

In this instructional unit, students will investigate physical properties of objects. Students will determine which properties are best for certain projects. Students will build structures and assemble and disassemble structures. Students will observe how matter goes through reversible and irreversible changes.

Student Science Performance

Grade or course: 2nd	Title:
Topic: Physical Science: Matter	What is Matter and How Does It Change?

Performance Expectation for GSE:
S2P1. Obtain, evaluate, and communicate information about the properties of matter and changes that occur in objects.

- Ask questions to describe and classify different objects according to their physical properties.
(Clarification statement: Examples of physical properties could include color, mass, length, texture, hardness, strength, absorbency, and flexibility.)
- Construct an explanation for how structures made from small pieces (linking cubes, building blocks) can be disassembled and then rearranged to make new and different structures.
- Provide evidence from observations to construct an explanation that some changes in matter caused by heating or cooling can be reversed and some changes are irreversible.
(Clarification statement: Changes in matter could include heating or freezing of water, baking a cake, boiling an egg.)

Performance Expectations for Instruction:
 Students will

- describe and classify various objects based on their physical properties.
- assemble and disassemble structures made from small pieces and explain how this can be done.
- explain changes in matter that can and cannot be reversed, based on evidence. (This instructional segment will take several days.)

[Additional notes on student supports](#)

Materials:
 Ice cubes and clear cups
 Variety of objects for students’ exploration, such as:

- wooden, foam, and plastic shapes
- pieces of cloth
- wooden craft sticks
- yarn
- natural items such as leaves and rocks
- rubber bands
- paper towels
- sturdy paper
- aluminum foil
- tissue paper
- straws
- string
- linking cubes or building blocks
- cotton balls
- bubble wrap
- plastic spoons

Students will continuously obtain, evaluate, and communicate information. This is not a linear process. Students will communicate through writing and discussions to allow for formative assessment. This

<p><i>benefits the teacher, student, and whole group to guide instruction to clarify misconceptions or extend content.</i></p>	
<p>Engaging Learners</p>	<p>Phenomenon Hot Spring in Yellowstone National Park</p> <p>Guiding Questions: How can matter change states? Why are the properties of different states of matter important?</p> <p>Tell students that this is a hot spring in Yellowstone National Park. Ask them to identify any water they see in the picture.</p> <p><i>Teacher Notes: Some students only identify liquid water at this point.</i></p>
	<p><i>Obtaining</i></p> <p>Students will obtain information about the states of matter by viewing samples of ice, water, and steam. If safety concerns are met, show students a kettle of steaming liquid or ask them to describe what they have observed in their kitchen at home.</p>
	<p><i>Evaluating and Communicating</i></p> <p>In small groups, students will use the information they obtained from their observations to revisit their answers of what water they see in the picture. Ask students to identify any water that is solid, water that is liquid, or water that is gas in the photo of the hot spring.</p> <p>In their small groups, students will discuss <u>how</u> the solid water became solid (The temperature changes to freezing.), how the water that is in a gaseous state became a gas (The water is heated until it boils.), and how each can change into liquid water (heating and cooling). Then share answers with the group.</p> <p>Have students investigate how ice behaves as it melts. Have students turn a plain sheet of paper landscape orientation and divide it into 3 columns-- solid, liquid, and gas. Give each group an ice cube in a clear cup or sealable bag, measure the temperature, and have them sketch its shape in the first column (solid). Have students then measure the temperature and sketch the ice cube an hour later in the liquid column. Have them write what they observed. Ask them to discuss the differences between the ice cube and the water. (The ice cube keeps its shape, but the water takes the shape of the cup.)</p> <p>Have them sketch what they think the steam would look like in the third column. Ask them why the steam is more difficult to draw. (It doesn't have a shape and it is sometimes invisible.)</p> <p>Ask students to tell others in their group of how we use air, water, and land for transportation. (boats, balloons, planes, cars, etc.)</p>
<p>Exploring</p>	<p>Phenomena Boat, Kite, Balloon- Putting a large boat in the water</p>

[Making and flying a kite](#)

[Giant Hot Air Internet Balloons](#)

Show students the videos above. How does each object move? Why does the hot air balloon rise? How does the kite fly? Why does the boat float? What are the states of matter in each video? (The boat is solid, the water is liquid and moves, the kite and balloon are solid, the air to fly the kite and fill the balloon is a gas.)

Questions to ask:

- What materials are each of these objects (boat, kite, balloon) made from?
- What are the physical properties of each?
- How are the outsides of the ship, the kite, and the hot air balloon alike and different?
- How are the physical properties of the ship, kite and the hot air balloon important for them to move?

