were supposed to learn" in any following lessons. Most of the assessment in this unit is based upon student interaction with the material (ie. applying what they have learned in class to a posed question or task and recording their results/efforts). I feel as though an assessment done in such a way will enable the students to not only see and hear the focus of the lesson, but experience it and prove that they understand.

At the end of each lesson plan I have included a brief reflection on what I believe will be the strengths, weaknesses, and possible hurdles within the lesson. There are some lessons which the students will find easier to grapple with, and there will be some that they just don't understand – in my reflection I made a point of stating what these things are, and how I plan on working around them. I believe that although a pre-emptive strike on my reflection now will prove to be helpful in troubleshooting the lessons, the real reflection will occur *after* I instruct the lesson and unit.

Student self-assessment on an individual basis within each lesson, however, at the end of each section (ie. state of matter) there is a student self-assessment sheet that each student will be required to fill in. It will allow the students to look at the previous few lessons and see what knowledge they have gained, where they struggled, and share with the teacher what they liked and didn't like. Attached is a sample of the self-assessment that will be given for the unit on liquids (essentially for the other sections the word "liquid" will be changed to "solid" and "gas").

Support Resources:

Levenson, Elaine (1994). *Teaching Children about Physical Science: Ideas and Activities Every Teacher and Parent Can Use*. Whitby, Ontario: McGraw Hill.

Osborne, Louise et al. (1998). *Solids, Liquids, and Gases*. Toronto, Ontario: Kids Can Press.

Zoehfeld, Kathleen Weidner (1998). *What Is the World Made Of?: All About Solids, Liquids, and Gases*. Canada: Harpercollins Juvenile Books.

Liquids

Name: _____

Date: _____

Self Assessment – Comprehension

How did you enjoy this section on liquids? Circle the face that shows how you feel.



What was your **favourite part** of our section on liquids?

If you could **change anything** we studied on liquids, what would it be? Why?

What was the **hardest part** of our section on liquids?

Unit Theme Overview	Major Learnings (TSWBAT):	Dates (weeks): 5.5
Subject Area: Science – Physical	1. Identify the properties of solids, liquids, and gases	
Topic-Theme: Liquids, Solids, and Gases	2. Investigate changes to the properties of matter when it is heated or cooled	
Grade: 2	3. Investigate the interactions of liquids and solids	Time per Lesson: 45 minutes
	4. Identify the properties of water that make it a unique liquid	Lessons per weeks: 2

No	Topic-Concept	Learning Statements (Lesson Objectives)	Resources	Lesson Activities – Strategies	Assessment	Notes – Integration with other subjects
1	Intro to Matter	-identify things that are matter -use five senses to make observations	-random classroom objects -markers -copies of “What is Matter” worksheet -balloon, cup, water	1) Ask “What is matter” – write answers on the board, then explain what matter is (10 mins) 2) Students go on a “Matter Hunt” →have them draw or write what they found (15 mins) →Ask if what they have found is matter 3) Do Matter Takes up Space demo (5 mins) 4) Hand out “What is Matter” worksheet to be completed (10 mins) 5) Students keep one object from Hunt to put into desk. 6) Clean up.	Take in worksheet – assess ability to recognize matter by its properties	Language Arts – writing skills. Art – drawing and colouring matter.
2	Intro to Solids Texture, shape	-identify properties of solids -use senses to make observations -demonstrate how to use a magnifying glass	-magnifying glasses -“Solids” worksheet -sponges, paperclips, chalk, beach glass	1) Ask students “What are solids?” → take suggestions and guide them to discovering solids do not change shape by themselves (8 mins) 2) Pass out sponges, paperclips, and chalk →ask students to describe texture in pairs(7 mins) 3) Pass out magnifying glasses →ask students to observe and draw on the worksheet the magnified image of one of the 4 solids given to them. (15 mins) 4) Review with students what they have learned about solids →ask them “What solids do have around your house?” - make a list on the board (5 mins) 5) Clean up.	Take in worksheet – drawings should show magnified details.	Art – completing drawing on worksheet.

