Design Pattern

Grade 5 Overall Claim Students demonstrate a sophisticated understanding of the core ideas and applications of practices and crosscutting concepts in the disciplines of science.				
Explanatory Statements	Students integrate disciplinary core ideas and crosscutting concepts with scientific practices to investigate and explain how and why phenomena occur, and to design and refine solutions to problems.		Students connect knowledge across the disciplines of science to ask questions, plan and carry out investigations, and analyze and interpret data to support an argument about phenomena in a variety of contexts.	
Measurement Target 1 (Topic 1 Bundle): Students are able to investigate and interpret data to draw or support conclusions about the structure and properties of matter, including whether or not matter is conserved, and to identify materials and mixtures based upon their properties or results of a reaction.				
Focal Knowledge, Skills, and Abilities (fKSAs)	**5.1a** Students are able to investigate the properties of matter using measurements to support a conclusion related to identifying materials.	**5.1b** Students are able to investigate or create an explanation around conservation of matter using measurements when substances are mixed, or undergo a change in form, properties, or state.	**5.1c** Students are able to identify what properties differ and what stays the same in a mixture or reaction.	**5.1d** Students are able to create a model that describes matter as made of particles too small to be seen.
Rationale	• Students will describe the evidence from data that properties of materials can be used to identify materials. • Students will use quantitative and qualitative data to identify materials based on their properties. • Students will measure and describe physical quantities such as weight, time, temperature, and volume.	• Students will describe that the total weights of the substances did not change, regardless of the reaction or changes in properties that were observed. • Students will identify and describe the purpose of an investigation. • Students will use quantitative and qualitative data to describe physical quantities such as weight, time, temperature, and volume.	• Students will use evidence, related to properties, to determine whether new substances are formed by mixing two or more substances. • Students will identify the change (cause) to a system (i.e., mixing of two or more substances) and quantify the result (effect). • Students will use quantitative and qualitative data to describe physical quantities such as weight, time, temperature, and volume.	• Students will develop and use models to demonstrate understanding that matter is made of particles too small to be seen. • Students will use the model to make a prediction about a phenomenon (e.g., an expanding balloon, evaporating liquids, substances that dissolve in a solvent, effects of wind).

Additional Knowledge, Skills, and Abilities (aKSAs)	• Declarative knowledge related to properties of matter • Knowledge of tools and measurements • Knowledge of units • Ability to construct a response supported with quantitative and qualitative data	• Declarative knowledge related to properties of matter • Declarative knowledge related to changes to matter (e.g., changes caused by heating or cooling can be reversed and some cannot) • Knowledge of tools and measurements • Knowledge of units • Ability to construct a response supported with quantitative and qualitative data	• Declarative knowledge related to properties of matter • Declarative knowledge related to changes to matter (e.g., changes caused by heating or cooling can be reversed and some cannot) • Knowledge of tools and measurements • Knowledge of units • Ability to construct a response supported with quantitative and qualitative data	• Declarative knowledge related to properties of matter • Understanding that systems and processes vary in size • Knowledge that a model explains or predicts
Potential Observations	• Correct calculations • Appropriate units • Correct use of quantitative and qualitative data to identify materials based on their properties • Correct use of scientific terminology • Complete and appropriate explanation that materials can be identified based on their observable and measurable properties	• Correct calculations • Appropriate units • Correct use of quantitative and qualitative data to identify materials based on their properties • Correct use of scientific terminology • Complete and appropriate explanation of relationships	• Correct calculations • Appropriate units • Correct use of quantitative and qualitative data to serve as evidence for whether the mixing of the two or more tested substances results in one or more new substances • Correct use of scientific terminology • Complete and appropriate explanation of relationships	• Correct description of relationship between components of a model • Correct explanation that matter is made of particles too small to be seen • Correct use of scientific terminology

Potential Work Products	• Use units of weight, time, temperature, and other variables to explain the relationships among different types of quantities • Use of quantitative and qualitative data to support conclusions • Identification of which measurements to take • Measurements or observations made • Description of how observations and measurements are used to identify materials based on their properties	• Use units of weight, time, temperature, and other variables to explain the relationships among different types of quantities • Use of quantitative and qualitative data to support conclusions • Identification of which measurements to take • Measurements or observations made • Description of how observations and measurements are used to address scientific questions about the conservation of the amount of matter	• Use of quantitative and qualitative data to support conclusions • Identification of which measurements to take • Measurements or observations made • Description of how cause and effect relationships are used to explain change (i.e., mixing of two or more substances)	• A representation of matter that is too small to be seen (this could be splitting something into smaller and smaller pieces, or it could be a picture of something like air going into a balloon) • Use of a model to make sense of phenomena (e.g., an expanding balloon, evaporating liquids, substances that dissolve in a solvent, effects of wind)
Characteristic Features	• All items require evidence of qualitative and quantitative thinking. • All items must prompt students to make connections between observed phenomenon or evidence and reasoning underlying the observation/evidence. • All items must elicit core ideas as defined in *Framework for K-12 Science Education* (NRC, 2012). • Students use scientific reasoning and process skills in observational (nonexperimental) investigations. • All items must include elements from at least two dimensions.	• All items require evidence of qualitative and quantitative thinking. • All items must prompt students to make connections between observed phenomenon or evidence and reasoning underlying the observation/evidence. • All items must elicit core ideas as defined in *Framework for K-12 Science Education* (NRC, 2012). • Students use scientific reasoning and process skills in observational (nonexperimental) investigations. • All items must include elements from at least two dimensions.	• All items require evidence of qualitative and quantitative thinking. • All items must prompt students to make connections between observed phenomenon or evidence and reasoning underlying the observation/evidence. • All items must elicit core ideas as defined in *Framework for K-12 Science Education* (NRC, 2012). • Students use scientific reasoning and process skills in observational (nonexperimental) investigations. • All items must include elements from at least two dimensions.	• All items must prompt students to make connections between observed phenomenon or evidence and reasoning underlying the observation/evidence. • All items must elicit core ideas as defined in *Framework for K-12 Science Education* (NRC, 2012). • Students use scientific reasoning and process skills. • All items must include elements from at least two dimensions.

Variable Features	• Properties presented (e.g., color, conductivity, magnetic, conductors) • Format of "real-world" phenomenon under investigation: image, data, text, combination • Standard units used (e.g., grams, liters) • Evidence needed to identify the substance	• Properties of substances presented • Reaction presented • Changes in properties presented during and/or after (e.g., heated, cooled, and/or mixed) • Format of "real-world" phenomenon under investigation: image, data, text, combination • Standard units used (e.g., grams)	• Properties of substances presented • Reaction presented • Changes in properties presented during and/or after (e.g., state of matter, color, texture, odor) • Format of "real-world" phenomenon under investigation: image, data, text, combination • Standard units used (e.g., grams, liters)	• Complexity of scientific concept(s) to be modeled • Function of the model: To explain a mechanism underlying a phenomenon; to predict future outcomes; to describe a phenomenon; to generate data to inform how the world work • The degree to which components of the model are provided