



# Stackable Instructionally- embedded Portable Science (SIPS) Assessments Project

## Grade 5 Science

### Unit 1 Instructionally-embedded Assessment Task:

#### “How Did the Balloon Fill?”

#### Matter and Its Interactions

July 2023

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## SIPS Grade 5 Unit 1 Instructionally-embedded Assessment Task

Grade 5	Unit 1	Task Title: How Did the Balloon Fill?
<b>NGSS Performance Expectations Code(s) and Description(s)</b>		
Code	Description	
5-PS1-4	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.	
<b>Acquisition Goals Number(s) and Descriptions(s)</b>		
Number	Description	
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.	
<b>Evidence Statements</b>		
<ul style="list-style-type: none"><li>• Accurately compare and contrast properties of matter before and after combining substances.</li><li>• Accurately identify and/or describe the evidence that supports a claim about whether or not mixing two substances results in a new substance.</li></ul>		

<b>Source Documentation and Information Resources References (e.g., publications, websites, citations, images, videos, etc.)</b> Please include source name, description, citation, and a link to its original location below. Include additional rows as needed.	<b>Licensing:</b> Please mark an “X” under the appropriate licensing. If resource is not under a creative commons (CC) license, please attempt to find a source with CC licensing. If you are unable, please select other and provide additional information about the source in the source documentation section.							
	<i>CC0/ Public Domain</i>	<i>CC BY</i>	<i>CC BY-SA</i>	<i>CC BY-NC</i>	<i>CC BY-NC-SA</i>	<i>CC BY-ND</i>	<i>CC BY-NC-ND</i>	<i>Other</i>
Associated with Prompt 1: <a href="#">Baking Soda + Vinegar Balloon Experiment! - YouTube (Education.com)</a>								X
Adapted for Prompt 1: <a href="#">5-PS1-4+Mixing+Substances+(Teacher+Version).pdf (squarespace.com)</a>					X			
Associated with Prompt 1 (referenced to create graph): for Vinegar and Baking Soda reaction: Heat Up or Cool Down? <a href="https://www.youtube.com/watch?v=E4ba9X9IY_s&amp;t=308s">https://www.youtube.com/watch?v=E4ba9X9IY_s&amp;t=308s</a>								X
Referenced for Prompt 2: Bleach vs. Food Coloring Rainbow Scott Milam <a href="https://www.youtube.com/watch?v=ljUgV3gq_Ng">https://www.youtube.com/watch?v=ljUgV3gq_Ng</a>								X

## Teacher Administration Guide

### Introduction

- Educators developed the accompanying classroom task to align to one or more aspects of the NGSS Performance Expectation(s) (PEs) to determine where students are in their learning at a specific point in time during an instructional sequence. Educators will need to make intentional decisions about when and how to use this task based on their students' learning needs, the purpose of giving the task, and the intended use of the evidence gathered.
- This task is designed to measure students' ability to integrate the dimensions and demonstrate their knowledge, skills, and abilities as represented by NGSS Performance Expectation **5-PS1-4: Matter and Its Interactions**. By administering this task, educators can gather and evaluate evidence to make accurate and meaningful judgments about students' science learning and determine how instruction may need to be adjusted along an instructional sequence to best support students.
- The phenomenon addressed in a phenomenon-based scenario is the formation of a new substance that can be identified by its properties when combining different substances (PS1.B.2 and CCC2).
- In this task, students figure out how to use data related to the properties of substances gained from multiple investigations to determine if a new substance is formed.

### Administration Guidelines

- One (1) class period
- Segment 4 Lessons: "Where Did it Go?" and "What Happened?"
- Students individually complete a series of prompts reflecting the following chain of sensemaking:
  - Students watch a video and complete a data table to record observations before and after mixing substances (Experiment 1).
  - Students interpret graphical data related to temperature change to determine if a new substance is formed when substances are mixed.
  - Students interpret provided observations from before and after mixing substances to determine if a new substance is formed (Experiment 2).
  - 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.

