Science Unit Plan

Unit Title: Matter	**Subject area(s):** Science	**Grade:** 2/3	**# of Lessons:** 16	**Teacher:** Alicia Irg (V00156794)

Core Competencies-Thinking/Communication/Personal & Social

Communication (Communication) **Communication (Collaboration)**	→ connect and engage with others → work collectively → determine common purpose
Thinking (Creative) **Thinking (Critical)**	→ creating and innovating → analysing and critiquing → questions and investigate
Personal and Social (Personal Awareness & Responsibility) **Personal and Social (Social Awareness & Responsibility)**	→ understanding relationships and cultural context → building relationships

Big Ideas	**Essential Questions**
Materials can be changed through physical and chemical processes (grade 2). *All matter is made of particles (grade 3).*	*How does particle arrangement affect the properties of matter?* *How and why do we change the properties of matter?*

Integration with other Subjects (Big Ideas)

English Language Arts	Mathematics	Social Studies	Arts	Health & Physical Education
→Curiosity and wonder lead us to new discoveries about ourselves and the world around us → Stories and other texts helps us learn about ourselves, our families and our communities → Language and text can be a source of creativity and joy	→ Objects and shapes have attributes that can be described, measured and compared	→ Learning about indigenous peoples nurtures multicultural awareness and respect for diversity	→ Dance, drama, music, and visual arts are each unique languages for creating and communicating	→Learning how to participate and move our bodies in different physical activities helps us develop physical literacy.

Learning Standards	
Curricular Competencies *Questioning and Predicting* → Demonstrate curiosity about the world → Observe objects and events in familiar contexts → Make simple predictions about familiar objects and events/make predictions based on prior knowledge *Planning and Conducting* → Suggest ways to plan and conduct an inquiry to find answers to their questions →Make and record observations → Safely manipulate materials to test ideas and predictions *Processing and Analyzing Data and Information* → Experience and interpret the local environment → Recognize First Peoples stories (including oral and written narratives), songs, and art as a way to share knowledge/identify First People perspectives and knowledge as sources of information → Compare observations with predictions through discussions/compare results with predictions, suggesting possible reasons for findings *Evaluating* →Compare observations with those of others → Make simple inferences based on their results and prior knowledge *Applying and Innovating* → Transfer and apply learning to new situations *Communicating* → Communicate observations and ideas using oral or written language, drawing, or role play → cooperatively design projects	**Content** *Grade 2* →*Physical ways (including warming, cooling, cutting, bending, stirring, mixing – materials may be combined or physically changed to be used in different ways) of changing materials* →*Chemical ways (including cooking, burning etc.) of changing materials* *Grade 3* →*Matter is anything that has mass and takes up space* →*Atoms are building blocks of matter*

Learning Plan				
Lesson Sequence	**Activity Outline**	**Materials/ Resources**	**Differentiation/ Considerations:**	**Assessment**
Lesson #1: What is the world made of? ***Objective***: Students will use prior knowledge and class discussions to define matter. Students will also learn that the building block of matter is the atom.	Ask students "*What is the world made of?*" and have the students think-pair-share. Have students work independently or in small groups to investigate this question by observing objects around the school yard. Facilitate a group discussion, using guiding questions: *What did you find? What is it made of? What are materials (e.g. wood, plastic, cement) made of? What are you made of?* Introduce the term MATTER. Begin a collaborative KWL chart on the board about matter. Ask students to contribute by writing on and posting post-it notes to the class chart. Review the chart with the class. Have students start their own KWL in their notebooks. Provide a definition of matter. Ask students to identify examples and non-examples of matter. Facilitate responses using guiding questions: *Does it take up space? Does it have mass? Can we measure it?* Present tinfoil demonstration to visualise how matter is broken down. Provide terminology not identified by students (matter, particle, atom, molecule, material) Have students complete KWL in their journals.	→ Tin foil → Scissors	Students should have been previously introduced to matter, but younger students may need more guidance. →Ask grade 3 students to work with grade 2 students. Students may need clarification on the following terms: weight versus mass, atom versus molecule versus particle, material versus matter → provide students with a visual definition handout to include in their journals for reference → ask students to write, verbalise or represent their own definitions of these terms through song, dance or art	***Student Journal entries will provide ongoing assessment throughout the unit.*** ***Formative:*** Anecdotal comments taken during observation of group activities and class discussions.

<table>
<tr>
<td>Lesson #2: Is air matter?

