

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

Students who demonstrate understanding can:

- 4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.** *[Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.]*

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

Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop a model to describe phenomena.

Disciplinary Core Ideas

PS4.B: Electromagnetic Radiation

- An object can be seen when light reflected from its surface enters the eyes.

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships are routinely identified.

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

1	Components of the model	
	a	Students develop a model to make sense of a phenomenon involving the relationship between light reflection and visibility of objects. In the model, students identify the relevant components, including:
		i. Light (including the light source).
		ii. Objects.
		iii. The path that light follows.
iv. The eye.		
2	Relationships	
	a	Students identify and describe* causal relationships between the components, including:
		i. Light enters the eye, allowing objects to be seen.
		ii. Light reflects off of objects, and then can travel and enter the eye.
iii. Objects can be seen only if light follows a path between a light source, the object, and the eye.		
3	Connections	
	a	Students use the model to describe* that in order to see objects that do not produce their own light, light must reflect off the object and into the eye.
		Students use the model to describe* the effects of the following on seeing an object:
	i.	Removing, blocking, or changing the light source (e.g., a dimmer light).
		Closing the eye.
	iii.	Changing the path of the light (e.g., using mirrors to direct the path of light to allow the visualization of a previously unseen object or to change the position in which the object can be seen, using an opaque or translucent barrier between 1) the light source and the object or 2) the object and the eye to change the path light follows and the visualization of the object).