

Shadow Drawings

BROWARD COUNTY ELEMENTARY SCIENCE BENCHMARK PLAN

Grade 1—Quarter 4

Activity 34

SC.B.1.1.2

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

SC.H.1.1.5

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

SC.H.2.1.1

The student knows that most natural events occur in patterns.

ACTIVITY ASSESSMENT OPPORTUNITIES

The following suggestions are intended to help 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. Ask, *Was the silhouette of your hand larger or smaller than your real hand?* (larger) *What would happen to the shadow if you moved your hand closer to the light?* (Students should be able to predict that the shadow will get even larger. Let them test this for themselves.) *How could you make your hand silhouette almost exactly the same size as your real hand?* (by holding it very close to the wall) *Would you be able to make the silhouette smaller than your real hand? Why, or why not?* (No. I'd have to move my hand farther away from the light, and I can't get it any farther away than the wall.)
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 opportunities to identify areas that may require additional review before proceeding further with the activity.

Shadow Drawings

OBJECTIVES

Students create shadow drawings of their hands and compare their shadows with their hands.

The students

- ▶ learn the correct order of the three things necessary to produce a shadow
- ▶ identify a silhouette
- ▶ make silhouettes of their hands
- ▶ compare their hand-silhouettes with their actual hands and note their similar shapes

SCHEDULE

About 40 minutes

VOCABULARY

silhouette

MATERIALS

For each student

- 1 Activity Sheet 34
- 1 crayon, black*
- 2 shts paper, construction, white
- 1 pair scissors*

For each team of four

- 2 batteries, C-cell
- 1 flashlight with bulb

For the class

- 1 bottle glue
- 1 Lincoln Profile Silhouette

- 4 pennies*
 - 1 roll tape, masking
- Delta Science Reader, *Sunshine and Shadows*

*provided by the teacher

PREPARATION

- 1 Make a copy of Activity Sheet 34 for each student.
- 2 Prepare the room so that it can be darkened as much as possible.
- 3 Put two C-cell batteries in each flashlight. Test the flashlights to make sure they produce a bright beam of light. Place the flashlights on desks or tables in front of a flat wall. The wall surface should be suitable for casting a shadow. The flashlights should be positioned about 0.5 m (1.5 ft) from the wall and far enough away from each other that light from one flashlight will not interfere with the shadow being cast by another flashlight.
- 4 Each student will need two sheets of white construction paper, a black crayon, and a pair of scissors. Each team of four will need a flashlight and access to glue and masking tape.
- 5 You will need the Lincoln Profile Silhouette. The silhouette is in the kit. It is also included as a copymaster following Activity Sheet 34.

BACKGROUND INFORMATION

A **silhouette** is a shadow-like drawing consisting of the outline of something, often a human profile, filled in with a solid color. A

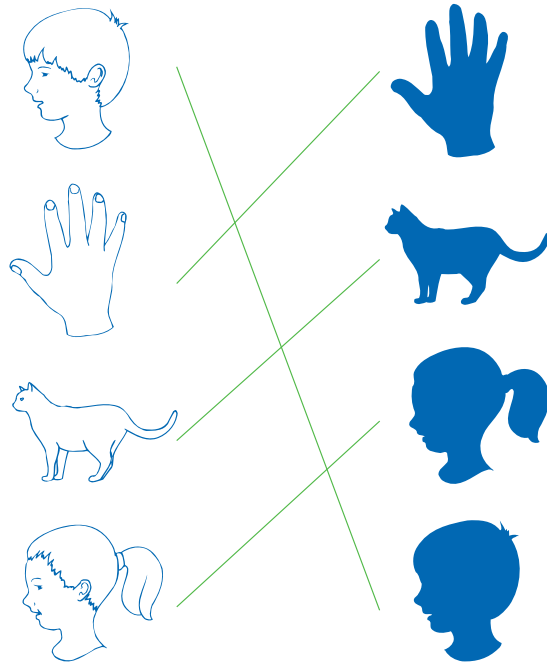
silhouette does not show the distortions sometimes seen in a true shadow; instead, it very closely matches the outline of the object itself. This effect is achieved by the careful positioning of the object in relation to the light source.

Although profile portraits are the best known silhouettes, outlines or shadow shapes of inanimate objects can also be silhouettes.

In this activity, students will trace the outline of a shadow to create their silhouette drawings. In doing so, they will learn that the three things necessary to produce a shadow must occur in precisely this order: light, object, surface. A shadow is formed only when a light source shines on an object in such a way that the object blocks the light, and a dark shape is cast upon a surface.

▼ Activity Sheet 34

Shadow Drawings



Guiding the Activity

Additional Information

1 To review Activity 33, ask students, **What three things do we need in order to make a shadow?**

Students may say these three things are necessary: sunshine, an object, and a surface for the shadow to fall upon.

