



Stackable Instructionally- embedded Portable Science (SIPS) Assessments Project

Grade 8 Science

Unit 4 Instructionally-embedded Assessment Task:

“I Can See You, but You Can’t See Me!”

Providing Solutions to Problems Using Simple Wave Properties

August 2023

The SIPS Grade 8 Science Unit 4 Instructionally-embedded Assessment Task: “I Can See You, but You Can’t See Me!” was developed with funding from the U.S. Department of Education under the Competitive Grants for State Assessments Program, CFDA 84.368A. The contents of this paper do not represent the policy of the U.S. Department of Education, and no assumption of endorsement by the Federal government should be made.

All rights reserved. Any or all portions of this document may be reproduced and distributed without prior permission, provided the source is cited as: Stackable Instructionally-embedded Portable Science (SIPS) Assessments Project. (2023). SIPS Grade 8 Science Unit 4 Instructionally-embedded Assessment Task: “I Can See You, but You Can’t See Me!”. Lincoln, NE: Nebraska Department of Education.



SIPS Grade 8 Unit 4 Instructionally-embedded Assessment Task

Grade 8	Unit 4	Instructional Segment 3	Task Title: I Can See You, but You Can't See Me!									
NGSS Performance Expectations Code(s) and Description(s)												
Code	Description											
MS-PS4-2.	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.]											
Acquisition Goals Number(s) and Descriptions(s)												
A16.	Develop a model for the path of different frequencies of light through the interface of different media that uses the ray model of light.											
Evidence Statements												
<ul style="list-style-type: none"> Develop a model to show how the path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. 												
Source Documentation and Information Resources References (e.g., publications, websites, citations, images, videos, etc.) Please include source name, description, citation, and a link to its original location below. Include additional rows as needed.					Licensing: 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>
Download Camping Cartoon Nature Royalty-Free Vector Graphic - Pixabay - Flashlight					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 **MS-PS4-2**. 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 in this task is related to what happens to light when it hits various materials.
- In this task, students are introduced to an investigation related to a phenomenon related to light. The results are presented qualitatively and quantitatively.
- **Background information:**
 - Students previously discovered that (1) a wave is a repeating pattern and (2) for a given wave, wavelength, frequency, and amplitude are properties that do not change and can be repeated in a given time.
 - In this assessment, students will be presented with a scenario related to what happens to light when it hits various materials. The important aspect of the task is the idea that when light hits an object, some is scattered or reflected, some is transmitted, and some is absorbed.

Administration Guidelines

- One (1) class period
- Segment 3 Lesson: "I Can See You, but You Can't See Me!"
- Students individually complete a series of prompts reflecting the following chain of sensemaking:
 - Students interpret qualitative data related to the investigation of shining a light on beakers of clear and dyed water.
 - Students use the terms emitted, transmitted, absorbed, and reflected to describe the results.
 - Students apply understanding of the properties of materials to relate the interaction of different types of surfaces to various applications related to light energy.
 - Students interpret a simple data set to help them understand how to create a model that best reflects the scattering, transmission, and absorption of light by different objects.
 - Students then draw a model of two objects and light interactions using information from the provided data set.

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 student's 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

- N/A

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

- Students work independently to complete the task.

Scoring Guidance

- A task-and prompt-specific scoring rubric indicates scoring criteria for each prompt 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 this task will be 5 to 10 minutes per student.

Student Task

This task is about how light interacts with objects and materials to make things happen.

Task Scenario

When light hits an object, some is scattered or reflected, some is transmitted, and some is absorbed. The total amount of light divided between these three interactions can be shown with the equation:

$$\begin{array}{l} \text{Total light} \\ \text{hitting an} \\ \text{object} \end{array} = \begin{array}{l} \text{Scattered/reflected} \\ \text{light} \end{array} + \begin{array}{l} \text{Transmitted} \\ \text{light} \end{array} + \begin{array}{l} \text{Absorbed} \\ \text{light} \end{array}$$

Students collected evidence to show that light is transmitted through objects, and light is reflected or scattered off objects. Now they will investigate what happens when light shines on dark and clear objects.

Prompt 1

Part A.

The teacher shines a bright light on two beakers of water. One beaker contains clear water, and the other contains water dyed darkly with food coloring. A light sensor and a thermometer are used to take several measurements of the variables related to this investigation.

