ACTIVITY 35

What Makes a Shadow?

BROWARD COUNTY ELEMENTARY SCIENCE BENCHMARK PLAN

Grade 1—Quarter 4
Activity 35

SC.B.1.1.2
The student knows that light can pass through some objects and not others.

SC.H.1.1.1
The student knows that in order to learn, it is important to observe the same things often and compare them.

SC.H.1.1.2
The student knows that when tests are repeated under the same conditions, similar results are usually obtained.

SC.H.1.1.3
The student knows that in doing science, it is often helpful to work with a team and to share findings with others.

SC.H.1.1.5
The student uses the senses, tools, and instruments to obtain information from his or her surroundings.

ACTIVITY ASSESSMENT OPPORTUNITIES

The following suggestions are intended to help you identify major concepts covered in the activity that may need extra reinforcement. The goal is to provide opportunities to assess student progress without creating the need for a separate, formal assessment session (or activity) for each of the 40 hands-on activities at this grade level.

1. Have students think of their rooms at home. Ask, *What are two objects in your room that will allow a lot of light to pass through? What are two objects in your room that will make a dark shadow?* Have students draw pictures of these objects and their shadows.

2. Use the Activity Sheet(s) to assess student understanding of the major concepts in the activity.

In addition to the above assessment suggestions, the questions in bold and tasks that students perform throughout the activity provide an opportunity to identify areas that may require additional review before proceeding further with the activity.

ACTIVITY 35

What Makes a Shadow?

OBJECTIVES

Students explore a variety of opaque, translucent, and transparent objects to find out which will make a shadow and which will not.

The students

- note that light passes through some objects and not others
- predict whether or not certain objects will produce shadows
- observe that objects produce light shadows, dark shadows, or no shadows, depending on how much light they allow to pass through them

SCHEDULE

About 40 minutes

MATERIALS

For each student

1	Activity Sheet 35

For each team of four

2	batteries, C-cell
1	book*
1	cup, plastic
1	flashlight with bulb

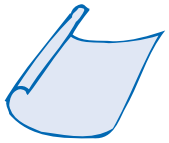
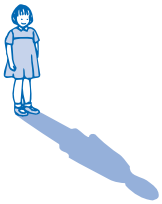
For the class

1	bag, clear, plastic, reclosable
1	box, cardboard*
1 roll	plastic wrap
	water, tap*
1 roll	waxed paper
	Delta Science Reader, *Sunshine and Shadows*

*provided by the teacher

PREPARATION

1. Make a copy of Activity Sheet 35 for each student.
2. Prepare the room so that it can be darkened as much as possible.
3. Put two C-cells in each flashlight. Test the flashlights to make sure they produce a bright beam of light. Place the flashlights in the center of desks or tables in front of a flat wall. The wall surface should be suitable for casting a shadow. The flashlights should be positioned far enough away from each other that light from one flashlight will not interfere with the shadow being cast at another flashlight.
4. Fill each cup half-full with water.
5. Cut a square of plastic wrap and a square of waxed paper, each about 30 cm × 30 cm (12 in. × 12 in.), for each team of four.
6. Make a chart on the board like the one shown in Figure 35-1.
7. Each team of four will need a flashlight, a book, a cup half-full of water, a square of plastic wrap, and a square of waxed paper. You will need to borrow these last four items from one of the teams for a demonstration.

				
 Does light pass through it?				
 Does it make a shadow?				

▲ ***Figure 35-1.*** *Record students' responses in a chart like this.*

BACKGROUND INFORMATION

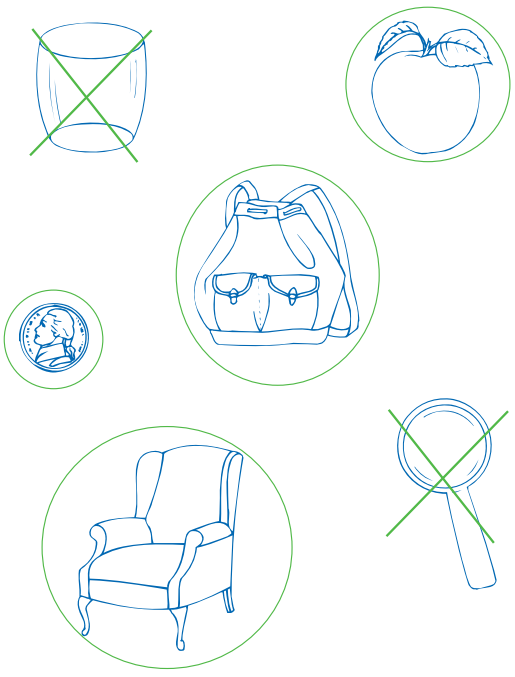
An ***opaque*** object is one that completely blocks light. Because they do not allow light to pass through them, opaque objects cast dark shadows. Most objects are opaque.