Objective: Students will use scientific method to prove that air is matter based on the definition that matter is anything that takes up space and has mass.</td>
<td>Ask students “Can something be matter if we can’t see it?” and encourage a brief discussion.

Present interactive demonstration Water Balloon in a Bottle. Have students take part suggesting methods and attempting strategies to get the balloon in the bottle.
Ask students consider reasoning with guiding questions:

Is the pop bottle empty? What happens if we add a hole to the bottle? Why would hole help? Why do we need to cover the hole? What does the experiment tell us about air? If the balloon can only be blown up when air moves out of the bottle, then air must….?

Have students draw the steps of the experiment in their notebooks to show the movement of air.

Ask student what else they must prove to say that air is matter (that it has mass). Remind students of/illicit definition of mass.
Ask students to suggest ways we might prove air has mass. Show students a balance scale and explain/demonstrate use.

Break students into small groups or pairs and provide them with 2 balloons, a ruler and a piece of string. Ask students to first design and then implement an experiment to poove whether air has mass. Students will complete a scientific method template in their journals as they work.

If necessary, provide guidance:
How could you use the materials you have to contain air? If air has mass, will a full balloon weigh more or less than an empty balloon? Could the ruler and string act as a balance scale? If air has mass, which balloon will sink, and which rise?

Facilitate a debrief of findings, unanswered questions and comments.</td>
<td>Demonstration:
→Balloons
→ water or sink
→Empty pop bottles
→ Blu tac
→ Lighter
→ Safety pin

Group Experiment:
(per group)
→ ruler
→ string
→ two balloons

→ core competency rating hand out</td>
<td>Designing the experiment could become frustrating for some students. If guiding questions are not helpful, students may be asked to consult with other groups or potentially be shown how to make the ruler and string into a balance scale.</td>
<td>Formative: Teacher observations and notes during group experiment.

Teacher checklist for planning and conducting competencies.

Self: rating of core competency: collaboration on template form</td>
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	Students complete a self-assessment of their collaboration skills during the lesson.			
Lesson #3: Describing Properties ***Objective:*** Students will be able to use and classify vocabulary to describe physical properties.	Share a mystery box with the class with only one item inside. Ask guiding questions: *How does it sound/feel? What can we compare it to? How? What could it be? Why do you think that? What does it look like? Does it have a smell?* Encourage further descriptions once object is revealed. Identify descriptions as physical properties and help students classify language use (e.g. texture, size, shape, colour…). Start a class anchor chart for property descriptions. Organise student into small groups or pairs to do independent mystery object investigations. Students will record properties and predictions in a table form in their journals. Students will trade their mystery objects with another group and try again with two more boxes. Once all groups have examined 3 boxes, reveal all items and allow students to compare to their predictions and add more descriptive language to their charts. Check in on students' confidence with the idea of matter and properties with a 4-finger rating.	→ about 10 items in individual containers that allow students to feel the objects but not see them	Students who are uncomfortable feeling the mystery objects can rely on group members' descriptions of the way things feel.	***Formative/Self:*** 4-finger rating
Lesson #4: States of Matter ***Objective:*** Students will identify and describe the three states	Lead a class discussion around an 'Is it matter?' PPT. Ask students to identify pictures as matter or not and give reasons why. Ask students to classify the examples of matter into the three states. Co-create an anchor chart about the common properties of the three respective states of matter. Students record the chart in their own journals.	→ Is it matter? PPT → States of Matter song cut into verses with the words gas, solid, liquid removed	If there are students with mobility issues or there is not a large enough space to play the enactment game with the whole class, small groups	***Formative:*** Exit slip – match the pictures and statements to the correct state of matter (stapled into journals)

