Module 6: Matter

Core Idea: PS1 Matter and its Interactions

Prerequisite Learning: KPS1.1, KPS1.2, KPS1.3, 3PS1.1, 3PS1.2, 3PS1.3

Percent of Time: 19%

Standard	Questions and Phenomenon Prompts	Module Vocabulary	Teacher Background/ Clarification Statement
5.PS1.1 Analyze and interpret data from observations and measurements of the physical properties of matter to explain phase changes between a solid, liquid, or gas. **Learning Targets:** • Explain that materials can be identified based on their observable and measurable properties. • Compare and contrast the measurable properties of solids, liquids, and gases (mass, volume, temperature). • Collect and analyze data from physical changes to solids and liquids that were affected by temperature change (melting, freezing, evaporating, condensing) to explain phase change. • Compare and contrast the observable properties of solids, liquids, and gasses (color, flexibility, shape, texture, and hardness). • Collect and analyze data from observations of materials that were affected by temperature change (color, flexibility, shape, texture, and hardness) to explain phase change. **Crosscutting Concept:** • **Structure and Function-** Students begin to recognize that objects have smaller substructures which determine the property of a material or system.	What will happen to an ice cube if I put it in a pot on the stove and turn up the heat after 1 minute? After 5 minutes? After 15 minutes? How does a chocolate bar feel when you leave it in a hot car after a few hours? Is there a way to know at what temperature water freezes and boils?	Solid Liquid Gas Observable Measurable Temperature Volume Mass Evaporate Condense Freeze Melt Dissolve Filter Mixture Separation Particle size Sort	In 3rd grade, students extensively study phases of matter. In 5th grade, measurements of physical properties such as boiling and freezing point are used. Observations and measurements of the physical properties of matter can be used to identify a sample of matter. Example: a liquid sample that changes from liquid to solid at 100° C can be identified as water.

Science and Engineering Practice: • **Analyzing and interpreting data-** Students should organize data (observations and measurements) in a manner which facilitates further analysis and comparisons.			
5.PS1.2 Analyze and interpret data to show that the amount of matter is conserved even when it changes form, including transitions where matter seems to vanish. **Learning Targets:** • Identify instances where matter appears to vanish (adding powdered lemonade to water, dropping an antacid tablet into water). • Measure and graph the weight of substances before they are heated, cooled, or mixed. • Measure and graph the weight of substances, including any new substances produced by a reaction, after they are heated, cooled, or mixed. • Calculate the difference between the total weight of the substances before and after they are heated, cooled, or mixed. • Describe the changes in properties they observe during and/or heating, cooling, or mixing substances. • Use measurements and calculations to provide evidence that the total weights of the substances did not change, regardless of the reaction or changes in properties that were observed. **Crosscutting Concept:** • **Energy and Matter-** Students track transformations of matter to demonstrate the law of conservation of mass. **Science and Engineering Practice:** • **Analyzing and interpreting data-** Students organize data (observations and measurements) in a manner which facilitates further analysis and comparisons.	Does this lemonade powder and this glass of water have the same amount of matter when I combine them together? Where does the powder go when I mix them? Which weighs more an ice cube or a melted ice cube? A cooked egg or raw egg? What makes you think that?		"Transitions where matter seems to vanish" can include evaporation of water, dissolving a solid into a liquid, or combining two substances to form a gas. This standard can be used to gather evidence to support a claim that matter does not cease to exist simply because we can no longer see it. Students do not have to distinguish between mass and weight.

5.PS1.3 Design a process to measure how different variables (temperature, particle size, stirring) affect the rate of dissolving solids into liquids. **Learning Targets:** • Plan and conduct and investigation to describe the relationship of changing temperature and the rate of dissolving solids into liquids using appropriate controls and variables. • Plan and conduct and investigation to describe the relationship of particle size and the rate of dissolving solids into liquids using appropriate controls and variables. • Plan and conduct and investigation to describe the relationship of stirring and the rate of dissolving solids into liquids using appropriate controls and variables. **Crosscutting Concept:** • **Stability and Change-** Students begin to describe changes in terms of time over which they occur; their rate. **Science and Engineering Practice:** • **Planning and carrying out controlled investigations-** Students carry out investigations in groups, where conditions and variables are controlled, utilize appropriate instruments, and deliberately plan multiple trials.	Does it matter if I use hot water or cold water to dissolve this sugar into this water? Why do you think one temperature will work faster than the other? Should I stir the mixture quickly or slowly to dissolve it faster? How about dropping into water the whole seltzer tablet or break it into small pieces?		Students can create experiments to investigate the relationships between these variables. Care should be taken to ensure that experiments use controls. For example, if studying temperatures on dissolving a solid, equal amounts of the solid should be used.
5.PS1.4 Evaluate the results of an experiment to determine whether the mixing of two or more substances result in a change of properties. **Learning Targets:** • Plan and conduct an experiment that provides evidence for whether new substances are formed by mixing two or more substances, based on the properties of the resulting substance. • Investigate common household materials (liquids or solids) that will dissolve in water (salt, sugar, drink mixes) and those that will not (sand, beans, rice, oils).	If I mix together this sand and this water will I have a new substance? What about mixing this lemonade powder and water? When I mix materials together, why does it not always		When two substances are combined there can be two results, 1) The two substances might become a new substance(s), or 2) the two substances will be simply mixed together without changing. A change in properties is

• Analyze data and communicate results from the experiment about substances before and after mixing and those that result in a change of properties and those that do not. **Crosscutting Concept:** • **Cause and Effect-** Students routinely search for cause and effect relationships in systems they study. **Science and Engineering Practice:** • **Engaging in argument from evidence-** Students create and identify evidence-based arguments and consider whether an argument is supported by evidence or relies on opinions or incomplete representations of relevant evidence.	result in making something new or changing properties? Observe the phenomenon of an irreversible chemical reaction by creating "elephant toothpaste."		evidence that a new substance has been formed. If no change in in properties has occurred, it is likely that the substances have merely mixed.