

## 1-PS4-3 Waves and Their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

- 1-PS4-3. Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.** [Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).] [Assessment Boundary: Assessment does not include the speed of light.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

### Science and Engineering Practices

#### Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct investigations collaboratively to produce evidence to answer a question.

### Disciplinary Core Ideas

#### PS4.B: Electromagnetic Radiation

- Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.)

### Crosscutting Concepts

#### Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

### Observable features of the student performance by the end of the grade:

1	Identifying the phenomenon under investigation
a	Students identify and describe* the phenomenon and purpose of the investigation, which include: <ol style="list-style-type: none"> <li>Answering a question about what happens when objects made of different materials (that allow light to pass through them in different ways) are placed in the path of a beam of light.</li> <li>Designing and conducting an investigation to gather evidence to support or refute student ideas about putting objects made of different materials in the path of a beam of light.</li> </ol>
2	Identifying evidence to address the purpose of the investigation
a	Students collaboratively develop an investigation plan and describe* the data that will result from the investigation, including: <ol style="list-style-type: none"> <li>Observations of the effect of placing objects made of different materials in a beam of light, including:               <ol style="list-style-type: none"> <li>A material that allows all light through results in the background lighting up.</li> <li>A material that allows only some light through results in the background lighting up, but looking darker than when the material allows all light in.</li> <li>A material that blocks all of the light will create a shadow.</li> <li>A material that changes the direction of the light will light up the surrounding space in a different direction.</li> </ol> </li> </ol>
b	Students individually describe* how these observations provide evidence to answer the question under investigation.
3	Planning the investigation
a	In the collaboratively developed investigation plan, students individually describe* (with support): <ol style="list-style-type: none"> <li>The materials to be placed in the beam of light, including:               <ol style="list-style-type: none"> <li>A material that allows all light through (e.g., clear plastic, clear glass).</li> <li>A material that allows only some light through (e.g., clouded plastic, wax paper).</li> <li>A material that blocks all of the light (e.g., cardboard, wood).</li> <li>A material that changes the direction of the light (e.g., mirror, aluminum foil).</li> </ol> </li> </ol>

		ii. How the effect of placing different materials in the beam of light will be observed and recorded.
		iii. The light source used to produce the beam of light.
4	Collecting the data	
	a	Students collaboratively collect and record observations about what happens when objects made of materials that allow light to pass through them in different ways are placed in the path of a beam of light, according to the developed investigation plan.