### Accessibility Considerations

Providing a range of accessibility considerations in the task (e.g., multiple ways of representing information, multiple types of supports, multiple ways in which students respond) promotes equity and fairness across a wide range of students who may be at different points in their science learning. In turn, these considerations can promote student interest and engagement in the tasks resulting in a more complete and accurate collection of evidence of students' science learning.

Accommodations for students with a disability or Multilingual Learners that are part of their on-going instructional programs are to be provided during the administration of this task. Accommodations should be consistent with those provided in students' daily instructional strategies and assessment opportunities, including assistive technology devices if appropriate. These accessibility considerations and accommodations enable accurate inferences about student learning and inform meaningful adjustments to planning and instruction.

## Ancillary Materials

- Computer for students to view a video **all together** for Prompt 1.
  - [Baking Soda + Vinegar Balloon Experiment! - YouTube](https://www.youtube.com/watch?v=U1q4Itz_ndQ) (Education.com)  
[https://www.youtube.com/watch?v=U1q4Itz\_ndQ]

## Instructions for Administering the Performance Task or Implementing the Research Task, Design Project, or Lab

- Preview the video, “Baking Soda + Vinegar Balloon Experiment!” and identify and pre-teach any general academic vocabulary words or domain-specific vocabulary words (e.g., mixing, substances, properties). Students should have access to and document the meaning of the vocabulary words to support their interpretation and understanding of the video’s content.
- Preview the task with students so they understand the purpose of watching the video (i.e., to record observations to determine if after mixing two substances, a new substance is formed). Start the video at **00:08/1:21** and end the video at **00:50/1:21**. Note that the start and stop times are critical to ensure that information about a chemical reaction occurring is not heard or seen. Be sure to enable Closed Captions [CC].
  - It is recommended that students have the opportunity to view the video twice to ensure that they can record observations before and after mixing in Prompt 1, Data Table 1 and Data Table 2.
- Have the task available to the students as they view the video so that they can record observations.

## Scoring Guidance

- A prompt-specific scoring rubric indicates scoring criteria for each prompt or activity across a range of score points.
- Student exemplars represent high-quality responses that align to full-point rubric scores. The exemplar responses are intended to assist educators’ understanding of the nature and expectations of each prompt when applying the scoring rubric. Note the exemplars serve as examples of high-quality responses, and students may respond with equally relevant, scientifically accurate responses and ideas that meet the expectations of a full-point rubric score. In general, the exemplar response associated with the highest score point in the rubric meets expectations and is scientifically accurate, complete, coherent, and consistent with the type of student evidence expected as described in the rubric.
- The approximate scoring time for each student per prompt is:
  - Prompt 1 (Part A & Part B) will require approximately .5 minutes
  - Prompt 2 will require approximately .5 minutes
  - Prompt 3 will require approximately 1.0 minutes

## Student Task

This task is about mixing substances.

### Task Scenario

You are determining if mixing two or more substances results in a new substance in science class. You collect data from two experiments to support the claim:

**A change in the observed properties of two substances after mixing may indicate that new substances have formed.**

### Prompt 1

#### Part A.

As you watch the video, “Mixing Baking Soda and Vinegar Balloon Experiment,” record your observations of the substances before mixing in **Data Table 1** and after mixing in **Data Table 2**.