Variable	Clear Water	Dyed Water
Amount of Reflected Light	Some light is reflected	Very little light is reflected
Amount of Transmitted Light	Most light is transmitted	Very little light is transmitted
Starting Water Temperature	Room temperature	Room temperature
Ending Water Temperature	Slightly warmer	Warmer

1. How does the amount of light hitting the dyed water compare to the light hitting the clear water?

2. How does the amount of transmitted light in the dyed water compare to the clear water?

3. How does the final temperature of the clear water compare with the final temperature of the dyed water?

4. Which beaker of water absorbs the most light? What evidence shows this?

Part B.

Based on the students' investigation, should a device that uses light to make something happen have **more** light reflected, transmitted, or absorbed? Why?

Part C.

Have you ever seen a tall building that looks as if it were made out of mirrors? These buildings are made using reflective glass. How would replacing clear windows with reflective glass affect the temperature inside the building? Explain.

Prompt 2

Part A.

When light shines on an object, the object may absorb, reflect, scatter, or transmit the light. Reflection occurs when light hits a smooth surface and is deflected in one direction. Scattering occurs when light hits a rough surface and is scattered in all directions.

SIPS Grade 8 Science Unit 4 Instructionally-embedded Assessment Task:
"I Can See You, but You Can't See Me!"

Light from the same flashlight is shined on several objects. A light detector measures the light after it hits each object. The light detector measures light intensity with the unit of lux. The results are shown in Table 1.

Table 1. Light Scattered and Transmitted by Objects


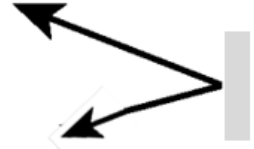
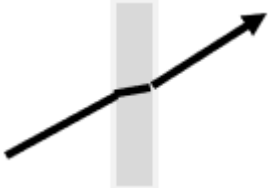

Object	Light Scattered	Light Transmitted
Jacket	131 lux	14 lux
Ice cube	450 lux	100 lux
Rock	157 lux	0 lux
Cardboard box	180 lux	2 lux

Which object absorbed the **most** light? Explain using evidence.

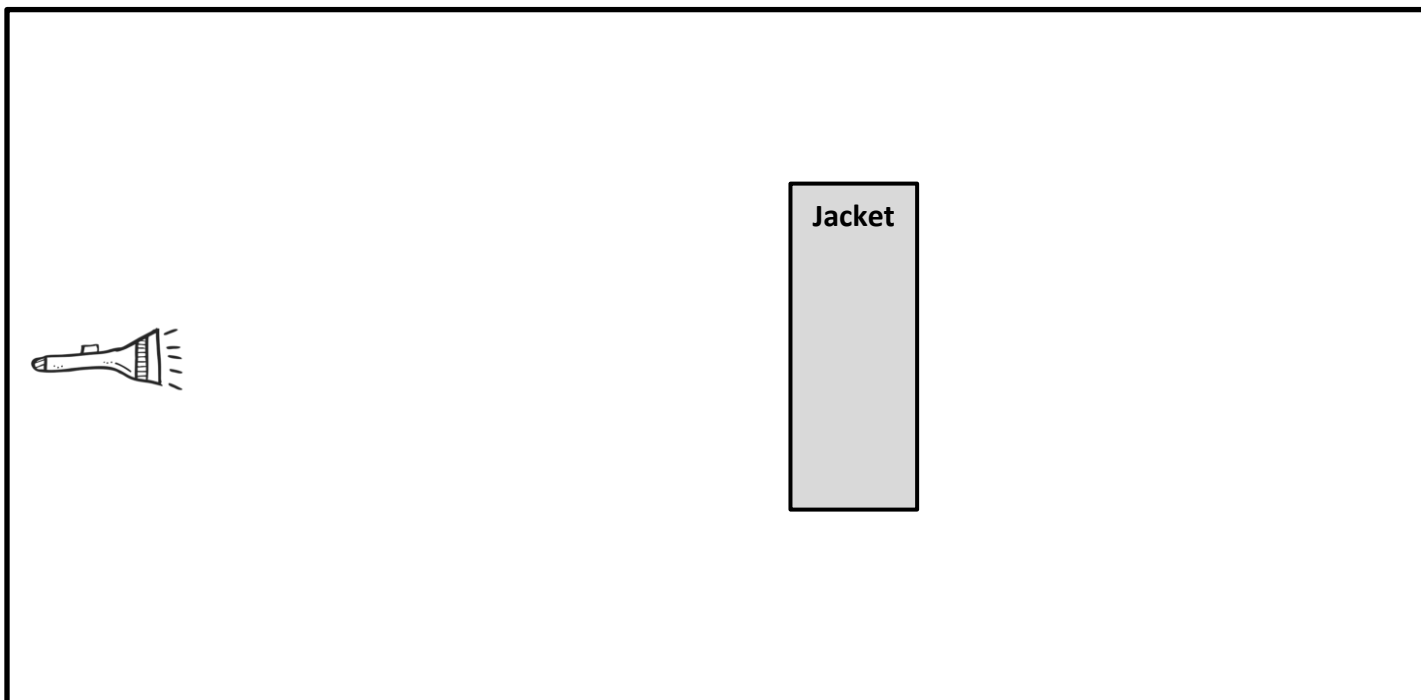
Part B.

