



Stackable Instructionally-embedded Portable Science (SIPS) Assessments Project

Grade 5 Science

Unit 1 Instructionally-embedded Assessment Task Specification Tool:

“Why Did the Balloon Fill?”

Matter and Its Interactions

July 2023

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Grade 5	Unit 1	Instructional Segment 4	Task Title: How Did the Balloon Fill?
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Unit 1: Matter and Its Interactions

Anchor Phenomenon

In this unit, we will use a scenario involving baking soda bread, but a different phenomenon could be used instead. For example, you may want to select a different yeast-less bread that is relevant to the local population. It is essential that it uses a chemical leavening agent, such as baking soda, to support making the chemical connections later in the unit (frybread, cornbread, banana bread for example). As students progress through the unit, they will revisit their explanation of the anchoring phenomenon to explain what occurred and why it occurred.

Problematization/Investigative Strategy for the Unit

Throughout this unit, students are seeking to explain a relevant phenomenon that involves molecules, changes of state, and physical and chemical changes. Students will experience other smaller phenomena that relate to these concepts and then apply their learning around those smaller-scale phenomena to the larger anchoring phenomenon.

- Why does cutting onions make you cry?
- How can we make our own salad dressing that will last over time?

Segment 4 Overview

By engaging in the practices of planning and carrying out investigations, asking questions, constructing explanations, and analyzing and interpreting data, students investigate mixing two substances that result in a new substance. Students learn how to use the properties of substances to determine whether a new substance was formed. Students then investigate whether any matter is added or lost when a new substance is formed, update their particle model to include a mixture that produces a new substance, use data analysis to explain that matter is conserved, and return to the initial anchor phenomenon to explain what went right and what went wrong.

Assessments for this segment focus on students' abilities to describe properties of substances that are mixed to form a new substance. Students are formally assessed on how they can engage with investigations, and how well they can use data to support claims that (1) a new substance was formed and (2) no matter was created, and no matter was destroyed when the new substance was formed. Students are informally assessed on these abilities as well.

Lesson Title

Lesson Description

Where Did it Go?

To introduce the idea of mixing and chemical changes, the teacher mixes baking soda (base) and vinegar/lemon juice (acid). The class measures the mass of the acid, base, and container before the reaction. As the class discusses the physical characteristics of these items, students may want to refer to What is This? for their list of physical characteristics of these two reactants. Allow students to observe the reaction and record their observations. After the reaction is concluded, measure the weight of the container and the products still in the container; then have students gather data on the physical properties. The class then generates questions they have about this mixture and what they

have seen. If students do not notice it, the teacher should use questioning to point out the change in total weight.

Using this change in weight as a talking point encourages students to consider why there was a change, ideally with students recognizing that during the reaction there were bubbles so some of it may have turned into a gas. Repeat the experiment but in a closed container; using a balloon is one way to do this. Again, gather data on the weight of the closed system, which will be the same as, or near, the weight of the system to start.

Looking at the weight and the physical properties, students find that this mixture is not like the others. To support that thinking, encourage students to consider how they would separate the mixture back. If students suggest boiling off the water to obtain vinegar, they will find that the result is to create “hot ice.” For more information about hot ice see ThoughtCo.

The class generates a series of questions about this reaction that students work to better understand over the remainder of the segment.

Students obtain information from curated resources that help explain how to determine if a new substance was formed, using properties of the substance(s) before and after. The teacher can provide this list of resources with specific questions or encourage students to engage in a more open exploration using the class-generated questions as a guide of what to look for. Teachers can refer to the core text and instructional resources at the end of the unit for potential resources as well as their core curriculum.

Students are then asked to synthesize what they learned in the information along with what they observed during the Where Did it Go? investigation to explain how they know whether a new substance was formed (i.e., a chemical reaction occurred).

What Happened?

Formal Assessment Title	Assessment Description
How Did the Balloon Fill?	The teacher demonstrates to students a chemical reaction in class in which a balloon is filled with carbon dioxide by a reaction of baking soda and an acid such as vinegar. Students gather observational and numeric data during the demonstration and then conduct additional research to understand the process of a chemical reaction that leads to the formation of products such as carbon dioxide. Students use their data and evidence from their research to write an explanation of the phenomenon and make connections back to the anchoring phenomenon.
NGSS PE(s) Code(s) & Description(s)	
5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.	

AG(s) Code(s) & Description(s)

A14. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

A17. Construct an explanation by comparing properties to determine whether mixing two or more substances results in a new substance.

Evidence Statement(s)

- Accurately identify and/or describe the evidence that supports a claim about whether or not mixing two substances results in a new substance.
 - Construct an appropriate explanation to support a claim about whether or not mixing two substances results in a new substance.
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Phenomenon or Phenomenon-rooted Design Problem

- The formation of a new substance can be identified by its properties when combining different substances.
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General Scenario Description

A student is studying the cause and effect of the formation of new substances in a science class and decides to enter a science fair to present the results of multiple experiments to determine what changes in properties may indicate that a new substance is formed.

Chain of Sensemaking

- Students watch a video and complete a data table to record observations of the properties of substances before and after mixing.
 - Students interpret provided graphical data related to temperature change to determine if a new substance is formed when substances are mixed.
 - Students interpret provided observations in a data table related to the properties of substances before and after mixing to determine if a new substance is formed.
 - Students support a provided claim by distinguishing a phase change from a chemical change (i.e., new substance being formed) and provide examples of evidence.
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Work Products

- Completion of data tables
 - Selection of response from provided choices
 - Extended response
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Application of Universal Design for Learning-based Guidelines to Promote Accessibility (<https://udlguidelines.cast.org/>)

Multiple Means of Engagement	Multiple Means of Representation	Multiple Means of Action & Expression
<ul style="list-style-type: none"><input checked="" type="checkbox"/> Context or content<input checked="" type="checkbox"/> Age appropriate<input checked="" type="checkbox"/> Appropriate for different groups<input checked="" type="checkbox"/> Makes sense of complex ideas in creative ways<input checked="" type="checkbox"/> Vary the degree of challenge or complexity within prompts	<ul style="list-style-type: none"><input type="checkbox"/> Provide visual diagrams and charts<input checked="" type="checkbox"/> Make explicit links between information provided in texts and any accompanying representation of that information in illustrations, equations, charts, or diagrams<input checked="" type="checkbox"/> Activate relevant prior knowledge<input type="checkbox"/> Bridge concepts with relevant and simple analogies and limited use of metaphors<input type="checkbox"/> Highlight or emphasize key elements in text, graphics, diagrams, formulas<input checked="" type="checkbox"/> Use outlines, graphic organizers, unit organizer routines, concept organizer routines, and concept mastery routines to emphasize key ideas and relationships<input checked="" type="checkbox"/> Give explicit prompts for each step in a sequential process	<ul style="list-style-type: none"><input checked="" type="checkbox"/> Solve problems using a variety of strategies<input checked="" type="checkbox"/> Sentence starters<input checked="" type="checkbox"/> Embed prompts to “show and explain your work”

Targeted PE(s) Code(s) and Alternate Conception(s)

- **5-PS1-4** Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
 - **Common Alternate Conceptions**
 - Physical changes are irreversible.
 - When matter dissolves or evaporates, it ceases to exist.
 - Color changes always indicate a chemical change.
 - All temperature changes that result from mixing substances indicate a chemical change.

Unit 1 Vocabulary

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| <ul style="list-style-type: none">● Matter● Substance● Solid● Liquid● Carbon dioxide | <ul style="list-style-type: none">● Gas● Properties● Solution |
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