A ***transparent*** object is capable of transmitting light so that bodies situated on the opposite side are clearly visible, as if there were no intervening material. A glass window is an example of a transparent object. Transparent objects cast essentially no shadows at all.

A ***translucent*** object permits light to pass through, but diffuses it so that bodies situated on the opposite side are not clearly visible. Translucent objects cast faint shadows. Some examples of translucent objects are waxed paper, window shades, lampshades, shower curtains, and some plastics.

▼ **Activity Sheet 35**

What Makes a Shadow?



Guiding the Activity

	Additional Information
1 Tap on the wall and the window. Ask students, **What is the difference between these two objects?**	*Accept all reasonable suggestions at this time. Students may suggest many ideas, but lead them to conclude that light can pass through one and not the other.*
Hold up a clear plastic bag and a cardboard box. Ask students, **What is the difference between these two objects?**	*Accept all reasonable suggestions at this time. Students may suggest many ideas, but lead them to the answer that light can pass through one and not the other.*
2 Hold up a book and ask, **Can light go through this book?**	*Students should say no.*
Show the students the chart on the board. Explain that the first row, next to the flashlight, will show whether or not light passes through the object shown in that column. Record the students' answer by writing "no" below the book in the first row of the chart.	
Hold up in turn a cup of water, a sheet of waxed paper, and a sheet of plastic wrap. For each one, ask, **Can light go through this?**	*Students should suggest that light can go through all of these objects. If some students answer no, take the object up close to them so they can try to see through it.*
Record the students' answers in the first row of the chart.	
3 Again hold up the book. Ask, **Do you think this book can make a shadow?**	*Students should say yes.*
Again, hold up in turn the cup of water, the sheet of waxed paper, and the sheet of plastic wrap. For each one ask, **Do you think this can make a shadow?**	*Students may say yes or no. Do not confirm or deny their responses at this time.*
4 Tell students that they will work in teams to find out which objects can produce shadows. Assign each team of four to a flashlight.	*You may wish to have older students or adult volunteers help with this activity.*

Guiding the Activity

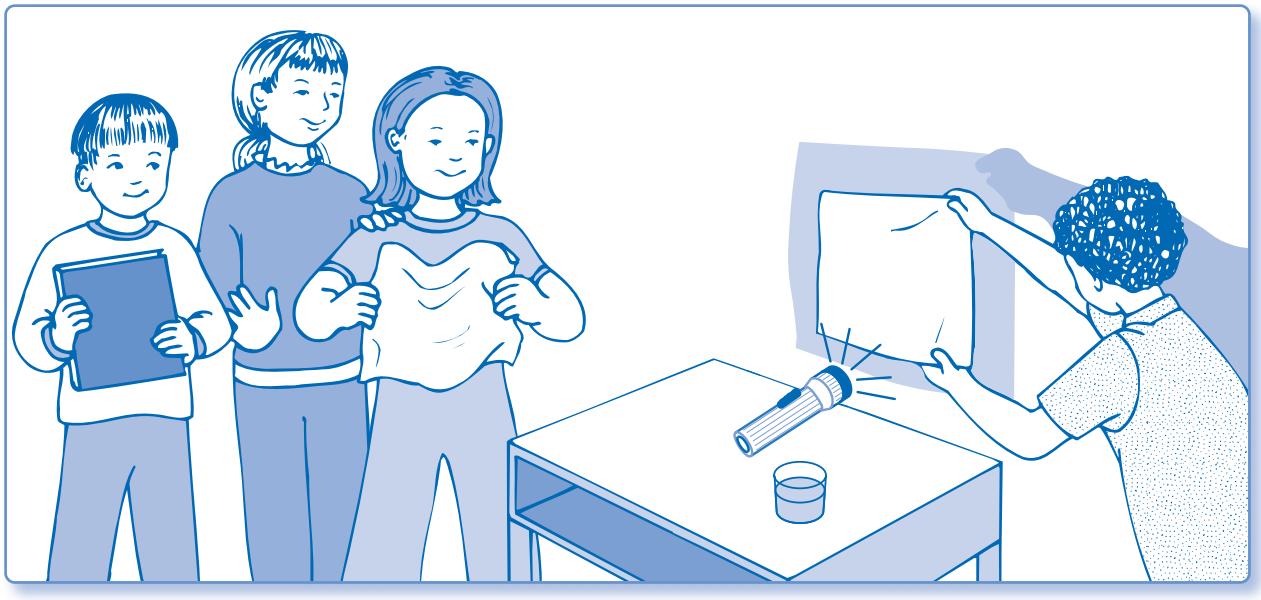
Additional Information

Give each team of four a book, a cup of water, a sheet of waxed paper, and a sheet of plastic wrap. Ask students, **How can you find out if these objects can make shadows?**

Students should say that they can turn on the flashlight and then hold each object a few inches away from the wall, within the area where the light shines on the wall.