Ask, **Is the sun the only light that can make a shadow?**

Students will probably say no.

2 Shine a flashlight onto the wall. Ask, **Can this flashlight be used to make a shadow?**

Students will probably say yes.

Ask, **How can a shadow be made with this flashlight?**

Answers may vary.

Darken the room and have a volunteer hold his or her hand between the flashlight and the wall. Ask, **Can you see a shadow?**

Students should say yes.

Guiding the Activity

- 3 Ask, **What three things are we using to make a shadow in the classroom?**

Ask students, **What is the order of these three things?**

Tell students that a shadow can only be formed when the order of these three things is as follows: light, object, surface for shadow to fall on.

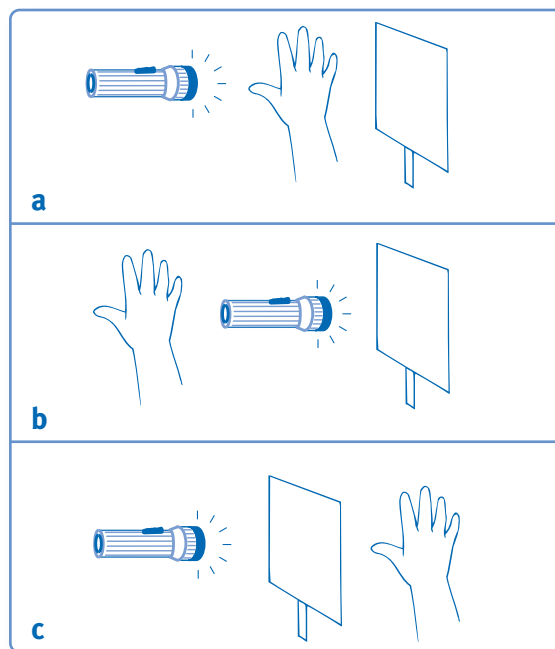
Turn the room lights back on, and sketch the drawings in Figure 34-1 on the board. Have students identify which will create a shadow on the screen.

Additional Information

a flashlight, an object to block the light (hand), and the wall as a surface for a shadow to fall upon

Students should note that the object is between the light and the surface that the shadow falls upon.

Only drawing a with the order: light/hand/screen will create a shadow.



▲ Figure 34-1. Which will make a shadow on the screen?

- 4 Show students the Lincoln Profile Silhouette. Ask, **What do you see in this picture?**

Ask students, **Do you know who the man is in the picture?**

Students will probably say they see the head of a man.

Some students may know that it is Abraham Lincoln and that Lincoln was a president of the United States.

Guiding the Activity

If students do not guess the correct identity, tell them that the man in the picture is Abraham Lincoln, who was once a great president of the United States. Tell students that Lincoln's picture is on the penny, and pass the pennies around for the students to look at.

Hold up the Lincoln Profile Silhouette again, and ask students, **Can you see how this picture and the picture on the penny look alike?**

Tell students that the type of picture you are holding is called a *silhouette*. Write this word on the board and explain that a **silhouette** is a shadow-like image that looks very much like an outline of the actual object. Explain that silhouettes are made by drawing or tracing the outline of something, then filling in the outline with a solid color.

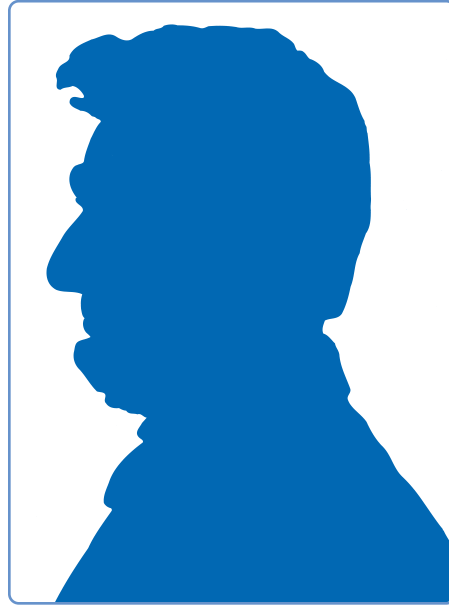
5 Tell students that they will make shadow drawings, or silhouettes, of their hands. They will make the silhouettes by drawing around the shadow of their hand to create an outline, then coloring in the image, and finally cutting it out.

Give each student two sheets of white construction paper, a pair of scissors, and a black crayon.

Divide the class into teams of four. Assign each team to a flashlight.

Additional Information

▼ Lincoln Profile Silhouette



Allow students to describe the similarities they have noticed.

The best-known silhouettes are profiles of people.

Guiding the Activity

- 6 Tell students that each one of them will take a turn at making a shadow drawing of his or her hand.

Darken the room once again. Tell one student in each team to turn on the flashlight.

