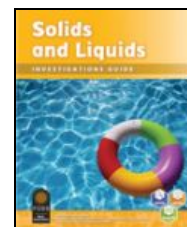


Investigation 1 - Solids

Students explore solid objects, such as pieces of wood, plastic, and metal. Students observe, describe, and sort the objects according to their properties. They construct towers (and other structures), using the properties inherent in the materials to accomplish the task. Students discover solid objects in the schoolyard environment, and sort the found objects into natural and human-made.



Standards - 2-PS1-1, 2-PS1-2, 2-PS1-3, K-2 ETS1-1, K-2 ETS1-2, K-2 ETS1-3

Investigation 1	Summary of Lesson	Priority
Part 1: Solid Objects **	After identifying three states of matter (solid, liquid, gas), students observe a variety of solid objects. After a period of free exploration, students describe properties of the objects and develop vocabulary in order to communicate their thinking about those properties. <i>Read, "Everything Matters".</i> <i>FQ - How can solid objects be described?</i>	High Introduction to concepts of solids and content vocabulary.
Part 2: Solid Materials **	Students observe eight similar rectangular objects that vary in the material from which they are made (fabric, plastic, rubber, wood, metal, paper, leather, ceramic). Students examine the objects unused in Part 1, as well as classroom objects, to determine their materials. <i>Read, "Solid Objects and Materials".</i> <i>Video, "Clothing and Building Material".</i> <i>FQ - What are solid objects made of?</i>	High Introduction to new content vocabulary
Part 3: Group Solid Objects *	Students group solid objects in a variety of ways to discover that many objects can have the same property and that different objects can be made of the same material. <i>FQ - Can two or more objects have the same property?</i>	High Review of content vocabulary and practice/reinforcing new vocabulary.
Part 4: Construct with Solids **	Students use solid material to build towers, using the best objects and the best materials at each level of the tower to provide strength and stability. After building towers, students take the structures apart and use the same materials to construct bridges. <i>Read, "Towers" and "Bridges".</i> <i>Video, "Properties of Materials"</i> <i>FQ - What are properties of successful towers?</i>	High This lesson reinforces concepts of solid properties and 2-PS1-1, 2-PS1-2, 2-PS1-3
Part 5: Outdoor Solids *	Students take a field trip to discover solid objects in the schoolyard environment. They sort the found objects into two groups - natural and human-made. <i>FQ - What solid objects are outdoors?</i>	Medium This activity could be done on a quick walk back from recess, then results could be shared in the classroom. Focus should be on new vocabulary-human-made and natural.
Assessment	i-Check	

Investigation 1 cont. - Solids

2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

2-PS1-2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

2-PS1-3 Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

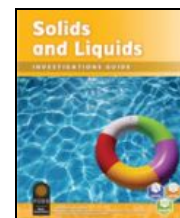
K-2 ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2 ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2 ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Investigation 2 - Liquids

Students investigate liquids in a variety of settings to become familiar with their properties. They learn precise liquids vocabulary, using liquid-properties cards. Students use representational materials to enhance their understanding of the unique behaviors of liquids. Students explore the properties of water puddles in the schoolyard.



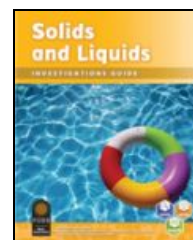
Standards - 2-PS1-1

Investigation 2	Summary of Lesson	Priority
Part 1: Liquids in Bottles *	Students working at a learning center investigate seven different liquids to develop the concept of liquid. They tip, swirl, shake, roll, and otherwise investigate the liquids in plastic bottles; plain water, corn syrup, liquid dish soap, liquid hand soap, cooking oil, fabric softener, and water with color. <i>FQ - How are liquids different from each other?</i>	High Introduction to concepts of liquids and content vocabulary.
Part 2: Properties of Liquids *	Students observe the seven liquids and describe their properties in their own words. Their descriptive language is used as a springboard to develop precise vocabulary for properties of liquids. Vocabulary is supported by posters and practiced with liquid-properties card activities. <i>FQ - How can liquids be described?</i>	Medium This lesson could be modified to do only the discussion piece. The games could be skipped.
Part 3: Liquid Level **	Students pour a measured volume of water in different containers. They observe that liquids fill different containers to different heights and that liquids always have flat, level surfaces. Students practice these concepts with representational tasks; recording the shape, location, and appearance of liquid in a bottle as the bottle rotates; and sequencing images of a bottle of liquid as it falls onto its side. <i>Read, "Liquids".</i> <i>Activity, "Falling Liquids".</i> <i>FQ - How do liquids change in containers?</i>	Medium Students are working on identifying properties of liquids, and 2-PS1-1, conducting an investigation to classify different materials. This could be done as a whole group to save time.
Part 4: Puddles	Students search their schoolyard for puddles. If they find puddles, they observe the water closely and describe its properties. Students try to make a puddle by choosing a likely site and pouring water. In the process, they learn two more key characteristics of liquids; they pour and flow. <i>FQ - Where are liquids outdoors?</i>	Low This lesson could be skipped.
Assessment	i-Check	

2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

Investigation 3 - Bits and Pieces

Students work with beans, rice, and cornmeal to find out how solids behave when the pieces are small. Students shake, rattle, and roll the materials in bottles, pour them from container to container, and separate them by using screens. Students go outdoors to find particulate solid materials. Students observe the particles when poured on a flat surface and compare the particles to water on the same surface.



