Backwards By Design Unit/Time Frame Plan Template
Grace Smyth

Subject	Science	**Grade Level**	2
Theme/Topic for Unit	Solids and Liquids	**Dates/Number of Classes**	8 classes
Developed By	Grace Smyth		

Essential Questions:
What are solids?
What are liquids?
How can we describe solids and liquids?
How do liquids and solids interact?

Stage 1 - Identify Desired Results

Learning Outcomes

LS2.1: Investigate properties (e.g., colour, taste, smell, shape, and texture) of familiar liquids and solids.

LS2.2: Investigate interactions between liquids and solids, and technologies based on those interactions.

Key Understandings	**Guiding Questions for Deep Understanding**
Students will understand how to identify a solid.	What is a solid?
Students will understand how to identify a liquid.	What is a liquid?
Students will understand the properties that make up a solid.	How can we describe solids?
Students will understand the properties that make up a liquid.	How can we describe liquids?
Students will understand that changes can occur when liquids and solids are mixed.	What happens when liquids and solids are mixed?

Knowledge: Students will know…	**Skills: Students will be able to…**
What defines solids and liquids. That solids and liquids are matter. That characteristics of solids and liquids can change. That certain solids dissolve in liquids and some do not. That some liquids mix with other liquids and some do not. That certain solids float in liquids and certain solids sink.	List several examples of liquids and solids. Explain why solids and liquids are matter. Predict changes in characteristics of liquids and solids. Predict if a solid will dissolve in water. Predict if a liquid will mix with another liquid. Predict if a solid will float of sink when placed in a liquid.

Stage 2 – Assessment Evidence

Assessment Evidence

Pre-Assessment:
- Brainstorm web of examples of solids and liquids (prior knowledge)
- Class discussions

Formative Assessment:
- Exit slips
- Checklists
- Anecdotal comments and records
- Science notebooks

Summative Assessment:
- Science notebooks
- Science poster

Stage 3 – Learning Plan

Unit Overview	
Lesson/# of Days	**Outline**
Lesson #1: Introduction to Solids and Liquids	**Outcomes/Indicators:** LS2.1: Investigate properties (e.g., colour, taste, smell, shape, and texture) of familiar liquids and solids. (a) Pose questions that lead to investigation and exploration of the properties of familiar liquids and solids. (b) Classify objects in various natural and constructed environments as liquids or solids. (h) Demonstrate that liquids and solids are matter because they have mass and take up space. CC2.3: Speak clearly and audibly in an appropriate sequence for a familiar audience and a specific purpose when recounting stories and experiences, giving directions, offering an opinion and providing reasons, and explaining information and directions. (a) Use oral language to initiate and sustain a conversation with a number of exchanges, interact with others, exchange ideas on a topic, and engage in play. **Assessment:** Pre-Assessment/Formative Assessment: - Class discussion (examples of solids and liquids) **Instructional Strategies:** - Brainstorming (interactive instruction) - Discussions (interactive instruction) - Observations (experiential learning) **Resources/Materials** - Various solid object - Various liquids - Variety of containers - Balloon - Chart paper - Markers **Learning Plan:** Set: 5 minutes

	Introduce the topic to students. "Today we are going to be talking about matter. Matter is anything that has mass or takes up space. Everything around us is matter. There are three different types of matter; solids, liquids, and gases." Create a brainstorm web on chart paper of examples of solids, liquids, and gases. <u>Development:</u> 15 minutes Introduce solids. Have students pass around variety of solids and explore how they are matter. Ask the following questions: - Do these objects take up space? - Do these objects have weight? "Solids are matter because they take up space and have mass, or weight. Solids are made up of tiny particles. They are so small that we cannot see them. In solids, the particles are very close together and they do not move very much." Ask students the following questions: - If I put this object into a container, will it change its shape to fit the container? - Does it get bigger to fill the container? Demonstrate this by putting multiple objects into a container. "Solids are a type of matter that have particles close together, they do not take the shape of their container, and they do not expand to fill their container." Refer back to the brainstorm web and make any changes if necessary. Introduce liquids. Have student pass around containers of various liquids. Ask the following questions: - Do these objects take up space? - Do these objects have weight or mass? "Liquids are also a type of matter that are made up of very small particles. These particles are farther apart than they are in solids. Since these particles have more space, they move around a little bit. This causes the liquid to flow." Demonstrate how liquids flow by pouring water from one container to another. Ask students the following questions: - Do liquids change their shape when they are poured into a container? - Do liquids expand to fill a container? Demonstrate this by pouring liquids into varying containers. Refer back to the brainstorm web and make any necessary changes.

	Introduce gases. “Gases are all around us and we might not even know it. Oxygen is a gas that is in their air we breathe in. Even though it might not seem like it, gases have mass and take up space which means they are matter.” Blow up balloon to demonstrate gasses taking up space. “The gas that we breathe out is called carbon dioxide. You can see that the carbon dioxide takes up space in the balloon and expands it. Gases do take the shape of their container and the do expand to fill a container. The particles in gasses are spread out and move around a lot.” Make any necessary changes. Have students return to their desks by calling one row at a time. <u>Closure:</u> 10 minutes Review what was taught. Consider the following closing questions: - What makes something a solid? - What makes something a liquid? - Are all liquids runny? Are all solids hard? Encourage students to look for examples of solids and liquids in their home.
Lesson #2: Exploring Solids	**<u>Outcomes/Indicators:</u>** LS2.1: Investigate properties (e.g., colour, taste, smell, shape, and texture) of familiar liquids and solids. (f) Record and compare observable physical properties (e.g., colour, taste, smell, shape, texture, transparency, and ability to adapt to the shape of container) of familiar liquids and solids. (g) Distinguish between properties of familiar liquids and solids. CC2.2: Use a variety of ways to represent understanding and to communicate ideas, procedures, stories, and feelings in a clear manner with essential details. (f) Combine illustrations and written text (e.g., captions, labels) to express ideas, feelings, and information**<u>.</u>** **<u>Assessment:</u>** Pre-Assessment: - Class discussion (What are solids and liquids?) Formative Assessment: - Science notebook submissions - Checklist (solids and liquids oral explanations)

Instructional Strategies

- Open discussion (interactive instruction)
- Inquiry (experiential)
- Observation (experiential)

Resources/Materials

- Paper clips
- Mini dice
- Rice
- Rocks
- Toilet paper rolls
- Sponge
- Cotton ball
- Teddy bear
- Containers
- Construction paper
- Mug
- Marker
- Fork
- Science notebooks.

Learning Plan

Set: 5 minutes

Review what was taught last class. “Yesterday we talked about solids, liquids, and gases. Can anyone remind me what a solid is? Can anyone remind me what a liquid is?”

Allow students time to share their knowledge on solids and liquids. Ask prompting questions if necessary.

- Do solids change their shape when they are put into a container?
- Do liquids change their shape when they are poured into a container?

Development: 15 minutes

Introduce the activity. “Around the room there are 3 stations. We are going to explore solids today. I will be the sound station up at the front. At this station we will shake a few containers and listen to the sounds that are being made. We will then try to guess what is in each container. We will record our predictions, or guesses in our science notebooks. Each container has a number on it, so you will write that number on your notebook and write or draw what you think is inside. Miss. Sinclair will have the sight group. At this station, you will work together or in a group of three. One partner will look at an object without showing the other group member

