

Brave the Cave



Focus Question:
How is light useful?

OBJECTIVE:



Students will have fun exploring the concepts of darkness, light, and visibility. Through first-hand observations of how dark spaces can transform with light, students will gather evidence to explain how light makes things visible.

Buzzword:
Visible

MODIFICATIONS



- **To Build a Cave:** In lieu of suggested materials, students may also play the game in a dark room, closet, or create a scaled-down cave just large enough to hold their “Secret Page” and light source with a way to peek inside. Depending on space and materials, partners may build their own caves or you may build one cave as a class and students can take turns making observations inside. Caves can be constructed from any materials students have on hand. It may be helpful to send a note home ahead of the lesson so that students may gather suitable supplies from around their home.
- **Measuring tool:** Students may use a ruler or other non-standard units, such as Unifix Cubes, to measure the distance they are able to see.
- **Light Sources:** Encourage students to be creative about what light sources are available to them. Any item that produces light - a flashlight, headlamp, lantern, phone or tablet, toy, etc. can be a source of light. It is okay, and encouraged, for different students to bring different tools inside with them.

Performance Expectation: 1-PS4-2

SEP: Constructing Explanations and Designing Solutions

CCC: Cause and Effect

FACILITATING THE EXPERIMENT

Cause and Effect

As students play inside their caves, they are investigating the effect of light shining on an object.

- 1. Before the Experiment:** Read the situation and have students share what they notice and wonder about the pictures of caves in the Student Guide. Be sure that students understand a cave is a dark space, like a tunnel. Allow students to share prior knowledge of dark places, and predictions about tools that will help them explore a dark space, like a cave.
- 2. Set Up the Experiment:** Guide pairs or teams of students in selecting appropriate materials to build a cave to the size they choose. See the “Extension” for ideas of how to extend the lesson as students build their structures. Each student should create a “Secret Page” and record their color and direction choices on the “Mini-Page” on page 3 of their guide. Partners will take turns as the cave explorer and the data recorder. Have each student keep their page secret from their partner until after the games are played.
- 3. During the Experiment:** The student who is the **cave explorer** should bring a measuring tool and their partner’s unseen “Secret Page” into the cave to play the games. The **data recorder** will ask the questions on page 3 of the student guide and record their partner’s answers. Encourage students to make their best guess, even if it is difficult or impossible to see in the low-light conditions. In the light round, the cave explorer should shine their light source at the “O” on the “Secret Page”.

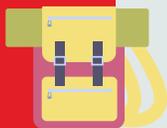
Have students switch roles until each has had a turn being a cave explorer. Allow them to discuss and compare results with their classmates. Their results should reflect that their partner was able to get more correct answers with the light source on because light made the pencils on the page more **visible**. Encourage students to explain how the absence or presence of a light source affects what is **visible** inside their cave using the results from each game as evidence.

- 4. Wrap Up:** Discuss the “What’s Going On?” questions together. Allow students to share their experience in the dark compared to in the light. Help students to use their experiences to explain how light is useful to us as humans.

WHAT'S GOING ON?

- 1. Compare your results in the dark to your results with the light source. What is different?** Possible student response: *“In the dark, I couldn’t guess the colors or directions because I could not see. When I used the light, I got the color and direction of the first three pencils right because I could see them.”* Students may have noticed that in the dark, it was challenging to see the direction and color of the pencils on the secret page. Guide students toward using specific examples or measurements to compare what they could and could not see inside their cave in the dark versus when using their light source. Point out that colors are hard or impossible to see in dark and low light, but can be seen in the light. Direction or shape of objects may have been easier to see, even in low light. When they measured how far they could see, students may have noticed that the distance from the light source affected how much of an object they could see. As they discuss, introduce the word **visible** to describe something we are able to see. Guide students in using their observations of what was visible in the dark and what was visible in the light as evidence to explain that objects can only be seen when light shines on them.
- 2. How was the light source useful to you?** Light is useful because it makes things **visible**. For humans, our eyesight is an important way to gather information about the world. We need light in order to see our food, shelter, toys, and friends. When a place is dark, humans use technology, like flashlights or head lamps, to make things **visible**.

Not all people rely on their sense of sight to navigate the world. Use this opportunity to discuss visual impairments with your students, and how these people may use other senses or other tools to navigate the world around them.



Additional Resources

CONNECT WITH US



Visit the California Science Center virtually or in person to explore this standard and extend the activity with related content.

- **Watch a free Virtual Field Trip video episode:** Join our educators as they work together to solve a tough communication problem using sound.
- **Reserve a live interactive Virtual Field Trip experience:** Invite our educators to visit your classroom virtually to explore lights and how it interacts with various materials.
- **Visit us in-person:** Visit the mole rat in the Desert Zone to learn about an animal that lives in the dark. Mole rats have adaptations to sense the world around them without light by using their senses of touch, hearing, and smell, instead of their eyesight.

Website: www.californiasciencecenter.org

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Share your students' experiments with us on social media for a chance to be featured!



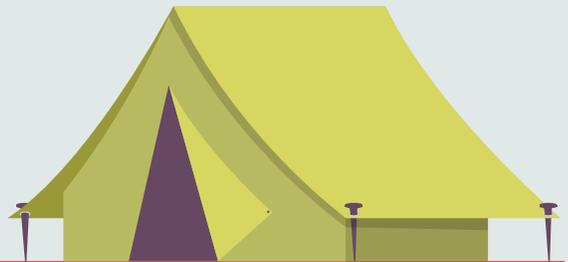
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EXTENSION



Constructing a cave from different materials creates an opportunity to discuss the effect each material has on the light that passes through it. You may wish to include a comparison of how well translucent, transparent, and opaque materials block light from reaching the inside of students' cave as they are constructing them. This addresses standard 1-PS4-3.