Standards - 2-PS1-1, 2-PS1-2

Investigation 3	Summary of Lesson	Priority
Part 1: Solids in Containers ***	<p>Students work at learning centers with solid materials representing five particle sizes; cornmeal, rice, and three different kinds of beans. Students investigate the properties of the materials, one at a time, by pouring them from one container to another.</p> <p><i>FQ - Are these materials solid or liquid?</i></p>	<p>High</p> <p>This starts out the Investigation on solids and solid properties. Introduction to concepts of solids and content vocabulary.</p>
Part 2: Separating Soup Mix ***	<p>Students use screens of three sizes to separate a mixture of five particulate materials: cornmeal, rice, mung beans, pinto beans, and lima beans.</p> <p><i>FQ - How can mixtures of particles be separated?</i></p>	<p>High</p> <p>This lesson directly meets standard 2-PS1-1</p>
Part 3: Solids in Bottles	<p>Students use funnels to put four particulate solid materials into clear bottles with caps. They observe how the particulate materials look, sound, and move when they shake and roll the bottles. Students compare the properties of particulate solid materials to liquids.</p> <p><i>FQ - How do particles of solids move in bottles?</i></p>	<p>Medium</p> <p>This lesson could be done as a whole group.</p>
Part 4: Beads and Screens	<p>Students use representations of screens of different mesh sizes to determine which screens can be used to separate mixtures of beads of two sizes. The concepts of solid and liquid are reinforced with a reading.</p> <p><i>Read, "Pouring".</i></p> <p><i>FQ - What is a general rule for using screens to separate a mixture of small objects?</i></p>	<p>Low</p> <p>This lesson could be skipped, as it is a repeat of Investigation 3, Part 2. The important piece of this lesson is the reading.</p>
Part 5: Spills	<p>Students go outdoors to search for particulate solid materials. They compare the behaviors of the particulate materials with water and observe differences in their appearances when poured on a flat surface.</p> <p><i>Read, "Comparing Solids and Liquids".</i></p> <p><i>FQ - Are there little pieces of solid materials outdoors?</i></p>	<p>Low</p> <p>This lesson could be skipped. The important piece of this lesson is the reading</p>
Assessment	i-Check	

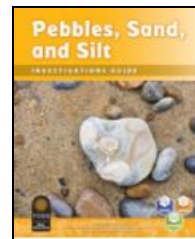
Investigation 3 cont. - Bits and Pieces

2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

2-PS1-2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

Investigation 4 - Solids, Liquids, and Water

Students investigate interactions between solids and water and liquids and water. They observe, describe, record, and organize the results. Students test toothpaste to determine if it is a solid or a liquid. They investigate melting and freezing of familiar liquids. Students collect solid materials outdoors and mix them with water. Students look for changes in the color and clarity of the water as evidence that something mixed with the water.



Standards - 2-PS1-1, 2-PS1-2, 2-PS1-3, 2-PS1-4

Investigation 4	Summary of Lesson	Priority
Part 1: Solids and Water ***	<p>Students investigate mixture made of water and familiar solid materials. They observe and discuss the changes that occur immediately and set the mixtures aside for a day. They observe the mixtures, note changes, and graph the changes. Students attempt to return the solids to their starting conditions by drying.</p> <p><i>FQ - What happens when solids are mixed with water?</i></p>	<p>High This lesson is important in meeting the DCIs of Engineering Practices, as well as leading into the other parts of the Investigation.</p>
Part 2: Liquids and Water ***	<p>Students add water to bottles of familiar liquids. They observe changes that occur immediately, then tip the bottles gently, and finally shake them vigorously. Students observe and record the results of the mixing after a day of settling.</p> <p><i>Read, "Mix it Up".</i></p> <p><i>FQ - What happens when liquids are mixed with water?</i></p>	<p>High This lesson directly meets 2-PS1-1 and 2-PS1-2.</p>
Part 3: Toothpaste Investigation **	<p>Students apply their knowledge of solids and liquids to determine if toothpaste is solid or liquid. Students observe its behavior in water before and after shaking. They let the mixture settle and observe again. They let a sample of the mixture evaporate and observe the results before reaching a conclusion.</p> <p><i>FQ - Is toothpaste solid or liquid?</i></p>	<p>High This lesson directly meets PS1-A</p>
Part 4: Changing Properties ***	<p>Students use a hot-water bath to see if they can change small samples of ice, margarine, and chocolate. They find that heat can melt some materials. They put liquids in a freezer to find that some materials freeze in the cold.</p> <p><i>Read, "Heating and Cooling" and "Is Change Reversible"?</i></p> <p><i>Activity, "Change it". Video, "Solids and Liquids".</i></p> <p><i>FQ - How do properties of materials change when they are heated or cooled?</i></p>	<p>High This lesson directly meets 2-PS1-4, the only time it is addressed in the kit.</p>

Part 5: Tea Time	<p>Students collect materials outdoors and mix them with water to see if they can make “tea”. Students look for changes in the color and clarity of the water as evidence that something from the solid material is mixed with the water.</p> <p><i>FQ - What happens when you mix water with solid plant material collected outdoors?</i></p>	<p>Low</p> <p>This lesson could be skipped. This could be an extension activity students could do at home.</p>
Assessment	i-Check	

Investigation 4 cont. - Solids, Liquids and Water

2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

2-PS1-2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

2-PS1-3 Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

2-PS1-4 Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.