Properties of Matter: Students will explore various materials and record the properties of each object. Objects could include: popsicle stick, cotton ball, piece of paper, bubble wrap, straw, plastic spoon, pencil, and tissue paper. Students can also select their own object to record. Students can use the handout, [Properties of Matter](#), or record results in their science journals. After students have described the properties of each object, they will design something that can built using the materials and draw a picture of their design and write a sentence describing their design. As time and resources allow, students may build their project according to their design. Students will then classify objects according to their flexibility, absorbency, and length.

Structures: Students will use coffee stirrers and clay to build structures. Challenge students to build the tallest structure possible using only materials provided. The structure must be able to stand on its own.

Obtaining and Communicating

Boat, Kite, Balloon- Provide students with a variety of materials, such as the ones listed in the Materials section. With students working in small groups, ask them to organize their materials according to the best for building a boat, a kite, or a balloon. Have them discuss their choices.

Students will discuss with their group members as they place each object in a category. The teacher will move about the room, asking students to explain why they put each object in a certain group. *This is a good opportunity to use vocabulary such as hardness, strength, flexibility, absorbency, structure.*

Students will make a T-chart in their Science journals, labeled “Boat,” “Kite,” and “Hot Air Balloon” and sketch or write the objects they placed into each category.

Next, place the Properties of Matter vocabulary words (such as *hardness, strength, flexibility, absorbency*) where students can see them, re-explaining as you go, scaffolding with examples of other objects that fit into each category. Ask students to work together, rearranging the objects to group them by each of those terms.

	<p>Properties of Matter: Students will communicate their design structure and plan in their science journal.</p> <p>Structures: Students will communicate the way in which they assembled their structure. Students will then unassembled their structure and start over again to build a new structure in a different way.</p> <p><i>Evaluating</i> Boat, Kite, Balloon- As a class, discuss which categories the “Boat” materials fell into (hard, not absorbent, strong, and possibly others) and which categories the “Hot Air Balloon” materials fell in (flexible, not hard, and possibly others) and how that relates to where they are used and how that makes a difference in their materials. The teacher will make a T-chart to show the class’s overall results.</p> <p>Properties of Matter: Students will work in partner groups to evaluate their structure design and give each other feedback. Students will make changes as needed to their design.</p> <p>Structures: Students will evaluate which structure was the tallest, how were the coffee stirrers assembled and disassembled to create the tallest tower? Students will draw their structure in their student journal and write about the steps they took to build their tower.</p>
<p>Explaining Finalizing Model</p>	<p><i>Obtaining</i> Students will review the class T-chart showing which materials were best for building a boat, kite or balloon.</p> <p><i>Evaluating and Communicating</i> The teacher will provide students with linking cubes, fabric, wooden craft sticks, aluminum foil, rubber bands, etc. and ask students to work in small groups to build either a model of a boat or a hot air balloon of their own. (They will need scissors, tape, glue, and so on for developing their model.)</p> <p>Students will discuss with their group and determine which materials they will use to build their structures. After discussing, each student will sketch their plan for their model in their Science journal.</p>
<p>Elaborating Applying Model to Solve a Problem</p>	<p><i>Obtaining and Evaluating</i> Students will discuss their sketches with their group, obtaining feedback on how to improve their plan for the model. The group will choose one sketch from which to build the model and use the materials provided to construct it.</p> <p><i>Communicating and Evaluating</i> Each group will present their model to the class, explaining why they chose the materials they did, based on their properties and their purpose.</p> <p>Classmates will use a “thumbs up, thumbs down, thumbs in the middle” signal to give feedback to each group as to whether they agree that the group chose the correct materials based on their properties and purpose or not, or they think some materials are appropriate and some are not. The teacher will give clarification, as needed.</p>

	Have students try out their boat, kite, and balloon designs to see if they can demonstrate how pushing and pulling on an object affects the motion of the object.
Evaluation	Assessment of Student Learning
	In their science journals, students will write 3 properties from the earlier Properties of Matter vocabulary word chart (<i>hardness, strength, flexibility, absorbency, etc.</i>) Under each, they will tell at least 2 objects that share that property. (They may not use objects that are already listed on the chart.)
SEP, CCC, DCI	Science Essentials
Science and Engineering Practices	<ul style="list-style-type: none"> ● Asking questions and defining problems ● Planning and carrying out investigations ● Constructing explanations and designing solutions ● Obtaining, evaluating, and communicating information ● Analyzing and interpreting data
Crosscutting Concepts	<ul style="list-style-type: none"> ● Matter and Energy ● Stability and Change
Disciplinary Core Ideas	<p>From <u>A Framework for K-12 Science Education:</u></p> <ul style="list-style-type: none"> ● PS1A: Structure and Properties of Matter ● PS1B: Chemical Reactions



Additional Supports for struggling learners:

The following supports are suggestions for this lesson and are not the only options to support students in the classroom. These supports target students that struggle with science material, this lesson or a previous lesson. These are generalized supports and do not take the place of IEP accommodations as required by each student’s Individualized Education Program.