3	Solids – the same type of matter can come in different sizes.	<ul style="list-style-type: none"> -work cooperatively with others -identify properties of solids -use senses to interpret observations -infer the probably outcome of an event based on observations 	<ul style="list-style-type: none"> -wooden baseball bat, toothpick -Arrowroot cookies -magnifying glasses -water, water jug, 4 glasses 	<ol style="list-style-type: none"> 1) Review characteristics of solids from yesterday (texture, shape, weight) (5 mins) 2) Ask “How are a baseball bat and a toothpick the same and different?” →write answers on the board →point out that objects of the same material, regardless of size, are still the same type of matter (10 mins) 3) Hand each student an Arrowroot – ask them to break it into smaller pieces – discuss with a partner whether or not it is still a cookie when broken →look at the pieces with a magnifier too – is it still a cookie? (10 mins) 4) Come together as a group, ask “Did the matter change?” “Is a big piece of cookie a solid?” “Is a small piece of cookie a solid?” “Other than size, are the big and small pieces of cookie the same?” →Discuss as a group – emphasize that regardless of size, so long as piece of matter has the properties of a solid it is one. “The same solid can come in different shapes and sizes.” (10 mins) 5) Do water demonstration 6) Clean up. 	Observational assessment – responses to group and partner questions/tasks – ability to predict with a partner the outcome of breaking a cookie apart.	
4	Intro to Liquids →Properties of Liquids Student Discovery Centres	<ul style="list-style-type: none"> -learn properties of liquids →clarity, viscosity - be able to describe liquids →key ideas/words – (in)visible / thickness / absorption -have opportunity to interact with liquids and learn properties first-hand 	<ul style="list-style-type: none"> -saran wrap / wax paper (extra – race track) / cardboard -veg. oil, water, vinegar, quick syrup, syrup, milk, molasses (containers for each) -paper towel / eyedroppers -copies of activity sheet -copies of race track 	<ol style="list-style-type: none"> 1) Explain activity (describe the liquids) (10 mins) 2) Break class into 6 groups of 4 – fill in worksheet (10 mins) 3) Ask students to guess what is in each container – how would they describe it? (5 mins) 4) Discuss clarity and thickness (7 mins) 5) Groups start absorption test – record results – (8 mins) 6) Discuss – (5 mins) 7) Groups start liquid race track (5 mins) 8) Clean up. 	Collect “Properties of Liquids” sheet – check for completion, meaningful descriptions, and interaction with test.	Language arts – filling in worksheet
5	Intro to Density Teach Demonstration	<ul style="list-style-type: none"> -define density -show understanding by comparing two objects 	<ul style="list-style-type: none"> -3 pop bottles with sand, water, air -20 containers →4 with sand →water →cotton balls →steelies/magnets -worksheet 	<ol style="list-style-type: none"> 1) Show pop-bottles filled with different materials (air, water, sand) →discuss which one is heavier and why – take up same amount of room (5 mins) 2) Think-pare-share of two same-sized/different-density objects (15 mins) →write on board written rule for density 3) In day-groups choose 2 of 4 containers and write on worksheet which they chose, which is denser, and how they know (15 mins) 4) Come back together and share (5 mins) 5) Clean up 	Take in worksheet	Language arts – filling in worksheet

6	<p>Liquid Densities</p> <p>Teacher Demonstrations and student experiments</p>	<p>-describe two liquids with different densities -define density -make reasonable predictions of which liquids are more dense</p>	<p>-syrup, glycerol, water, food colouring, veg. oil, rubbing alcohol -choc. Syrup and milk / oil & vinegar / water & oil -copies of predictions worksheet</p>	<p>1) Recap what we know about density (5 mins) 2) Can 2 liquids have different densities? Can one liquid be more dense than another? →take answers, thoughts (5 mins) 3) Do liquid demonstration (10 mins) →what do we see? →why do you think it is this way? 4) Can you think of any place where you can see two liquids of different densities together? (oil spill, chocolate milk, salad dressing, oil & vinegar) (5 mins) 5) Show different liquids – students circle their predictions of which is denser – teacher mixes liquids – discuss results (10 mins) 4) Ticket out the door – write out “density is...” (5 mins) 5) Clean up</p>	<p>Review ticket out the door – comprehension. Examine density predictions.</p>	<p>Language arts – filling in worksheet</p> <p>Social studies – oil spill example</p>
7	<p>Liquid-solid Interactions</p> <p>Teacher Demonstration – 3 different interactions</p>	<p>-students will understand relationship of solids in liquids: →float, sink, dissolve -students will be able to make reasonable predictions of interactions</p>	<p>-cup of marbles, Styrofoam, sugar -jar of water -5 clear containers of water →cocoa powder, pennies, marbles, bread, fabric, sand, chips (5 containers of each) -worksheet</p>	<p>1) Do 3 interactions demo →discuss why each solid does what it does (float, sink, dissolve) (10 mins) →what happened to the sugar? Less dense? More dense? (5 mins) 2) Define dissolving – dissolving is when a solid breaks down into smaller parts. →the solid (sugar) is still there, but it is too small to see (5 mins) 3) In day groups, try to dissolve different solids in water – mark your results on the worksheet (15 minutes) 4) Come back together and recap – which solids dissolved? (5 mins) 5) Now, with the raisin and lifesaver, predict what will happen to them overnight (on worksheet) – and why (if time) (5-10 mins). 6) Clean up.</p>	<p>Collect worksheet – check for predictions and completion of experiments.</p>	
8	<p>Water – surface tension →Demo – Pennies in glass</p> <p>Student experiment.</p>	<p>-understand surface tension -experiment to see if they can float a paperclip on water</p>	<p>-glass, water, pennies -dishes, paperclips, rocks -booklet to write in</p>	<p>1) Penny/water demo (5 mins) 2) Discuss what they see, what is happening, why is the water bulging? (5 mins) – write ideas on board 3) Explain surface tension (5 mins) →introduce experiment 4) Get into pairs and give task – can you get a paper clip and a small rock to float? (10 mins) 5) Discuss as a class each group’s results →ask “which one floats?” “why does it float sometimes, and sink sometimes?” (10 mins) 6) Write down why the paper clip floats and not the rock (10 mins). 7) Clean up.</p>	<p>Take in booklet – check for understanding in describing why the paperclip floats and not the rock.</p>	<p>Language arts – writing in booklet.</p>