of matter. Students will be able to connect particle arrangement to the three states of matter.	Give students the three verses from "States of Matter" song relating to the three states but remove the words gas, liquid and solid. Ask students to work independently or with a partner to identify which verse describes which state. Play "States of Matter" (https://www.youtube.com/watch?v=jmm1J2yI9tk) video to connect properties to particle arrangement. Ask concept checking questions and encourage questions or comments from students. Ask students to illustrate and label the particle arrangement in each of the three states of matter in their notebooks. Play the states of matter enactment game outside – students enact the particle arrangement of the state called by the teacher as they move around the field.		could enact different states while other students guess.	
Lesson #5: Oobleck ***Objective:*** Students will review what they know about the three states of matter and be introduced to non-Newtonian fluids.	Facilitate a game of matter Hot Seat, using words and terminology learned over the past four lessons. Conduct a brief review about what students know about the properties of liquids, and solids. Refer to the anchor chart. Play "Oobleck and Non-Newtonian Fluids: Crash Course Kids #46.1" (https://www.youtube.com/watch?v=Fnd-2jetT1w)video until 1minute 40 seconds. Ask students to consider the question "*Can some substances have properties of more than one state*?" Encourage comments, suggestions and questions. Give instructions and expectations for making oobleck. Separate students into small groups to take part in the activity. Have key questions on displayed on the board:	→ Water → Cornstartch → Bowls → Spoons → Ziploc bags → Food colouring → Oobleck Investigation handout	Students who are uncomfortable touching the oobleck can wear gloves or use a utensil such as a spoon.	***Formative:*** Teacher works on checklist for communicating competencies.

	What properties of a solid does oobleck have? What properties of a liquid does oobleck have? When does oobleck act like a solid and when does it act like a liquid? Is it more of a solid? A liquid? Or both? Have students clean up after the oobleck. Facilitate class discussion of findings in relation to key questions. Elicit ideas for the reasons why oobleck acts as both a solid and a liquid. Play the end of the oobleck video and ask students if they can name any other non-Newtonian liquids. Have students record their own definition and an example of a non-Newtonian fluid in their journals.			
Lesson #6: Viscosity of Liquids ***Objective:*** Students will explore the viscosity of liquids and se how it applies to the food industry.	Introduce the term 'viscosity' and definition with viscosity of liquids race demonstration. Ask students to make predictions about which liquids will flow fastest and which will flow slowest. As for justification. Have the students record their predictions and results, as well as the definition for viscosity in their journals. Remind students of oobleck and ask them "*Why do you think some liquids are more viscous than others?*" Encourage comments, suggestions and questions. Play 'Viscosity Measurement in Food Processing' video from 40 seconds to 2 minutes and 40 seconds (https://www.youtube.com/watch?v=35RAzhR-tEU) Facilitate a class discussion of viscosity in food products with guiding questions: *Are there any other foods in which viscosity is important? What about sauces? Would you like it if your ketchup was the same viscosity as oil? Why or why not?* Record student examples on the board. Ask students how viscosity of food items might be changed. Allow time for think-pair-share.	**Demonstration:** → 3 liquids with different viscosities (e.g. oil, juice, syrup) → large white poster board → baking tray → timer (optional) **Smoothie making** →blender (or whisk if fruit does not need to be blended) →cups →spoons →Yoghurt →Milk →pureed fruit	If blenders or volunteers are difficult to come by, students could make smoothies using milk, yoghurt and pureed fruit. These could be mixed using a plastic fork or spoon. This lesson would be most successful with one or two adult volunteers to facilitate smoothie making while the teacher circulated to help with written tasks. Students who are struggling to write about viscosity	***Formative:*** Teacher works on checklist for communicating competencies.

	Ask guiding questions or provide examples if necessary: *What might you do if your soup was too thick (too viscous)? Or if your sauce was too runny (not viscous enough)? Think about egg yolks, we can cook them more to increase their viscosity. When we make gravy, we sometimes add flour or cornstarch to make them more viscous, but too much will make them jelly like.* Show students two premade versions of a smoothie and the recipes used to make them (the examples should be extreme, with one very viscous and on very watery). Tell students they will be experimenting with their viscosity in their own food today by making a smoothie with the perfect viscosity. Students use the examples as reference and work independently to write a recipe for their own smoothies. Circulate and ask guiding questions: *What would make the smoothie more viscous? What would make it less viscous? How do you like your smoothie?* Students take turns preparing their smoothies with the help of an adult (have a volunteer come in) Students who are not making their smoothie should answer the following questions in their journals: *Was your smoothie the right consistency? Why or why not? What would you do different next time?*		may draw pictures to demonstrate their understanding. Stronger students may want to follow up on the question about why certain liquids are more viscous than others or investigate how different factors affect viscosity (e.g. heat)	
Lesson #7: Introduction to density ***Objective:*** Students will learn what density is, determine	Divide and arrange students into two circles facing each other and provide the following prompts for inside/outside conversation activity: *Why do some things float on water and some things sink?* Bring the class back together and ask a few volunteers to share their theories.	→ large buckets filled with water → 5-6 objects of varying size, weight and shape	For a challenge, students can consider/attempt to make changes to the objects that result in density changes (floaters become sinkers or vice versa)	***Formative:*** Exit slip – number the pictures with 1 being the densest and 3 being the least dense.

