

Lesson Plan: Phase Change Matter

Topic: Oobleck Phase Change, Matter
 Subject: States of Matter

Grade level: 3rd
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NSES:

Content Standard A: As a result of activities in grades K-4, all students should develop: 1) abilities necessary to do scientific inquiry, 2) understanding about scientific inquiry. Content Standard B: As a result of activities in grades K-4, all students should develop an understanding of 1) properties of objects and materials.

Teaching Standard A: Teachers of science plan an inquiry-based science program for their students

SOL: Science 3.3: The student will investigate and understand that objects are made of materials that can be described by their physical properties.

Daily Questions:

What are the physical properties of matter? Does all matter fit into only one category?

Procedures for Learning Experience	Guiding Questions	Materials Needed	Evaluation (Assessment)	Approximate Time Needed
<p>Engagement: Introduce topic as “States of Matter”. Class will be exploring whether a substance is solid, liquid, or gas.</p> <p>Distribute Worksheet and give quick definition of Matter, Solid, Liquid, Gas</p> <p>Read-aloud <u>Bartholomew and the Oobleck</u> by Dr. Seuss. Pause throughout the story to invite student input on the physical properties of the oobleck as described by Dr. Seuss.</p> <p>After story concludes, teacher asks students to list characteristics of Oobleck. Descriptions are written on whiteboard. Given these descriptions, students are asked to consider physical characteristics of solids and liquids and write prediction on worksheet: Is oobleck a solid, liquid, or gas?</p>	<p>What do solids look like?</p> <p>What do liquids look like?</p>	<p><u>Bartholomew and the Oobleck</u> by Dr. Seuss</p>	<p>Formative assessment: Observe student response to teacher’s questioning during the story. Observe student participation in brainstorming activity and the quality of their contributions to the discussion about the characteristics of states of matter.</p>	<p>15 minutes</p>

<p>Exploration: The students will work in small teacher-assigned cooperative learning groups of 7. Student teachers will each supervise one group</p> <p>Students should have their individual worksheets and instructions.</p> <p>Allow sufficient time (10 minutes) for students to conduct the investigation and record their observations. Teacher manages and mediates the student groups while circulating through the room. Teacher should make suggestions regarding group dynamics as well as the investigative process. Teacher should encourage students to continue the mixing process until all the liquid is absorbed into the oobleck.</p>	<p>What state of matter is borax? Glue? Water?</p> <p>What happens to borax when it mixed with water?</p> <p>What happens to the glue solution when it is mixed with the borax solution?</p> <p>What does this new mixture (oobleck) look like? Consider shape, size, odor, color, and texture – not taste.</p>	<p>Goggles</p> <p>Instruction and observation sheet</p> <p>School glue, hot (not scalding) water, borax, measuring cups and tablespoon, mixing spoon, two mixing bowls</p>	<p>Formative assessment: Observe student participation in collaborative groups.</p>	<p>15 minutes</p>
<p>Explanation: The class refocuses into a large group discussion with input from each small group. The speaker presents the group information: summary of initial predictions and final group answer. Teacher records group findings on a whiteboard and highlights the observation and explanation of the terms: matter (anything that has mass and takes up space), solid (matter with definite shape and size that will not change unless outside forces are placed on it) liquid (matter that is wet and flows or pours, has definite volume but not a definite shape, will take the shape of the container in which they are placed), gas (usually colorless matter that does not have a definite shape or volume and takes the shape of the container in which it is placed) dissolve (when mixed with liquids, solids break apart and become part of that liquid)</p>	<p>What state of matter is borax? Glue? Water?</p> <p>What happened when borax was mixed with water?</p> <p>What happened to the glue solution when mixed with the borax solution?</p> <p>What are some observations about this mixture in terms of characteristics of solids, liquids, and</p>	<p>Whiteboard (or chart paper) on which to record student observations.</p>	<p>Formative assessment: Observe student participation in large group conversation.</p>	<p>15 minutes</p>

<p>physical change (when matter changes from one state to another) chemical change (when matter changes to a different matter), mixture (combination of different matter), solution (mixture of different matter through dissolving).</p> <p>End the discussion by summarizing the characteristics of solids, liquids, and oobleck and lead to group conclusion that oobleck is a liquid (flows, has definite volume, and takes shape of the container in which it is placed).</p>	<p>gases?</p> <p>What happens when oobleck is placed on a table? In a cup?</p> <p>What conclusion can class come to about oobleck's state of matter?</p>			
<p>Extension: Introduce other familiar mixtures such as play dough, cornstarch-based solutions, mayonnaise, and shaving cream. Ask students to make predictions about their behavior and classification in their science journals. Distribute these substances among the groups (one substance for each student group) and ask them to investigate and record their observations as they did with the oobleck activity. Allow time for group discussion and recording of observations. The class refocuses into a large group discussion with input from each small group. The director presents the group information: characteristics of their material and whether they classified it as a liquid, solid, or gas.</p>	<p>What do you observe about the mixture in terms of characteristics of solids, liquids, and gases?</p> <p>How was it similar and different to oobleck?</p>	<p>Play dough, cornstarch and water, mayonnaise, and shaving cream</p> <p>One mixing bowl per group</p>	<p>Formative assessment: Observe student participation in collaborative groups.</p>	<p>15 minutes</p>

Notes:

Timing: This lesson follows introduction and exploration of initial concepts of states of matter (solid, liquid, and gas). It is envisioned as a midpoint in a two-week unit. Summative assessment is done in a unit-ending multiple-choice quiz.

Safety: Goggles must be used due to the inclusion of diluted borax. Water should be hot but NOT scalding.

Differentiation: Small collaborative group assignments should result in heterogeneous groupings to allow more advanced and confident students to mentor students who might benefit from additional support. ELL students should be provided with a vocabulary sheet defining terminology in their native language.

Plasma: Plasma is the fourth state of matter. It is a high energy, electrically-charged mixture of ions and electrons and is the most abundant form of matter in the universe. A majority of the matter in inner-stellar space is plasma. All the stars that shine are all plasma. Plasma appears on earth only in places like lightning bolts, flames, auroras, and fluorescent lights.

Natural plasma exist only at very high temperatures, or low temperature vacuums. Artificial plasma can be created by using electrical charges on gas, this is seen in neon signs. Plasma at low temperatures is hard to maintain because outside a vacuum low temperature plasma reacts rapidly with any molecules it encounters. Natural plasmas do not breakdown or react rapidly, but are extremely hot (over 20,000 degrees Celsius minimum) and their energy is so high that they vaporize any material they touch.

SOL language

The student will investigate and understand that objects are made of materials that can be described by their physical properties. Key concepts include

- a) objects are made of one or more materials;
- b) physical properties remain the same as the material is changed in visible size; and
- c) visible physical changes are identified.