**Data Table 1. Experiment 1 Observations Before Mixing**

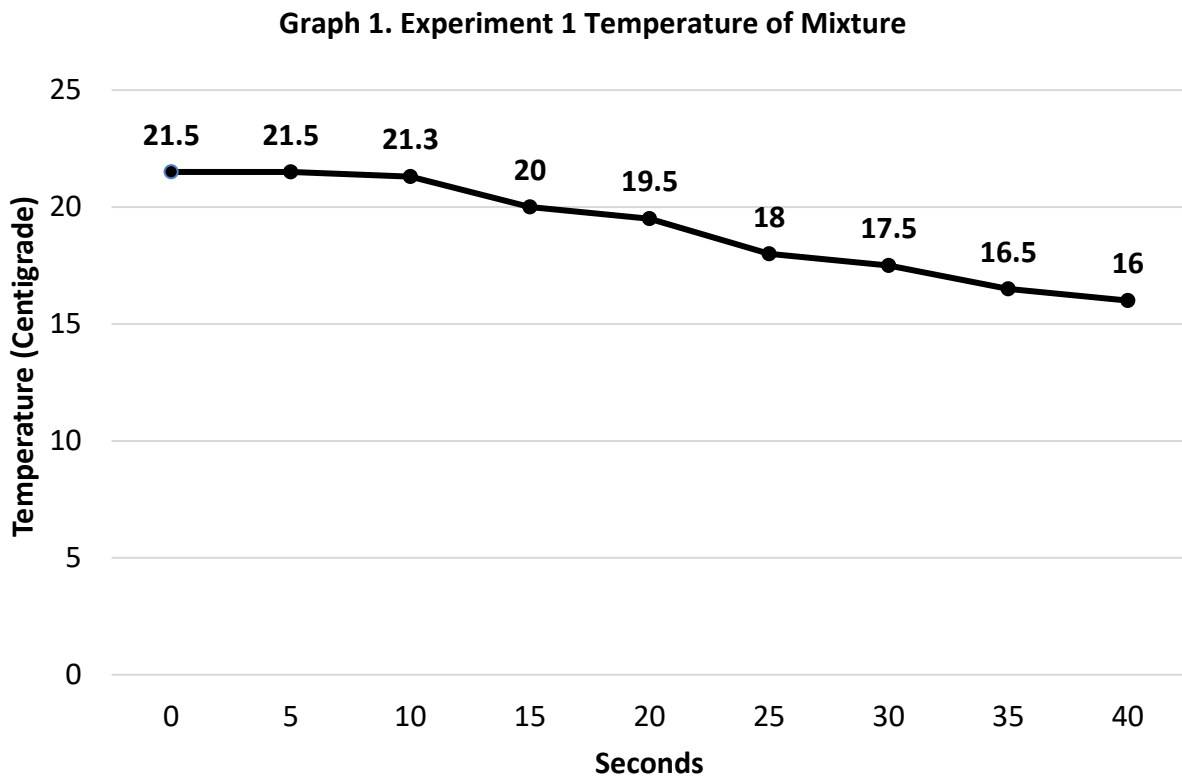
Substance	Color	State of Matter
Baking Soda		
Vinegar		

**Data Table 2. Experiment 1 Observations After Mixing**

Substance	Color	State of Matter
Solution	cloudy	mixture of liquid and solid
Carbon Dioxide		

**Part B.**

Graph 1 shows temperature data collected during Experiment 1 when mixing baking soda and vinegar.



Identify if you think a new substance was formed in Experiment 1. Use information from **Data Table 1, Data Table 2, AND Graph 1** to support your answer. **(Circle one.)**

A new substance was formed.	A new substance was <b>NOT</b> formed.
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**Prompt 2**

You conduct a second experiment that involves mixing substances together. The procedure for Experiment 2 is:

1. Fill jars 1, 2, and 3 each with 300 ml of water.
2. Add 2-3 drops of red food coloring to the water in each of the jars.
3. Stir the solution. Record the color.
4. Add 20 ml of Liquid 1 to Jar 1. Record the color.
5. Add 20 ml of Liquid 2 to Jar 2. Record the color.
6. Add 20 ml of Liquid 3 to Jar 3. Record the color.

Table 3 shows the recorded observations of Experiment 2.

**Data Table 3. Observations Collected During Experiment 2**

Jar	Added Substance	New Color	Added Liquid	New Color
1	Red food coloring	Red	Liquid 1	Red
2	Red food coloring	Red	Liquid 2	Clear
3	Red food coloring	Red	Liquid 3	Red

Identify if you think a new substance was formed in Experiment 2. Use information from **Data Table 3** to support your answer. **(Circle one.)**

A new substance was formed.	A new substance was <b>NOT</b> formed.
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**Prompt 3**

Use data from **Experiment 1** and **Experiment 2** to support the claim:

**A change in the observed properties of two substances after mixing may indicate that new substances have formed.**

The claim is supported by **Data Tables 1 and 2** from **Experiment 1** because \_\_\_\_\_

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The claim is supported by **Graph 1** from **Experiment 1** because \_\_\_\_\_

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The claim is supported by **Experiment 2** because \_\_\_\_\_

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**Task Rubric to Evaluate Student Evidence**

Task	Score Point 0	Score Point 1	Score Point 2	Score Point 3	Score Point 4	Score Point 5
<p><b>Prompt 1</b> <b>Part A.</b></p>	<p>No aspect of the response is correct</p>	<p>Response includes <b>one (1)</b> of the <b>six (6)</b> aspects</p>	<p>Response includes <b>two (2)</b> of the <b>six (6)</b> aspects</p>	<p>Response includes <b>three (3)</b> of the <b>six (6)</b> aspects</p>	<p>Response includes <b>four (4)</b> of the <b>six (6)</b> aspects</p>	<p>Response includes at least <b>five (5)</b> of the <b>six (6)</b> following aspects:</p> <ul style="list-style-type: none"> <li>• Data Table 1 identifies accurate color for baking soda</li> <li>• Data Table 1 identifies accurate color for vinegar</li> <li>• Data Table 1 identifies accurate state of matter for baking soda</li> <li>• Data Table 1 identifies accurate state of matter for vinegar</li> <li>• Data Table 2 identifies accurate color for carbon dioxide</li> </ul>

						<ul style="list-style-type: none"> <li>Data Table 2 identifies accurate state of matter for carbon dioxide</li> </ul>
<b>Prompt 1 Part B.</b>	No aspect of the response is correct	Circles "A new substance was formed."	NA	NA	NA	NA
<b>Prompt 2</b>	No aspect of the response is correct	Circles "A new substance was formed."	NA	NA	NA	NA
<b>Prompt 3</b>	No aspect of the response is correct	Response includes <b>one (1)</b> of the <b>three (3)</b> aspects	Response includes <b>two (2)</b> of the <b>three (3)</b> aspects	Response includes the following aspects as evidence that a new substance is formed when two substances are mixed: <ul style="list-style-type: none"> <li>Carbon dioxide/a gas is formed</li> <li>A change in temperature occurred</li> <li>A change in color occurred</li> </ul>	NA	NA

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## Exemplar Responses

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### Prompt 1

#### Part A.

As you watch the video, "Mixing Baking Soda and Vinegar Balloon Experiment," record your observations of the substances before mixing in **Data Table 1** and after mixing in **Data Table 2**.

**Data Table 1. Experiment 1 Observations Before Mixing**

Substance	Color	State of Matter
Baking Soda	white	liquid
Vinegar	clear	liquid

**Data Table 2. Experiment 1 Observations After Mixing**

Substance	Color	State of Matter
Solution	cloudy	mixture of liquid and solid
Carbon Dioxide	no color / none	gas

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**Prompt 1**

**Part B.**

Identify if you think a new substance was formed in Experiment 1. Use information from **Data Table 1, Data Table 2, AND Graph 1** to support your answer. (Circle one.)

A new substance was formed.	A new substance was <b>NOT</b> formed.
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**Prompt 2**

**Part A.**

Identify if you think a new substance was formed in Experiment 2. Use information from **Data Table 3** to support your answer.

A new substance was formed.	A new substance was <b>NOT</b> formed.
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**Prompt 3**

Use data from **Experiment 1** and **Experiment 2** to support the claim:

<b>A change in the observed properties of two substances after mixing may indicate that new substances may have formed.</b>
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The claim is supported by **Data Tables 1 and 2** from **Experiment 1** because after the vinegar and baking soda were mixed, carbon dioxide, a gas, was produced that filled the balloon. Carbon dioxide was a new substance.

The claim is supported by the **Graph 1** from **Experiment 1** because when the vinegar and baking soda were being mixed, the temperature of the mixture decreased. A change in temperature means a new substance was formed.

The claim is supported by the **Data Table 3** from **Experiment 2** because after Liquid 2 was added in Jar 2, there was a change in the color. The liquid went from red to clear. A change in color means that a new substance was formed.