Use the key to draw a model of two objects and light interactions described in **Table 1**.

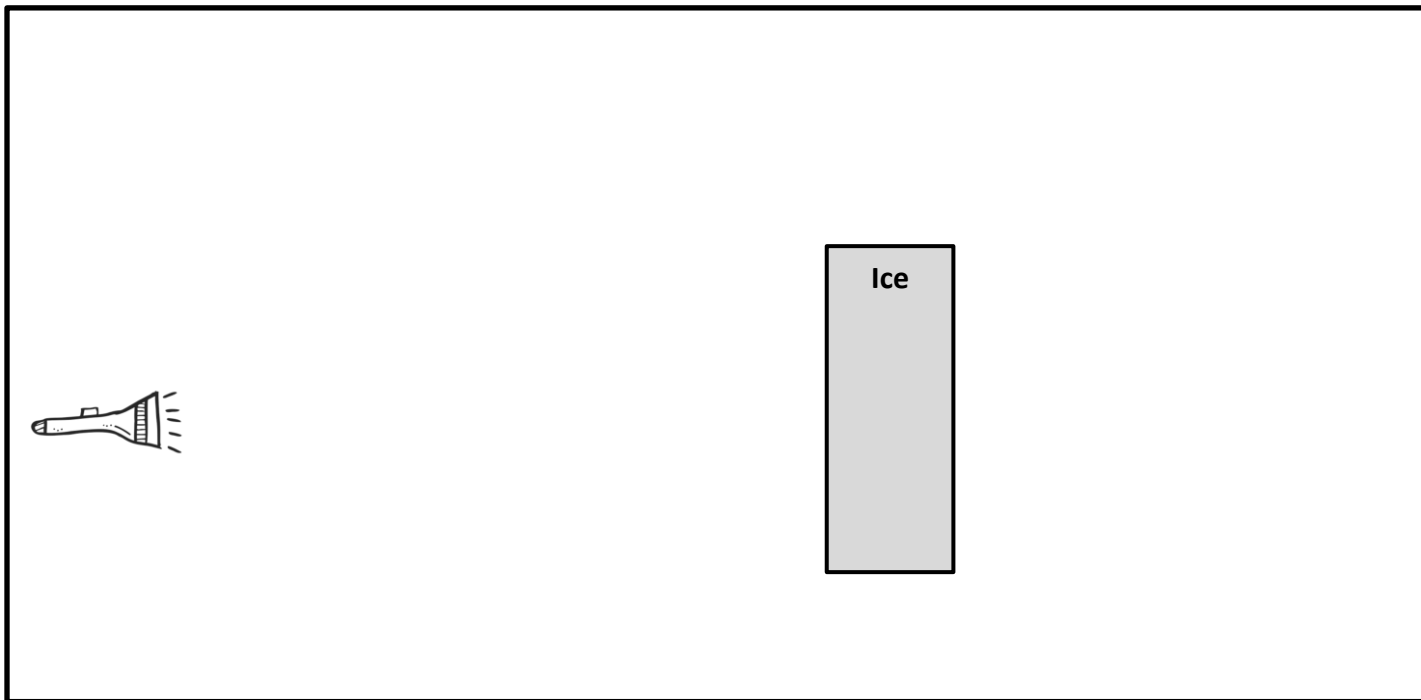
Key:

Light Path	
Scattering	
Transmission	
Absorption	

Condition 1 - Light from the Flashlight Interacting with the Jacket



Condition 2 - Light from the Flashlight Interacting with the Ice



Task Rubric to Evaluate Student Evidence

Task	Score Point 0	Score Point 1	Score Point 2	Score Point 3	Score Point 4
Prompt 1 Part A.	No aspect of the response is correct	Response includes the following aspects: <ul style="list-style-type: none"> • One (1) correct response 	Response includes the following aspects: <ul style="list-style-type: none"> • Two (2) correct responses 	Response includes the following aspects: <ul style="list-style-type: none"> • Three (3) correct responses 	Response includes the following aspects: <ul style="list-style-type: none"> • Four (4) correct responses
Prompt 1 Part B. & Part C.	No aspect of the response is correct	Response includes one (1) of the four (4) aspects	Response includes two (2) of the four (4) aspects	Response includes three (3) of the four (4) aspects	Response includes the following aspects: <p>Part B</p> <ul style="list-style-type: none"> • Most of the light must be absorbed • Evidence or example to support conclusion <p>Part C</p> <ul style="list-style-type: none"> • Mirrored glass causes most of the light to be reflected • The effect is the sun’s energy will not cause the interior of the building to heat up
Prompt 2 Part A.	No aspect of the response is correct	Response includes one (1) of the two (2) aspects	Response includes the following aspects: <ul style="list-style-type: none"> • Jacket • Explanation of how calculations made 	NA	NA

			based on light scattered and transmitted data		
Prompt 2 Part B. Condition 1	No aspect of the response is correct	Response includes one (1) of the four (4) aspects	Response includes two (2) of the four (4) aspects	Response includes three (3) of the four (4) aspects	Model includes the following aspects: Condition 1 - Jacket <ul style="list-style-type: none"> • Rays leaving the flashlight • Most of the rays are indicated as absorbed • Some rays are scattered • Very few rays are transmitted
Prompt 2 Part B. Condition 2	No aspect of the response is correct	Response includes one (1) of the four (4) aspects	<ul style="list-style-type: none"> • Response includes two (2) of the four (4) aspects 	<ul style="list-style-type: none"> • Response includes three (3) of the four (4) aspects 	Model includes the following aspects: Condition 2 - Ice <ul style="list-style-type: none"> • Rays leaving the flashlight • Most of the rays are indicated as scattered • Some rays are transmitted • Very few or no rays are absorbed

Exemplar Responses

Prompt 1

Part A.

1. *How does the amount of light hitting the dyed water compare to the light hitting the clear water?*

The same amount of light is hitting the clear water and dyed water because they were under the same light bulb.

2. *How does the amount of transmitted light in the dyed water compare to the clear water?*

The dyed water transmitted less light than the clear water.

3. *How did the final temperature of the clear water compare with the final temperature of the dyed water?*

The dyed water's temperature increased more than the temperature of the clear water.

4. *Which beaker of water absorbed the most light? What evidence showed this?*

The dyed water absorbed the most light. The same amount of light hit each beaker, but less was reflected and transmitted by the dyed water, which means it must have been absorbed.

Part B.

*Based on the students' investigation, should a device that uses light to make something happen have **more** light reflected, transmitted, or absorbed? Why?*

Most of the light needs to be absorbed to make something happen. The water with food coloring absorbs more light and becomes warmer.

*(Other responses might give examples such as a solar cooker helping light be absorbed to heat something, a solar calculator absorbing light to generate electricity, etc.)

Part C.

Have you ever seen a tall building that looks as if it were made out of mirrors? These buildings are made using reflective glass. How would replacing clear windows with reflective glass affect the temperature inside the building? Explain.

Most of the light is reflected away from the building by mirrored glass. That means the temperature inside the building will not be raised by the sun's light because the glass does not absorb the sun's energy.

Prompt 2

Part A.

*Which object absorbed the **most** light? Explain using evidence.*

The jacket absorbed the most light. The ice cube scattered the most light, 450 lux. The jacket had the lowest reading for light scattered, 131 lux, and did not transmit much light. So, it absorbed the most light.

Part B.

Use the key to draw a model of two object and light interactions described in **Table 1**.

Condition 1 - Light from the Flashlight Interacting with the Jacket

Condition 1 -

The model of light rays interacting with the jacket includes multiple rays emanating from the flashlight pointing towards the "Jacket". Most of the rays are indicated as absorbed. Some rays are scattered. Very few rays are transmitted.

Condition 2 - Light from the Flashlight Interacting with the Ice

Condition 2 -

The model of light rays interacting with the ice includes multiple rays emanating from the flashlight pointing towards the "Ice". Most of the rays are indicated as scattered. Some rays are transmitted. Very few or no rays are absorbed.

Task Notes:
