

## 5E Lesson Plan # 1

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**TITLE OF LESSON:** Solids and Liquids!

**TECHNOLOGY LESSON:** No

**DATE OF LESSON:** Day 2 of Matter Unit

**LENGTH OF LESSON:** 60+ minutes

**NAME OF COURSE:** 3<sup>rd</sup> Grade Physical Science

### **SOURCE OF THE LESSON:**

- Matter: Solids, liquids, & Gases by Kevin Beals and Carolyn Willard  
Gems® Teacher's guide for Grades 1-3  
Laurence Hall of Science, University of California at Berkley  
Activity 1 – Solids and Liquids

### **TEKS ADDRESSED:**

- 112.5. Science, Grade 3.  
3.2(B) Scientific processes. The student uses scientific inquiry methods during field and laboratory investigations. The student is expected to collect information by observing and measuring.
- 3.7(B) Science concepts. The student knows that matter has physical properties. The student is expected to identify matter as liquids, solids, and gases.

### **CONCEPT STATEMENT:**

- The universe is made up of all types of matter. In order for students to comprehend the different characteristics, attributes, and qualities of matter, students should to be introduced to the topic by first investigating a variety of solids and liquids.
- The scientific process is fundamental to many aspects of the science curriculum. Students should be introduced to and experience the investigative aspect of the scientific process by observing, sorting, categorizing, comparing and recording different characteristics of liquid and solid objects.
- This lesson provides a foundation for students to build upon during further studies of matter and the scientific process.

### **PERFORMANCE OBJECTIVES:**

- Students will be able to explain the different characteristics / properties of solids and liquids.
- Students will use properties of solids and liquids to classify objects
- Students will work cooperatively in groups investigating, discussing and sorting a variety of objects according to their observable characteristics
- Students will use data sheets to record and annotate observations and findings.

## **RESOURCES:**

### **For the teacher**

- 4 sentence strips with the following statements  
*Ideally they should each have an illustration representing the statement.*
  - Hold their shape and do not turn into a puddle
  - Take their shape of their container
  - Stay flat on top unless moving
  - Don't hold their shape, and do not make a puddle
- 2 large Solids and Liquids signs for the class display

### **For the class**

*Materials listed are for a class of 32 students - adjust quantities depending on actual class size.*

- 1 plastic spoon
- 2 index cards (3x5) labeled #1 and #2
- 1 rock, any kind, big enough for the whole class to see
- 1 cotton ball
- 1 piece of fabric at least a few inches square
- 3 transparent containers of different shaper (one with a lid)
- 1 cafeteria tray
- 8-12 sentence strips
- Push pins or masking tape
- 1 wide-tip felt marker
- A space about 6-9 ft. wide on a bulletin board or wall for a display  
*The display needs to be at a height students can reach. It also needs to be stay up for the entire Matter unit in order for it to be used during other lessons.*

### **For each student**

- 1 binder, clipboard, or folder to keep journal pages together
- 1 copy of **Solids** student data sheet from Matter Gems® Guide
- 1 copy of **Liquids** student data sheet from Matter Gems® Guide

### **Materials to make solid/liquid collections**

- 8 clear plastic bags to hold collections of solid and liquid items  
*Clear gallon-size freezer bags with double interlocking seals are ideal.*
- 32 clear plastic vials with tight-fitting lids
- 8 or more small glass beads or marbles
- 1 bag of cotton balls
- 8 or more small rocks or pebbles
- 1 box of wooden toothpicks, any kind
- 1 small box of metal paperclips
- 8 screws, nuts, bolts, washers and/or coins
- 8 small pieces of fabric
- 1 cup of a thick, clear liquid like corn syrup or dishwashing detergent
- 1 cup of a thick, opaque liquid like shampoo, hair conditioner, or hand lotion
- 1 oz. of red food coloring

- 1 oz. of blue food coloring
- 1 bottle of water
- (optional) a small container of glue to seal lids on containers, if needed

*Note: You may want to substitute other items for the solids and liquids listed. Each item should be made of just one material so it can be classified as either a solid or a liquid. Select liquids that will not spoil so they can be stored and used again with future classes. If vials to hold the liquids are not available, other clear containers that will not leak or break, such as small plastic water bottles, will work.*

#### **SAFETY CONSIDERATIONS:**

- Students may become overly excited and curious and have a tendency to get a bit rambunctious and careless when exposed to so many objects at once. In order to prevent havoc, they should be instructed to gently handle the materials at their table and NOT to throw any of the items around.
- Students will also be manipulating certain types of liquids that contain chemicals. These particular items could cause discomfort and/or injury if ingested or rubbed into the eyes. Students should be told not to puncture or open the containers containing liquids. If this occurs, they are to contact the teacher and wash their hands immediately.
- As an added precaution, have all students wash their hands at the conclusion of the lesson.