factors that affect density and practice making predictions.	Introduce the term and definition of density. Remind student of the definition of mass. Arrange students into small groups and give instructions for students to complete the Sink or Float experiment. Students will be given a prediction, observation, results table template to complete in their journals. Encourage students to examine objects before making a prediction and dropping them into the bucket of water. Circle and facilitate sink or float experiments, ask questions related to predictions and patterns that students are noticing. When all groups are finished, have a quick debrief conversation with whole group, asking groups to share and compare results. Ask guiding questions: *Why do some objects float and others sink? Does shape matter? Does weight matter? Does size matter? How do you know? How could we test out hypotheses about what makes something float or sink?* *Which objects are denser than water? Which objects are less dense than water?* Students complete one of the following prompts in their journals: *I used to think……. But now I know…. Because….* *The most surprising thing I learned/saw today was….*		If students complete their sink or float experiment early, have the journal prompts on the board for them to start on. Offer plastic garbage bags to cover clothing if students are worried about being wet. Have towels on hand for clean up if necessary.	Staple the exit slips into journals. Teacher works on checklist for communicating, question and predicting competencies.
Lesson #8: Density part 2 ***Objective:*** Students will apply what they have learned to make	Play "Density- Why does oil float on water?" video (https://www.youtube.com/watch?v=vSXTBnnx4OA), stopping to ask questions relating to past class. Give instructions for 3-layer float experiment and separate students into small groups or pairs.	**Per group:** →Oil →Water →Honey →Coin →Cork →Grape →Tall clear cup	Students will need to be reminded to add liquids and solids slowly and gently. If students complete all tasks early, ask them to	***Formative:*** Teacher works on checklist for communicating, question & predicting and evaluating competencies.

predictions about the density of liquids and solids.	Students will record predictions, observations and conclusions in their journal according to a provided template. Circulate during experiment, facilitating where necessary. Ask questions about predictions, patterns and strategies. Students should draw and label the final product once they have added all liquids and solids to the cup. Facilitate group discussion about findings. Identify any issues, problems or reasons for differing results and how those might be solved next time. If students are finished early, or there is time, have students attempt the following question in their journal: *Do you think there is a relationship between the viscosity and the density of a liquid? Explain your answer.*		stir the contents of the glass and see what happens. Ask them to first make a prediction. Students may find the journal prompt difficult. Allow them to work in pairs or small groups.	
Lesson #9 Relating physical properties to use ***Objective:*** Students will learn about local indigenous practices and resources. Students will connect what they have learned about physical properties to	Introduce 'The story of the Cedar Tree' video (https://www.youtube.com/watch?v=H_lVHL4eYqM) or (if possible) a local indigenous community member to talk about cedar, traditional materials or resources (*recognising that when a community member is asked to talk, we cannot dictate the content*) If the video is used, facilitate a group discussion with prompts and questions as necessary: Do you think people in other parts of the world use cedar like the local indigenous people here? Why or why not? Why do you think cedar can be used in so many ways? Set up stations with different parts of cedar for students to explore the properties of cedar (cedar wood and tub of water to check buoyancy/density, cedar bark strips, cedar plank, cedar needles). If possible, include artifacts made out of or with the cedar parts at each station. Write the following question prompt on the board:	→Different parts of cedar tree (e.g. cedar needles, cedar wood, cedar bark strips, roots, branches) → a bucket of water → artifacts made of cedar (if possible)	To extend this topic, allow students to share important materials from their own cultures. Consider connecting to Language Arts by exploring the story of the cedar tree along with other oral stories that share the importance of natural resources.	***Peer:*** TAG of journal entry