General supports for the following categories:

<u>Reading:</u>	<u>Writing:</u>	<u>Math:</u>
<ol style="list-style-type: none"> 1. The teacher can have students match letters prior to reading to remind them of the alphabet. 2. The teacher can have students identify words that they know in the text as the class reads. 3. The teacher should remind students to use strategies when they are reading. 	<ol style="list-style-type: none"> 1. The teacher can provide practice for students in the area of writing both in context and practicing just letters. 2. The teacher can provide a sentence starter for the students. 3. The teacher should continually give encouragement to the students. 4. The teacher can provide constructive positive feedback during the writing process to help students understand the expectations. 	<ol style="list-style-type: none"> 1. Provide students with opportunities to interact with numbers. 2. The teacher can provide manipulatives to allow the students to count and interact with materials.

Supports for this specific lesson if needed:

Performance expectations for instruction:

1. The teacher should provide information to students in various formats to reach as many students as possible.
2. The students should be given adequate time to complete each part of the lesson.
3. The students should be allowed to express their knowledge in various formats.
4. The teacher should be sure to provide multiple ways for the students to communicate their knowledge of the material.

Engage:

1. The teacher should consider showing a video of the geyser. Then students can make observations about the geyser and the forms of water than can be seen.
2. The teacher should have clear and consistent guidelines for discussion. These guidelines are to help

make students more comfortable which should make students more likely to participate in the discussion.

3. The teacher should use intentional and flexible grouping to group students. Best practice is to use data to drive student groupings.
4. The teacher should consider providing with some questions to use as a discussion starter for the group.
5. The teacher should be prepared to repeat directions as needed.
6. The teacher can ask students if they have seen steam at home when their parents are cooking or outside in the summer after it rains.
7. The teacher should consider using guiding questions as the students work to gauge student understanding.

Exploring:

1. The teacher may need to consider showing the videos more than once to allow students to make adequate observations.
2. The teacher should have clear and consistent guidelines for discussion. These guidelines should help students feel more comfortable and be more likely to participate in the discussion.
3. The teacher should be sure to provide multiple ways for the students to communicate their knowledge of the material. This could include labeling images, drawing pictures, writing or verbally explaining.
4. Students may need additional time to complete their assignment.
5. The teacher should consider giving students the double t-chart to use for sorting items into the different categories.
6. The teacher should be encouraging students to use vocabulary as they discuss the properties of matter.

Explaining:

1. The teacher should use intentional and flexible grouping to group students. Best practice is to use data to group students.
2. The teacher should have clear and consistent guidelines for group discussion. These guidelines should help students feel more comfortable and be more likely to participate in the group assignment.
3. Students may need additional time to complete their assignment.
4. The teacher should be sure to provide multiple ways for the students to communicate their knowledge of the material. This could include labeling images, drawing pictures, writing or verbally explaining.

Elaborating:

1. The teacher should have clear and consistent guidelines for group discussion. These guidelines should help students feel more comfortable and be more likely to participate in the group assignment.
2. The teacher should consider having multiple options for students to use in presenting their work to the class. This could be using technology, gallery walk or giving a presentation.

Evaluating:

1. Students may need additional time to complete their assignment.
2. The teacher should be sure to provide multiple ways for the students to communicate their knowledge of the material. This could include labeling images, drawing pictures, writing or verbally explaining.



Name _____ Date _____

Properties of Matter

Directions: Record the properties of each object in the chart below. Choose your own object for the last row.

	color	length (How long is it?)	texture (What does it feel like?)	flexibility (Can you bend it?)	absorbency (Can it hold liquid?)
popsicle stick					
cotton ball					
piece of paper					
bubble wrap					
straw					
plastic spoon					
pencil					
tissue paper					



Directions: Pick three objects. What could you make with the three objects you choose? Draw your design and write a sentence describing your design.

My three objects are _____, _____, and _____.

Directions: Classify your objects into the groups below.

Length

Objects shorter than 20cm	Objects longer than 20cm



Flexibility

Objects that can bend	Objects that can't bend

Absorbency

Objects that can hold water	Objects that can't hold water