Have a second team member tape a sheet of construction paper onto the wall in the area where the light is shining on the wall. Then have the same student hold his or her arm about 10 cm (4 in.) away from the paper, so that a shadow of the hand and wrist falls on the paper. Tell these students to spread their fingers so the shadow clearly shows a hand.

Have a third team member trace the shadow with a crayon.

Have a fourth team member color in the outline so that it is solid black (see Figure 34-2).

Have the first student cut out the silhouette of the hand and glue it onto the second sheet of white paper.

Provide time for each student to make a hand silhouette.

Additional Information

If necessary, help students adjust the angle of their hands until the shadow is sharp.

Have students write their names on the white paper below their hand silhouettes.



▲ **Figure 34-2.** A student creates a silhouette of her hand.

Guiding the Activity

7 Ask students, **What did you make?**

Ask, **What has a similar shape to the silhouette?**

Tell each student to place his or her hand next to his or her silhouette. Ask, **Do the silhouette of your hand and your real hand look the same?**

Tell students that, with the setup they used, an object will make a shadow that has approximately the shape of the outline of the object.

Turn the room lights back on and give each student a copy of **Activity Sheet 34**. Instruct students to draw a line from each object to its silhouette.

Review the students' answers with them.

8 As appropriate, read or review pages 3 and 4–7 of the Delta Science Reader *Sunshine and Shadows*.

Additional Information

a silhouette of a hand; a shadow drawing

Students should say that one of their hands has a similar shape.

Students will notice that the basic shape is the same, but the silhouettes may be bigger than their hands.

REINFORCEMENT

Have students place other objects between the flashlights and the wall to create different silhouettes. For best results, encourage them to use simple objects with easily identifiable outlines. For each object used, tell students to compare the silhouette drawing to the outline of the actual object.

SCIENCE JOURNALS

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

CLEANUP

Have students discard their paper scraps and put away the tape and glue. Return the flashlights and batteries to the kit.

SCIENCE AT HOME

Encourage students to use the activity setup at home to make silhouette drawings of their family members' hands. Have them compare the hand silhouettes and look for similarities in palm shape, finger length, and so on.

Connections

Science Extension

Make (or ask some of your more capable students to make) a number of distinctive silhouettes of common objects—for example, a toy car, a spoon, a toothbrush, a shoe, a small stuffed animal, a leaf, and a coffee cup—using the technique described in the basic activity. Mount each silhouette on white paper, and arrange the silhouettes on a bulletin board to create a “Mystery Silhouettes” display. Let the class try to identify the object used to make each silhouette. As a more difficult challenge, include one silhouette that could have been made by several different objects. For example, a simple circle could be the silhouette of a ball, a dish, an orange, or any other circular or round object.

Science and the Arts

► Students could make silhouettes of their heads and faces using the same technique they used to make hand silhouettes. The student whose silhouette is being drawn should sit sideways between a bright flashlight and a sheet of white paper taped to the wall while another student traces around the first student’s shadow. (If students cannot trace a facial contour accurately, set up one “silhouette station” in the room for students to go to one by one, and have an older student or adult volunteer do the tracing. Students also may need some help holding the tracing firmly on a sheet of black paper while cutting around it.) A silhouette mounted on heavy white paper or mat board makes a nice gift for a family member or friend. Before students take their silhouettes home, however, display them in the classroom for a few days so students can try to identify which classmate is shown in each silhouette.

► As a follow-up to Science and Social Studies below, have students make a classroom mural of spray-painted hand silhouettes similar to those made by ancient peoples. Obtain a roll of heavy, brown paper (to represent a rock surface), and attach a long strip of it to a wall or bulletin board. Fill several spray bottles with a solution of washable colored paint mixed with water. Let each student use a spray bottle to make a silhouette of one hand. (*Note:* If students have difficulty operating the spray bottle while holding the other hand against the “rock surface,” have them work in pairs, with the second student doing the spraying. Also make sure students wear a smock to protect their clothing.) Help each student label the painted silhouette with his or her name. When the mural is completed, have each student attach his or her black-paper silhouette above the spray-painted silhouette for comparison and contrast.

Science and Social Studies

In Australia, Europe, the American Southwest, and other areas throughout the world, ancient peoples made silhouettes of their hands on rock formations and cave walls, often to accompany larger paintings with apparent symbolic significance. Obtain books and magazines with colored photographs of such paintings for students to examine. Point out that these hand silhouettes were made not with shadows but with ancient forms of paint: The person held his or her hand against a rock surface and then sprayed paint at it. (One archaeologist has shown that the paintings’ creators may have applied the paint with their mouths, first chewing charcoal or other pigment to mix it with saliva, then “spitting” the mixture in repeated short bursts.) Explain that we do not know for sure what the paintings meant to the people who made them. Encourage students to offer their own ideas about why ancient peoples made such pictures.