material choices and uses.	*What physical properties do the different parts of cedar have?* Have students record descriptions of properties at each station in their journals. Circle and ask guided questions to aid investigations and connect to learning: *Is the cedar more or less dense than water? Why might cedar be a good choice for X? Cedar strips were used to make hats and clothing, what properties does it have that would make it a good material?* Once students have visited all the stations, facilitate group discussion about what properties students found cedar to have and why those properties lend to its use in different objects. Have students draw a picture of one item/object/tool made of cedar and write two or three sentences to explain the properties of cedar that make it a good material for this object/item or tool. Have students peer assess their work following TAG format (tell something you like, ask a question and give a piece of advice).			
Lesson #10: Reversible and irreversible changes **Objective:** Students will explore changes to properties, differentiating between reversible	Share/read the wordless picture book 'Journey of the Sea Glass' by Nicole Fazio to the class. Encourage predictions and observations throughout reading. Facilitate a discussion about how the sea glass changed and why/how. Ask students if the changes can be reversed, and why or why not. Conduct a series of short demonstrations showing changes to objects (e.g. ripping a paper in two, boiling water, creating frost on a can, opening an aluminum can, breaking apart connecting blocks)	→ objects for demonstrations (paper, pop cans, egg, connecting blocks, water, kettle)	Although we live close to the beach, it is possible that not all children will be familiar with the setting or with sea glass. → bring in examples of sea glass, sand and possibly saltwater for students to interact with.	

and irreversible changes	Have students make predictions about whether the changes will be reversible. Ask the students to record their predictions, observations, how changes were made and whether the changes were reversible or irreversible in their journals according to a given template.			
Lesson #11: Beach clean up and exploration ***Objective:*** Students will make a positive contribution to the community while exploring how the properties of objects on the beach have changed.	Lead students on a beach walk and clean up. Remind students of 'The Journey of the Sea Glass' and ask them to find one item on the beach that may have had its own journey. Ensure safety. Help students find an appropriate object using guiding questions: *What state of matter is your object? What properties does it have? Do you think it always had those properties? What do you think has changed about it? Why or how did those changes happen?* Facilitate an end of trip debrief circle and ask students to share the object they found. Remind students that they will be using their objects as inspiration to write their own stories in the next few Language Arts classes.	→ garbage bags → gloves	Students who are not able to come on the field trip could find an object that appears to have undergone changes in their back yard or on the school grounds.	***Formative:*** Teacher observation of student participation and contribution to debrief circle
Lesson #12: Chemical versus physical changes Objective: Students will learn the difference between chemical	Give a brief lesson on the definitions and differences between chemical and physical changes (keep these definitions up on the board). Have students record definitions in their journals. Explain that students are going to watch a series of change demonstrations. It will be their job to predict whether the change will be chemical or physical. Demonstrations include: →Melting coloured ice cubes (using different water temperatures)	→ three ice cubes made with food colouring → three containers → kettle → water → lemon → knife → candle → lighter	With a strong or focused group, the demonstration experiments could be done by the students in small groups.	***Formative:*** Exit slip – What is one question you still have about chemical and/or physical changes? (staple into journals)

and physical changes.	→Boiling water (making water vapor) →Burning a candle →Cutting a lemon in half → Making elephant toothpaste Students will record their predictions, observations and conclusions about the type of change in their journals according to a given template. Use guiding questions to help students identify changes throughout demonstrations: *Is it a chemical change or a physical change? Did I create something new? Has the type of matter changed? Has it only changed shape, or has it become something entirely different? Is it reversible or irreversible? What tools did I use to cause the change?* Once students have completed their tables, facilitate a debrief conversation. Ask students to share observations and conclusions. Correct any misconceptions.	→ hydrogen peroxide → dish soap → yeast in warm water		
Lesson #13: How does salt change ice? Objective: Students will learn about the chemical change involved when salt is put on ice.	Arrange students into small groups, no bigger than four per group. Give each group a set of cards with pictures of different types of changes (chemical and physical). Tell students they must categorise the cards into chemical and physical reactions. All group members must agree. Circle and listen to student responses. Clarify any misconceptions with the group if necessary. Review learning about chemical versus physical and co-create anchor chart. Play first 37 seconds of 'Salt; Ice' video (https://www.britannica.com/video/187014/explanation-salt-roadways-ice) and ask students for comments and ideas. Ask students if they think it is a chemical change or a physical change. Break students into small groups, set up and give students instructions for the ice cube tower activity.	→ ice cubes → salt	Students who are uncomfortable touching the ice can wear gloves	***Formative:*** Teacher works on checklist for communicating, applying & innovating and evaluating competencies.