	and the other group member will have to try to draw it. The person describing it can't tell their partner what it is and has to use describing words. Mrs. Flaman-Drumm will be at the touch station. Here, you will feel objects without looking at them and try to guess what they are. Each container will have a number that you can write in your notebook and write your prediction of what the object is. You can also draw the object based on what you feel. I will have quiet music playing in the background, if I can't hear the music, that means it is too loud. When I turn off the lights, that will be your signal to quietly move with your group to the next station." Split the class into three pre-made groups. Assign each group a station to start at. Allow groups 5 minutes at each station. Set timer at the front to keep track of time. While students are working through the stations, use the checklist to briefly assess students understanding of solids and liquids. Make a note by student's names who may need additional explanation of the topic. <u>Closure:</u> 5 minutes Have students return to their desks. Have a few students share their observations from each station. Reveal the objects from each station to students.
Lesson #3: Exploring Liquids	**<u>Outcomes/Indicators:</u>** LS2.1: Investigate properties (e.g., colour, taste, smell, shape, and texture) of familiar liquids and solids. (f) Record and compare observable physical properties (e.g., colour, taste, smell, shape, texture, transparency, and ability to adapt to the shape of container) of familiar liquids and solids. (g) Distinguish between properties of familiar liquids and solids. LS2.2: Investigate interactions between liquids and solids, and technologies based on those interactions. (b) Investigate how liquids change when they are poured into different containers. CC2.2: Use a variety of ways to represent understanding and to communicate ideas, procedures, stories, and feelings in a clear manner with essential details. (f) Combine illustrations and written text (e.g., captions, labels) to express ideas, feelings, and information.

Assessment:

Pre-Assessment:

- Class discussion (What are solids and liquids?)

Formative Assessment:

- Science notebook submissions
- Checklist (solids and liquids oral explanations)

Instructional Strategies/Process Learning:

- Open discussion (interactive instruction)
- Inquiry (experiential)
- Observation (experiential)

Resources/Materials:

- Soy sauce
- Dr. Pepper
- Coffee
- Vanilla
- Lemon juice
- Peppermint tea
- Syrup
- Containers
- Science notebooks

Learning Plan:

Set: 5 mins

Review what was learned yesterday. Ask students questions to activate prior knowledge:

- What types of solids did we explore yesterday?
- How did we explore these solids?

Development: 15 mins

Explain to students that we will be doing stations to explore types of matter. Today we will be exploring liquids. At the first station, you will try to determine what the liquid is only by looking at it. You will draw pictures and write you're your predictions in your science notebooks. At the second station, you will be smelling various liquids and predicting what they are based on what you know about liquids and smells. At the third station, you will be creating drawings in your notebook of different liquids that you see everyday and labelling them. Break students into the same groups they were previously divided into.

Allow students approximately 5 minutes at each station. Use signals that have been used previously, including low music,

	setting a timer, and turning off the lights to signal when it is time to change stations. Once students have had time at each station, call students to return to their desks quietly. <u>Closure</u>: 5 mins Allow students to share the liquids they drew in their notebooks. Reveal to students the liquids that were present at each station.
Lesson #4: Solids and Liquids Identification	**<u>Outcome/Indicators:</u>** LS2.1: Investigate properties (e.g., colour, taste, smell, shape, and texture) of familiar liquids and solids. (b) Classify objects in various natural and constructed environments as liquids or solids. (g) Distinguish between properties of familiar liquids and solids. **<u>Assessment:</u>** Pre-Assessment: -Students will be prompted with questions at the beginning of class to activate prior knowledge and recall information taught in previous lessons. Formative Assessment: - Students will demonstrate their understanding of solids and liquids during the activity. A checklist will be used to make note of students who appear to need additional support understanding solids and liquids. - Students notebooks will be taken in to check understanding. - Students will complete an exit slip to demonstrate understanding. **<u>Instructional Strategies:</u>** - Discussion (interactive instruction) - Game (interactive instructions) - Written response (independent study) **<u>Resources/Materials:</u>** - Solids and liquids signs - PowerPoint - Science notebooks - Exit slips

Name _____

Solids, Liquids and Gases Test

Look at each picture and tell whether it is a solid, liquid or a gas.

1. Milk

_____

2. Beans

_____

3. Lotion

_____

4. Cloud

_____

5. Breath

_____

6. Leaf

_____

7. How are solids and liquids different?

_____

_____

_____

<u>Learning Plan</u>

<u>Set:</u>

Students will be asked prompting questions to activate prior knowledge.

- What is a solid?
- What is a liquid?
- Does a solid change its shape when it is put into a container?
- Does the size of a solid change?
- Does a liquid change its shape when it is put into a container?
- Does a liquid change its size?

	- What are examples of solids and liquids? Once students have reviewed this content, they will be introduced to a song about solids and liquids to the tune of "If You're Happy and You Know It". The lyrics will be written on the whiteboard for students to follow along. "Oh, a solid keeps its size and its shape (yes, yes!) And a liquid keeps its size not its shape (yes, no!) But the one that's not the same has three letters in its name Gas does not keep its size or its shape (no, no!)" Once students have learned the song, they can practice singing it faster each time. <u>Development:</u> Solids and liquids popsicle stick signs and science notebooks will be handed out to each student by the assigned handout person. A PowerPoint will be displayed at the front of the room with slides showing pictures of various solids and liquids. When a picture is displayed on the board, students will hold up either their solid or liquid sign to indicate what they think the item is. This will be a method of formative assessment. Students may be asked to explain why they believe that particular item is a solid or a liquid, to ensure students have an understanding of properties and characteristics of the states of matter. If there is additional time, students will draw a beach scene in their notebooks. Once they have drawn this, they will label parts of their picture as solids or liquids. If a student finishes early, they can color their picture. Once students are finished, they will hand their notebooks in and have their work checked by a teacher. <u>Closure:</u> Students will complete an exit slip. Exit slips will be handed out by the assigned handout person. The exit slip questions will be read out loud to students and they will complete the questions one at a time as a class, to ensure students have an understanding of what they are being asked. Exit slips will be collected for assessment.
Lesson #5: Slime	**<u>Outcome/Indicators:</u>** LS2.1: Investigate properties (e.g., colour, taste, smell, shape, and texture) of familiar liquids and solids. (a) Pose questions that lead to investigation and exploration of the properties of familiar liquids and solids.

	(b)Classify objects in various natural and constructed environments as liquids or solids. **Assessment:** - Science notebooks will be taken in for assessment. **Instructional Strategies:** - Open discussion (interactive instruction) - Inquiry (experiential) - Observation (experiential) **Resources/Materials** - Water - Cornstarch - Containers - Mixing utensils **Learning Plan** Set: Play Oobleck and Non-Newtonian Fluids Crash Course video on YouTube. 0:00-1:52 Introduce big question. What about something that acts like more than one state of matter? Have students brainstorm ideas of things they might have difficulty classifying as a liquid or a solid (butter, slime, peanut butter, snow). Development: Have science notebooks handed out to students. Explain to students that we will be making oobleck. Oobleck is made with cornstarch and water and we are going to try to figure out if it is a liquid or solid. Have students make a prediction in their science notebooks at their desk. Write on the board, "I think oobleck will be a _____." Tell students that in their groups, they will write their observations and conclusions. Once everyone has had an opportunity to make a prediction, call pre-made groups of 5 to come to the front and pick up their materials. Have each group find a quiet space in the classroom to work. Remind students that if they are fooling around they will have to return to their desk. Play quiet music in the background while students work. Rotate to each group to ensure they are staying on task and writing predictions.

	Turn off the lights when students have had time to complete their inquiry. Have one student take the supplies to the c table. Call students to return to their desk. Closure: Call on students to share their observations and conclusions. Introduce the term non-newtonian fluid. Explain that there are some substances that act like more than one state of matter. Encourage students to keep their eyes open to see if they can recognize any substances that might fit into more than one state of matter.
Lesson #6: Introduction to Mixtures	**Outcomes/Indicators:** LS2.1: Investigate properties (e.g., colour, taste, smell, shape, and texture) of familiar liquids and solids. (a) Pose questions that lead to investigation and exploration of the properties of familiar liquids and solids. LS2.2: Investigate interactions between liquids and solids, and technologies based on those interactions. (a) Pose questions that lead to exploration and investigation of combining liquids and solids. **Assessment:** - Student's science notebooks will be handed in for assessment. **Instructional Strategies:** - Open discussion (interactive instruction) - Inquiry (experiential) - Observation (experiential) **Resources/Materials:** - Science notebooks - Water - Containers - Iced tea crystals - Food coloring - Oil - Rocks or sand - Beads **Learning Plan:**

	<u>Set:</u> Review solids, liquids, and gases by asking students questions and having them sing the solids, liquids, gases song. "Oh a solid keeps its size and its shape (yes yes!) And a liquid keeps its size not its shape (yes, no!) But the one that's not the same has 3 letters in its name Gas does not keep its size or its shape (no, no!) <u>Development:</u> Have student's science notebooks handed out. Explain that we will be talking about mixing matter. The first thing we will be talking about is mixtures. Mixtures are a combination of 2 or more substances that keep their properties and can be easily separated. (Ex. fruit salad, markers and crayons, rocks and water.) Write the definition on the board and have students copy it into their notebooks. Give them 4 minutes (set the timer) to draw and label an example of a mixture. Another type of mixture is called a solution. A solution is a type of mixture where 1 substance is dissolved into another substance. The substances cannot be separated. (Iced tea, food coloring, sugar and water). Give students 4 minutes to write this in their science notebooks. Tell students that they will now be experimenting with mixtures and solutions. Each group will write in their science notebook if they predict that it will be a mixture or solution. They will then write their observations and determine if their mixture was a mixture or a solution. Break the class into 5 pre-made groups. Hand out material to each group and have them find their own quiet space in the classroom. Give students 5 minutes to complete the task (set timer). Rotate around the classroom asking prompting questions to encourage inquiry. Turn the lights off as a signal to stop and listen. Have one group member return their materials to the c table and the rest of the class return to their desks. <u>Closure:</u> Ask one member from each group to share their predictions, observations, and conclusion with the class. Ask them review questions about mixtures and solutions.

Lesson #7: Mixtures Stations	**Outcome/Indicators:** LS2.2: Investigate interactions between liquids and solids, and technologies based on those interactions. (a) Pose questions that lead to exploration and investigation of combining liquids and solids. (e) Distinguish between familiar solids (e.g., sand, sugar, salt, gravel, soil, and drink crystals) that dissolve in water and those that do not. **Assessment:** Pre-Assessment: - Class discussion (What are mixtures and solutions?) Formative Assessment: - Science notebook submissions **Instructional Strategies** - Open discussion (interactive instruction) - Inquiry (experiential) - Observation (experiential) **Resources/Materials:** - Science notebooks - Water - Containers - Iced tea crystals - Food coloring - Oil - Rocks or sand - Beads **Learning Plan** Set: 5 mins Explain to students that we will be creating mixtures. "We have been talking about solids and liquids and mixtures and solutions. Solids and liquids can be mixed to create a mixture. Sometimes solids dissolve in liquids and sometimes they do not. You can also mix liquids together and certain solids together." Have students brainstorm a list of mixtures. Development: 15 mins Introduce the activity to students. "There are 4 stations around the room. At each station you will mix the solid or liquid that is there with water. You will write and draw your observations in your science notebooks. Pay attention to any changes that happen. Does

	the solid dissolve when the mixture is created? Does the colour or thickness change when you create the mixture? Any observations you see should be included in your book. When I turn off the lights, that will be your signal to quietly move to the next station. Allow students time at each station. Turn off the lights to signal when it is time to switch stations. Closure: 5 mins Have students gather together. Allow a few students to share their observations from the activity and allow others to compare their observations. Exit slip.
Lesson #8: Solids and Liquids Review/ Matter Café Menus	**Outcomes/Indicators:** LS2.1: Investigate properties (e.g., colour, taste, smell, shape, and texture) of familiar liquids and solids. (b) Classify objects in various natural and constructed environments as liquids or solids. (g) Distinguish between properties of familiar liquids and solids. **Assessment:** - Menus will be taken in and assessed based on co-created rubric. **Learning Plan** Set: Students will review what they have learned about solids, liquids, and gases, as well as mixtures and solutions. Explain to students that we will be creating a menu for the matter café. This will be used to assess what you know about solids liquids and gases. Show students an example of the menu. Ask students what the teacher should be looking for and what should be included in the menu. Create a rubric based off of this information. Development: Allow students time to work on their menus. Write the requirements on the board so students know what is expected of them. Provide feedback to students as they are working on their menus. Closure:

	Have students hand in their menus and ask a few students to share examples of what they included.