9	Intro to Gases	<ul style="list-style-type: none"> -identify properties of gases -interact with air as a gas -recognize that gases (air) are everywhere 	<ul style="list-style-type: none"> -balloons -tray with water -bubble mixture (water, dish soap, light corn syrup), wands, containers, newspaper -copies of worksheet 	<ol style="list-style-type: none"> 1) Do balloon demonstration →ask, “What is in this balloon?” – discuss answers (5 mins) 2) Brainstorm ideas of places where we can find air (5 mins) 3) Do 2nd balloon demo with water →ask students to think-pare-share about what will happen →help students realize that the bubbles are like temporary balloons (10 mins) 4) Introduce concept/experiment of making own bubbles (5 mins) 5) Let students begin to blow bubbles – ask them to find different ways of making the bubbles (waving with hand, slow, fast, etc.) – encourage them to be creative and experiment with bubbles (15 mins) 6) Recap that gases are everywhere, and air is one of the gases – handout worksheet for homework, or in-class if time allows (5 mins) 7) Clean up. 	Collect worksheet – check for understanding of locations of air (in balloons, tire, hot air balloon, and EVERYWHERE).	
10	Gas expansion	-recognize that a gas fills the space it is place in – it takes the complete shape of the container	-balloon, vinegar, baking soda, pop bottle -copies of gases worksheet	<ol style="list-style-type: none"> 1) Recap with the students what we learned about gases the previous day (5 mins) 2) Ask them to think-pare-share about a solids, liquids, and gases – what kind of shape do they have? (the solid shape stays the same – the liquid takes the same of the container it is poured into but does not always fill it up – it sits at the bottom) →discuss this with the class as a whole (10 mins) 3) Do CO₂ Balloon demo (5 mins) 4) Ask the students what kind of shape the gas has in this example (it completely fills the bottle and the balloon). →explain that a gas expands to fill the space that it is (write it on the board) (10 mins) 5) Hand out gases worksheet and ask students to colour the areas of the object where the gas is →include the written property you placed on the board (15 mins) 	Collect worksheet – check for understanding based upon the student’s ability to recognize that gases fill the space available.	Art – colouring the pictures.

11	Water – demonstrating all three states of matter	<ul style="list-style-type: none"> -investigate the changes in states of matter when heated and cooled -use senses interpret observations -identify the properties of solids, liquids, and gases 	-ice cubes, small plastic container, plastic bags	<ol style="list-style-type: none"> 1) Review three forms of matter – properties and characteristics (8 mins) 2) Handout worksheet with Riddle on it – have students read it aloud with you and try to answer it (water) (7 mins) 3) Ask students what we call water in each of the three states (ice, water, steam, water vapour) → where can we find examples of each state of water? (5 mins) 4) Plug in kettle and start boiling water 5) Hand out plastic bags and ice cubes – let students have a melting race – be creative, but keep ice in bag (10 mins) 6) Gather students around kettle → ask them what they see (steam, bubbles) → ask them to predict what will happen when a spoon is placed in the steam (condensation – water again) (10 mins) 7) Discuss as a class what it is that makes the ice melt, and the water boil, and the steam to turn back to water (changing heat) (5 mins) 	Observation – during discussions, through student predictions, and in questioning, observe student knowledge and insight into the processes occurring.	
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