	While students are working through the activity, ask guiding questions: *Is it easier to stack the ice cubes with or without salt? Why? What happened to the ice cubes after you put salt on them?* After students have finished and cleaned up, facilitate a group debrief. Ask students to share observations from the activity. Ask students if they think it was a chemical or physical change. Give explanation (with illustrations) of salt breaking/interfering with bonds in the ice, lowering freezing point. Ask students again if they think it is a physical or chemical change. Have students draw and label their most successful tower in their journals. Students should also make note of helpful strategies.			
Lesson #14: Making banana bread ***Objective:*** Students will see the practical application of physical and chemical changes in everyday life.	Play "Physical and Chemical Changes" video (https://www.youtube.com/watch?v=BgM3e8YZxuc&vl=en) Arrange students in small groups and ask them to come up with as many physical and chemical changes that they see in their everyday life as they can. Ask some students to share ideas with the class. Brainstorm and record ideas on the board for why we might *want* cause physical or chemical changes. Introduce and set up activity – making banana bread. Ask students to pay attention throughout the class for examples of both physical and chemical change.	→ baking supplies and tools → oven → gloves	ELL students and struggling readers should be paired with strong readers so that everyone can take part in the baking activity. It might be helpful to have adult volunteers on this day. Students who finish early should start work on their journals.	

	Small groups of students will work together to follow the banana bread recipe. Once the batter is made, loaves will be taken out of the classroom to bake in the oven. Students will help clean up after baking. While bread is baking, ask students to draw pictures and describe examples of physical and chemical change that they saw in their journals. Students will get to enjoy their banana bread. While they are eating ask the students what kind of change will happen to the banana bread in their bodies.			
Lesson #15: Summative task introduction Objective: Students will be introduced to the final unit project, choose a group or pair and start brainstorming ideas.	Students will be given instructions for their final unit project. Students will be making a poster with a partner. They will be assessed according to a criteria check list. The task is as follows: Students will choose to design a piece of clothing, a type of food/drink OR a form of transportation. Students will have to consider what they want to use their design for and what properties it would need to have. They will use this information to decide what materials they will use and what changes they would need to make to that material. Students will share their design on a poster. The checklist will include: A picture of the design The name of the design The purpose of the design The state of matter the final design is in The material used in the design The properties of the material and how they are useful to the design One chemical change they would have to make to their material and why One physical change they would have to make to their material and why	→ poster paper → markers → criteria check list and project overview handout	Some examples should be available for students who are struggling to come up with ideas. Allow students to choose their own partners as they will be working with them over the next few lessons.	

	In this lesson, students should find a partner and start brain storming ideas.			
Lesson #16: Pair work on summative task ***Objective:*** Students should begin designing and doing any research necessary for their project	Allow students time to work with their partners. Students should now be designing. Circulate and ask guiding questions. Allow students to use devices to do research if necessary.	→ poster paper → markers → criteria check list and project overview handout	Students should be allowed to use devices to research information about materials and properties if they want, although it is not necessary.	
Lesson #16: Pair work on summative task ***Objective:*** Students should be working on their poster	Allow students time to work with their partners. Students should now be working on completing their posters. Circulate and ask guiding questions. Allow students to use devices to do research if necessary.	→ poster paper → markers → criteria check list and project overview handout		
Lesson #16: Pair work on summative task ***Objective***: Students will complete their posters and share with the class	Students can use half the class to add finishing touches to their posters. Students will then be split into two groups and present their posters to their peers in a gallery walk style. Students will complete a two stars and a whish assessment for at least one other group.	→ poster paper → markers → criteria check list and project overview handout		***Summative:*** Student projects will be assessed according to a criteria check list ***Peer:*** two stars and a wish

Extended Lesson Outline

Lesson #5: Oobleck	Topic: Non-Newtonian liquids
Big Ideas: *Materials can be changed through physical and chemical processes (grade 2); All matter is made of particles (grade 3).*	**First People's Principles of Learning:** Learning is holistic, reflexive, *experiential*, and relational (focused on connectedness, on reciprocal relationships, and a sense of place)
Competencies: *Questioning and Predicting* → Demonstrate curiosity about the world *Evaluating* →Compare observations with those of others → Make simple inferences based on their results and prior knowledge *Applying and Innovating* → Transfer and apply learning to new situations *Communicating* → Communicate observations and ideas using oral or written language, drawing, or role play	**Content:** → *Physical ways (including warming, cooling, cutting, bending, stirring, mixing – materials may be combined or physically changed to be used in different ways) of changing materials (grade 2)* → *Matter is anything that has mass and takes up space (grade 3)*
Core Competencies	
Communication (Communication) **Communication (Collaboration)**	→ connect and engage with others → work collectively → determine common purpose
Thinking (Critical)	→ questioning and investigating