Darken the room. Tell students to find out which objects can make shadows. Instruct them to pay attention to how dark the shadows are.

Instruct students to make sure the plastic wrap and waxed paper are spread out flat, rather than balled up, when testing them (see Figure 35-2).



▲ ***Figure 35-2.*** *Students testing objects to see if they cast shadows.*

5

Turn the room lights back on. Ask students, **What did you learn about the book? Can it make a shadow?**

yes

Ask, **Is the shadow light or dark?**

Students should note that the book casts a dark shadow.

In the second row of the chart, below the book, shade in a dark shadow.

6

Ask the students about each of the other objects they tested.

Students should note that the cup of water and waxed paper cast faint shadows, and the plastic wrap casts almost no shadow at all.

Guiding the Activity

Guiding the Activity	Additional Information
Record the students' answers by shading in light shadows below the cup of water and the sheet of waxed paper, and even lighter shadows below the plastic wrap in the second row of the chart.	
7 Ask students, Can all objects make a shadow?	*no*
Ask, **How can you tell whether or not an object will make a shadow?**	*Students should conclude that if light cannot pass through an object, it will create a shadow. If light can pass through an object, it will create a faint shadow or no shadow.*
8 Ask, **What is an example of an object that lets light pass through it?**	*the plastic wrap, a glass window, and so forth*
Ask, **Do these objects create shadows?**	*Some create no shadows and others create faint or pale shadows.*
Ask, **What is an example of an object that does not let light pass through it?**	*Students may mention the book, the cardboard box, the wall, and so forth.*
Ask, **Do these objects make shadows?**	*yes*
9 Give each student a copy of **Activity Sheet 35.** Tell students to circle objects that they think will create a dark shadow. Tell them to draw an ✘ on objects that they think will make a faint shadow or no shadow at all.	
Review the students' answers with them.	
Challenge students to identify which objects let light pass through them and which do not.	*The glass and the magnifying lens let light pass through them; the apple, knapsack, chair, and nickel do not.*
10 As appropriate, read or review pages 3 and 4–7 of the Delta Science Reader *Sunshine and Shadows*.	

Reinforcement

Provide students with the objects pictured on the activity sheet. Have them review their predictions of what type of shadow each object will produce and then test their predictions.

Science Journals

Have students place their completed activity sheets in their science journals.

Cleanup

Have students pour out the water and leave the cups to air dry. Discard the squares of plastic wrap and waxed paper. Return the flashlights, batteries, and rolls of plastic wrap and waxed paper to the kit.

Connections

Science Challenge

Give each team about 20 squares of waxed paper. Tell students to begin with one layer of paper and observe its shadow, then add more layers one by one to see how the shadow changes. Ask students to explain why the shadow becomes darker as more layers are added. (Each layer blocks some of the light. More and more light is blocked as additional layers are added.)

Science Extension

Provide a variety of other objects and materials for students to test as described in the basic activity. Appropriate transparent materials include clear acetate (such as report covers), Plexiglas™ (available from hardware or building supply stores), and clear plastic and glass bottles and other containers. Appropriate translucent materials include sheer fabrics of different weights, tracing paper, tissue paper, and "frosted" drinking glasses (glass or plastic), medicine bottles, and plastic shower curtain liners.

Science and Health

Ask whether any students in the class have ever had an X-ray picture taken when they hurt themselves. If so, let students describe the experience. Explain that the X rays used to take pictures of the body are a special kind of light that people cannot see. Unlike regular sunlight, X rays can pass through skin, muscles, and many other body parts. However, X rays cannot pass through bones and teeth because those body parts are too thick and heavy. In an X-ray photograph, the bones or teeth show up as white shadows against a darker background. Try to obtain a few X-ray photographs, and mount them on the classroom windows so students can examine them.

Science, Technology, and Society

- Ask students to identify things that people use to make shadows (shade) on purpose so they can protect themselves from the sun's heat. Students might mention devices such as window shades, blinds, or curtains indoors, window awnings outdoors, beach or patio umbrellas, hats with brims, tents, and the like. If students live in an area where houses and other buildings are designed with window overhangs that help shield the interior from sunlight, point out these building features to students.
- As appropriate, encourage supervised use of the Internet for research projects related to the sun, sunshine, and shadows. A list of related websites is provided in the References and Resources section.