
5E Lesson on Light and Shadows, Grades 4–5

Phase	Student Behaviors/Activities
Engage	<ol style="list-style-type: none">1. In prior lessons, students were introduced to different forms of energy and their properties. In this 5E, light energy is used to promote understanding of the following vocabulary terms: heat, light energy, reflection, shadows, cast a shadow, and solar energy (the sun).2. Set-up: A lamp is plugged in and shining on a white wall or screen.3. Pose a series of questions to get students to activate prior knowledge: What do you see in the front of the room? Which form of energy is being presented? What evidence do you have from your observations?4. Ask: What will happen if you place your body between the wall/screen and the lamp? Students write their ideas in their journals and share them with the class.5. Demonstrate the above scenario with students. Ask them to name the parts of the model: the light source, their body, the wall, and the resulting shadow. Have the students move toward and away from the wall with their backs to the light. Ask: What do you notice about the reflection of light off of your body onto the wall? What do you think is causing what you see? How do you think the shadow is cast? (Place the lamp in different positions.)6. Teacher tells the story of the classroom model.
Explore	<ol style="list-style-type: none">1. Pose the following questions: What is a shadow? How do you make/cast a shadow?2. Assemble the following materials for each group: a sheet of white poster board, several stacking cubes, and a flashlight.3. Students, in groups, use the materials to create shadows using the flashlight (See Figure 1.) Turn off the classroom lights.4. Students build a tower using the cubes and position the flashlight and the poster board to create their shadows. (See journal entry in Figure 2.)5. Within groups, students describe each shadow they create and write the story of their tabletop model in their journals. Each student shares their story with group members.6. Teacher moves from group to group listening to student stories and later will read the journal entries.
Explain	<p>The following day, using the classroom and tabletop models, the teacher connects the ideas from the Engage and the Explore phases using the academic language (heat, light, energy, reflection, shadows, and casting a shadow) associated with these experiences. Students present their stories for the models they created. Lastly, ask: What role does the sun play in casting shadows? See you tomorrow.</p>
Elaborate	<ol style="list-style-type: none">1. Students go outside and replicate the classroom and tabletop models they created in the classroom.2. Materials needed: a piece of chalk, student bodies, and the sun. Ask: What do the sun and the flashlight have in common? (You now have the sun and not the flashlight as a light source.) Tell the students their challenge will be to create shadows. (Caution: Do not look directly at the sun!)3. Before going outside, students predict what their shadows will look like.4. Ask: What is the relationship between the sun and the casting of shadows? What is the relationship between the position of the sun and the shape of a shadow? What are the parts of your model?5. Students use the same model design to cast their shadows at three different times during the day (9 AM, noon, and 3 PM).6. At each time of day, students use the chalk to outline their body's shadow and record this information in their journals. (See Figure 3.)
Evaluate	<ol style="list-style-type: none">1. On the following day, students report out and explain the shadow shapes at a given time of day.2. Ask: Do you see any patterns? What do the shadows look like at 9 AM, noon, and at 3 PM? Why are they similar or different?3. Why do you think your shadow shapes differ at specific times of the day?4. Students play the vocabulary "loop."
