### 1-PS4-2 Waves and Their Applications in Technologies for Information Transfer

Students who demonstrate understanding can:

1-PS4-2. **Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.** [Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.]

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

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
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<tbody>
<tr>
<td><strong>Constructing Explanations and Designing Solutions</strong></td>
<td><strong>PS4.B: Electromagnetic Radiation</strong></td>
<td><strong>Cause and Effect</strong></td>
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<td>Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.</td>
<td>Objects can be seen if light is available to illuminate them or if they give off their own light.</td>
<td>Simple tests can be designed to gather evidence to support or refute student ideas about causes.</td>
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<td>• Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.</td>
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### Observable features of the student performance by the end of the grade:

1. **Articulating the explanation of phenomena**
   - a. Students articulate a statement that relates the given phenomenon to a scientific idea, including that when an object in the dark is lit (e.g., turning on a light in the dark space or from light the object itself gives off), it can be seen.
   - b. Students use evidence and reasoning to construct an evidence-based account of the phenomenon.

2. **Evidence**
   - a. Students make observations (firsthand or from media) to serve as the basis for evidence, including:
     - i. The appearance (e.g., visible, not visible, somewhat visible but difficult to see) of objects in a space with no light.
     - ii. The appearance (e.g., visible, not visible, somewhat visible but difficult to see) of objects in a space with light.
     - iii. The appearance (e.g., visible, not visible, somewhat visible but difficult to see) of objects (e.g., light bulbs, glow sticks) that give off light in a space with no other light.
   - b. Students describe* how their observations provide evidence to support their explanation.

3. **Reasoning**
   - a. Students logically connect the evidence to support the evidence-based account of the phenomenon. Students describe* lines of reasoning that include:
     - i. The presence of light in a space causes objects to be able to be seen in that space.
     - ii. Objects cannot be seen if there is no light to illuminate them, but the same object in the same space can be seen if a light source is introduced.
     - iii. The ability of an object to give off its own light causes the object to be seen in a space where there is no other light.