#### **SUPPLEMENTARY MATERIALS, HANDOUTS (per student):**

- 1 copy of **Solids** data sheet from Matter Gems® Guide
- 1 copy of **Liquids** data sheet from Matter Gems® Guide

### Five-E organization

<b>ENGAGEMENT</b>		<i>Time: 5 min.</i>
<i>What the Teacher Will Do</i>	<i>Probing Questions</i>	<i>Student Responses Potential Misconceptions</i>
<p>Introduce the lesson using the Universe as a <i>hook</i>.</p> <p>Write responses to questions on the board</p>	<p>When I say the word “Universe”, what do you think of?</p> <p>What comes to your mind?</p>	<p>The stars The sun The sky The Earth</p>
<p>If students are only naming astronomical objects, ask about the Earth and things that exist on Earth.</p>	<p>What else is part of the Universe?</p> <p>Is the Earth part of the Universe?</p>	<p>The oceans Mountains People</p>
<p>Begin to have students focus on things around them as also being part of the Universe.</p>	<p>Is this chair part of the Universe?</p> <p>What about this book or glass of water?</p>	<p>Yes! No! Maybe?</p>
<p>Have them call out different objects and continue to write their responses in the board.</p>		
<p>Eventually they will begin to agree with everything you mention and realize that everything is part of the Universe.</p>		
<p>Tell the students that their first task will be to explore a group of objects and figure out of what they are made.</p>		
<p>Hold up a plastic spoon.</p> <p>Repeat as necessary using a different object.</p>	<p>What is this?</p> <p>What is it made of?</p>	<p>A spoon. Plastic.</p>
<p>Hold up one of the bags with assorted objects.</p> <p>Explain that they will be working in groups exploring and analyzing different objects.</p>		
<p>Divide the class into groups of four.</p>		

<b>EXPLORATION (PART 1)</b>		<i>Time: 5 min.</i>
<b>Observing Collection of Objects</b>		
<i>What the Teacher Will Do</i>	<i>Probing Questions</i>	<i>Student Responses Potential Misconceptions</i>
Give each group a bag of objects.  Explain that they are to work cooperatively and share the materials.		
Instruct them to observe, compare, contrast and discuss the objects according to what they are made of, physical attributes, etc.	What do you notice that is similar or different among the objects?  Are there any similarities in how they can be used?	
Move around the groups to ensure students stay on task.  Guide the discussions toward the objective as necessary.	Are there differences or similarities of the materials of which they are made	

<b>EXPLORATION (PART 2)</b>		<i>Time: 10 min.</i>
<b>Sorting Objects</b>		
<i>What the Teacher Will Do</i>	<i>Probing Questions</i>	<i>Student Responses Potential Misconceptions</i>
After the groups have had a few minutes to freely explore the objects, regain the attention of the class.	Does anyone know what it means to <i>sort</i> things?	Putting them in order Organizing them Arranging them Putting things in groups Put them in a straight line.
Clarify the concept of <i>sorting</i> and any misconceptions s necessary.		
Explain that they will sort their objects into groups.	What are some ways that you can sort objects?	By color By size By shape If it is soft or hard If it is smooth or rough
Drop on the table an object that bounces and one that does not.	What other attributes do these two objects have?	One bounces and the other doesn't. One makes a louder noise when you drop it.

	Is this another way we can sort objects?	Yes.
Tell them that they will work together in grouping and sorting their objects in any way they decide, as long as everyone agrees on the reason for their sort. Have them limit the groupings to two categories.		
Explain that everything in a group must be alike or have something in common with each other in some way.	Should the objects in a group be similar or have something in common with each other?	Yes. No.
Ensure they understand that they can sort their objects into more than one or two groups.  Clarify instructions as necessary.	Will you have just one group of objects?  Can you have several different groups of objects?	No. Yes. Maybe.
Instruct the groups to begin sorting their objects.  Circulate among the groups and challenge the students to explain their reasoning.  Ask early finishers to resort their objects in a different way.		
When they have finished sorting their objects in at least have them replace the objects in their bags.		

***EXPLANATION***

*Time: 20 min.*

**Secret Sort**

<i>What the Teacher Will Do</i>	<i>Probing Questions</i>	<i>Student Responses Potential Misconceptions</i>
Gather the class away from their bags of material, where they can hold a discussion and see your demonstration.		

Ideally, have the students sit in a semi-circle on a carpet.		
Ask them to describe how their groups sorted the objects.	Why did you sort them the way you did?  Do you notice any similarities among the groups?	(Answers will vary.)
Tell the class you will all now play the <i>Secret Sort</i> game.	Does anyone want to play a secret mystery game?	Yes!
Explain that you are going to sort some objects into two groups, but you're not going to tell them why you're sorting them that way.	Do you think you can guess the secret sort rule for each group?	Yes! No. Maybe.
Ensure they understand that they will do this silently in their head.	Do you think you can do this secretly and silently in your head without talking to each other?	Yes! No. Maybe.
Set the index cards labeled #1 and #2 on the carpet a foot or two apart.		
Say that all objects placed in each group will have something in common – something that's the same about them.  Explain concept and clarify misconceptions as necessary.	Can anyone explain what it means to have something in common with something else?	Something the same Something different Have the same size
Tell them that the challenging part of the game is that they need to be silent as their minds investigate and the objects.	Does everyone understand what to do and how important it is to do it quietly?	Yes. Be quiet.
Hold up a rock and poke it, shake it, toss it in the air, drop it, etc. Set in next to card #1.		
Hold up a small container of water and move it, shake it, rotate it. Set it next to card #2.		

Continue dramatically introducing each object in similar fashion and placing each under their respective card - #1 for solids and #2 for liquids.		
As students are beginning to catch on, add to the fun by pretending to put a solid object in the liquid group, then finally placing it in the solids group and vice versa.		
Before you reveal secret rule, call on students for ideas.  Identify that not all objects are hard by singling out softer objects.	What is the same about the things in group one?  Are all the items hard? What about this cotton ball, or this piece of clay?	Things that are hard. Things that are dry. Things that don't move.
If students come up with the term <i>solid</i> , have them expand on this concept.	What does it mean to be a solid?	You can hold it.
Place Solids in front of Group #1.	What is this word?	Solids.
Explain that scientists define solids as things that hold their shape.  Explain that the shape if clay can be changed using your hands, but left alone, the clay keeps its shape.	When the rock is placed on the table or carpet, does it turn into a puddle?  What about this cotton ball, or piece of clay?	No.  The shape of clay can be changed.
Set the sentence strip " <i>Hold their shape and do not turn onto a puddle</i> " below the Solids sign.		
Bring attention to objects in group #2.	What is the same about everything in group #2? What do these objects have in common?	Things that are wet. They are liquids.
Place the Liquids sign in front of Group #2.	Who knows what this word says? What does it mean to be a liquid?	Liquid You can't hold it. It doesn't have a shape. It's wet.



Explain that a liquid is something that does not hold its shape.		
Demonstrate by pouring water from one container to another of a very different shape.	Can you see how the water is keeping the shape of this glass?	Yes.
	What do you think will happen to the shape of the water if I pour it into this other glass?	It will be the shape of the new glass.
	Can you see how the water changed its shape to be the same as the new container?	Yes.
	What if I pour it on to this plate?	It will spill and .make a mess.
	Will it keep the same shape as the glass or make a puddle?	No. Make a puddle.
	What's the difference between a solid and a liquid?	Solids hold their shape; liquids don't.
Set the sentence strip " <i>Don't hold their shape, and do make a puddle</i> " below the Liquids sign.	Can everyone read this?	
Point out that liquids can be different from each other in many ways – such as in color, in whether or not you can see through them, or whether they are thick or thin.	Are all liquids the same? How are some liquids different? What are some examples of different liquids?	No. Some have bubbles, different colors, can be eaten, etc. Milk, syrup, juice, water, etc.
Add the sentence strips " <i>Takes the shape of its container</i> " below the liquids sign.	Can everyone read this?	
Add the sentence strip " <i>Stay flat on top, unless moving</i> " below the Liquids sign.  Demonstrate and explain the concept by pouring a liquid.	What does this mean?	Liquids are flat on top.

<b>ELABORATION</b>		<i>Time: 15 min.</i>
<b>Re-Sorting and Recording in Journals</b>		
<i>What the Teacher Will Do</i>	<i>Probing Questions</i>	<i>Student Responses Potential Misconceptions</i>
Tell the students they will get to re-sort their bag of objects into solids and liquids.		
Pass out the Solids and Liquids student sheets. Explain that they will draw and label all their objects on to the appropriate sheets.		
Assemble signs and sentence strips on the class display board.		

<b>EVALUATION</b>		<i>Time: 5 min</i>
<i>What the Teacher Will Do</i>	<i>Probing Questions</i>	<i>Student Responses Potential Misconceptions</i>
Review work sheets. Have students share what they drew on their Solids and Liquids sheets.		
Evaluate if students understand the characteristics of solids and liquids in the form of riddles.  Decide if you want to have the class recite answers individually or as a group.  Develop riddle questions as necessary and if time permits.	If I give you mystery clues, can guess if I am a liquid or a solid?  What am I if I keep my own shape when I am left alone?  What am I if I can form a puddle?  What am I if I change my shape when placed in a new container?  What am I if I do not take the shape of a container?	YES!  Solid  Liquid  Liquid  Solid
Explain that they will continue to add objects, pictures, and words to the class display board as they learn more about matter.		

# LIQUIDS

**You can tell something is a liquid because:**

- It doesn't hold its shape. (It makes a puddle.)
- It takes the shape of its container.
- It stays flat on top unless moving.

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**Draw and label different types of liquids here:**

# SOLIDS

You can tell something is a solid because:

- It holds its shape. (It does not make a puddle.)

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Draw and label different types of solids here:

**Hard Solids**

**Soft Solids**