Lesson Preparation	
Materials: → Water ½ cup + 1 cup per group → Cornstarch 1 cup per group → Bowls 1 per group → Spoons 1 per group → Ziploc bags 1 per group	**Resources:** → Lesson outline inspiration: https://teachbcdb.bctf.ca/download/1160?filename=sd71webchemistryg3.pdf → "Non-Newtonian Fluids: Crash Course Kids#46" video: https://www.youtube.com/watch?v=Fnd-2jetT1w

→ Food coloring A couple drops per group → gloves →Oobleck Investigation hand out	**Prior to lesson:** → have all materials measured out and arranged to have groups of students no greater than four → Prepare and print Oobleck Investigation hand out → Prepare a list of key vocabulary for Matter Hot Seat

Rational: This lesson will allow students to review distinguishing features of liquids and solids. Investigating oobleck will give students hands-on experience with a non-Newtonian liquid, allowing them to make simple predictions about these atypical fluids. This lesson also sets students up to consider viscosity in the next lesson.

Key Questions:
→ What are the properties of a solid?
→ What are the properties of a liquid?
→ Can some substances or matter have properties of more than one state?
→ What is a non-Newtonian liquid?
→ What properties of a non-Newtonian liquid are like a solid? Like a liquid?

Lesson sequencing and timing:

Matter Hot Seat (*approximately 5 to 10 minutes***):**
Explain Hot Seats and tell the students that they will play the game with words related to our science unit about matter.
- → A volunteer student will come to the front of the class and face their peers.
- → The teacher will write a word related to the unit on the board.
  - → The volunteer should not be able to see the word, but the rest of the class should.
  - → Possible words: *matter, liquid, solid, property, mass, particle, atom, molecule, hard, fluid, material, flexible* etc.
- → The rest of the class will take turns giving the volunteer student hints about the word to help them guess it.
- → Hints cannot include the word but can be spoken or acted out.
- → Once the volunteer has guessed the word, a new volunteer is chosen and the game proceeds.

Liquids versus solids table (*approximately 5 minutes***):**
Draw a T-chart on the board and ask students to do the same in their science journals.
→ Label one side *liquids* and the other *solids.*
→ Ask the class to name properties of solids and liquids and record them in the appropriate columns. Have students do the same in their journal.

→ If necessary, prompt students to look at the anchor chart already in the room or back at the states of matter fill in the blank versus completed last lesson.

Oobleck introduction video and discussion (*approximately 5 minutes***):**
Play "Oobleck and Non-Newtonian Fluids: Crash Course Kids #46.1" (https://www.youtube.com/watch?v=Fnd-2jetT1w) video until 1minute 40 seconds.

→ Ask students to consider the question "*Can some substances/matter have properties of more than one state*?"

→ Encourage comments, suggestions and questions. See if students can come up with any examples. If not, ask them if they think it is possible for something to have properties of more than one state and why or why not?

Making Oobleck (*approximately 15 to 20 minutes***):**
Tell the students that they will be working in small groups to create something called OOBLECK.

→ Model how to create oobleck following instructions on the student Oobleck Investigation hand out (School District 71, 2016):

1. Put 1 cup of cornstarch in a bowl and add 1-2 drops of food coloring (optional).
2. Slowly add up to ¾ cup water while mixing, until all the cornstarch is wet.
3. Keep adding water until the oobleck feels like a liquid when mixed slowly.
4. Oobleck is done when it is no longer powdery (needs more water) but doesn't splash when hit with a spoon (needs more corn starch).

→ Tell students they will follow the instruction on the handout:

1. Make oobleck
2. Test oobleck's properties and check or circle the ones that match those in the T-chart we made earlier
3. Investigate strain rate (what happens when you try to move or disturb oobleck quickly? Slowly?)

→Remind students that when they are finished, they will need to clean up their workspace, complete their handouts and share their findings with the class (left over oobleck can be thrown out or put in a ziplock bag to be taken home).

→ Separate students into small groups (no more than four per group) and give out Oobleck Investigation hand out.

→ Ask students to collect the necessary supplies (already separated into groups), offer gloves to students who want or need them.

Wrap up (*approximately 10 minutes minutes***):**
→ Once students have completed their investigations and clean up, have a group discussion for students to share and compare findings (have questions from Oobleck Investigation on the board).

→ Ask students whether they think oobleck is a liquid or a solid and why or why not.

→ Play the end of "Obleck and Non-Newtonian Fluids: Crash Course Kids #46" video.

→ Ask a few volunteer students to explain what a non-Newtonian fluid is in their own words.

→ Ask students if they can think of any other non-Newtonian fluids.

→ Have examples ready if students are unable to think of any (e.g. *quicksand, ketchup, gel*)

→ Have students record their own definition and an example of a non-Newtonian fluid in their journals.

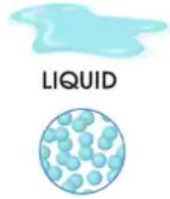
Modifications/considerations:

→ Hot seats can also be played as a team game or in pairs depending on class dynamics, one of these options may be better.
→ If students need a more concrete comparison, groups can test a bowl of water against their oobleck.
→ It is important to have gloves available to students who may be uncomfortable touching the oobleck or for those that have sensitivities.
→ Food colouring is not necessary to make oobleck and could be omitted or be distributed by a teacher if necessary.
→ Groups should include mixes of grade 2 and 3 students and varying abilities to provide peer support during reading and writing tasks.
→ Struggling writers/readers and ELL students may need to verbalise their answers to the final journal prompt questions and have a teacher write them down; they may also draw pictures to represent their understanding.

Assessment:

While students are creating oobleck, the teacher can circulate and assess between 3 to 5 students on the communication competency "*communicate observations and ideas using oral or written language, drawing, or role play*" on a check list with all the students' names. The teacher should be listening to hear students interacting with their peers and discussing their observation using vocabulary related to properties and states of matter.
The Oobleck investigation handout should be stapled into the students' journals. This along with their responses to the final journal prompt should represent their understanding of the properties of solids and liquids as well as how non-Newtonian fluids may have properties of both.

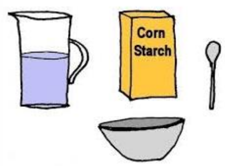
Oobleck Investigation!



Can some substances have properties from more than one state of matter? Make oobleck and find out!

Step One: Make the oobleck

You will need:



→ Water ½ cup + 1 cup per group
→ Cornstarch 1 cup per group
→ Bowls 1 per group
→ Spoons 1 per group
→ Ziploc bags 1 per group
→ Food coloring A couple drops per group

Instructions:

1. Put 1 cup of cornstarch in a bowl
2. ***Slowly*** add water while mixing

Step Two: Investigate properties

Now you can experiment with the oobleck and see if it acts like a solid or a liquid.

Go through the properties on the T-chart you made in your journal and test if the oobleck has any of those properties.

Here are some ideas to test properties:

	Yes	No
→Hit the surface with a spoon. Does is splash?	☐	☐
→Tip the bowl to one side. Does it flow?	☐	☐
→ Stir the oobleck. Does it hold its shape?	☐	☐

Circle the properties on the T-chart that oobleck has.

Are there more circles on the liquid side or the solid side? Is oobleck more like a liquid or a solid?

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____

Step Three: Investigate strain rate

Strain rate relates to how fast you can move your oobleck.

Try the following experiments and record what happens.

→Stir the oobleck quickly with your finger.
→Stir the oobleck slowly with your finger.

Which was more difficult, which was easier? Why?

____

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→Let your fingers sink to the bottom of the bowl and then pull your fingers up quickly.
→Let your fingers sink to the bottom of the bowl and then pull your fingers up slowly.

Which was more difficult, which was easier? Why?

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References

McCracken County Schools (2020). Structure and Properties of Matter: 2nd grade Teacher's Guide. Retrieved from: http://www.mccracken.kyschools.us/Downloads/2%20NGSS%20UNIT%20Matter.pdf

School District No. 71 (2016). Chemistry Grade 2. Retrieved from: https://portal.sd71.bc.ca/group/wyhzgr4/Pages/default.aspx

School District No. 71 (2016). Chemistry Grade 3. Retrieved from: https://portal.sd71.bc.ca/group/wyhzgr4/Pages/default.aspx

Youngstown City School District (2020). 3rd Grade Science Unit: What's the Matter? Retrieved from: http://www.youngstowncityschools.org/UserFiles/Servers/Server_471589/File/Departments/Curriculum/Curriculum%20Resources/Curriculum%20Maps%20and%20Units/Grade%203%20Quarter%203%20Lessons%20ycsd.pdf