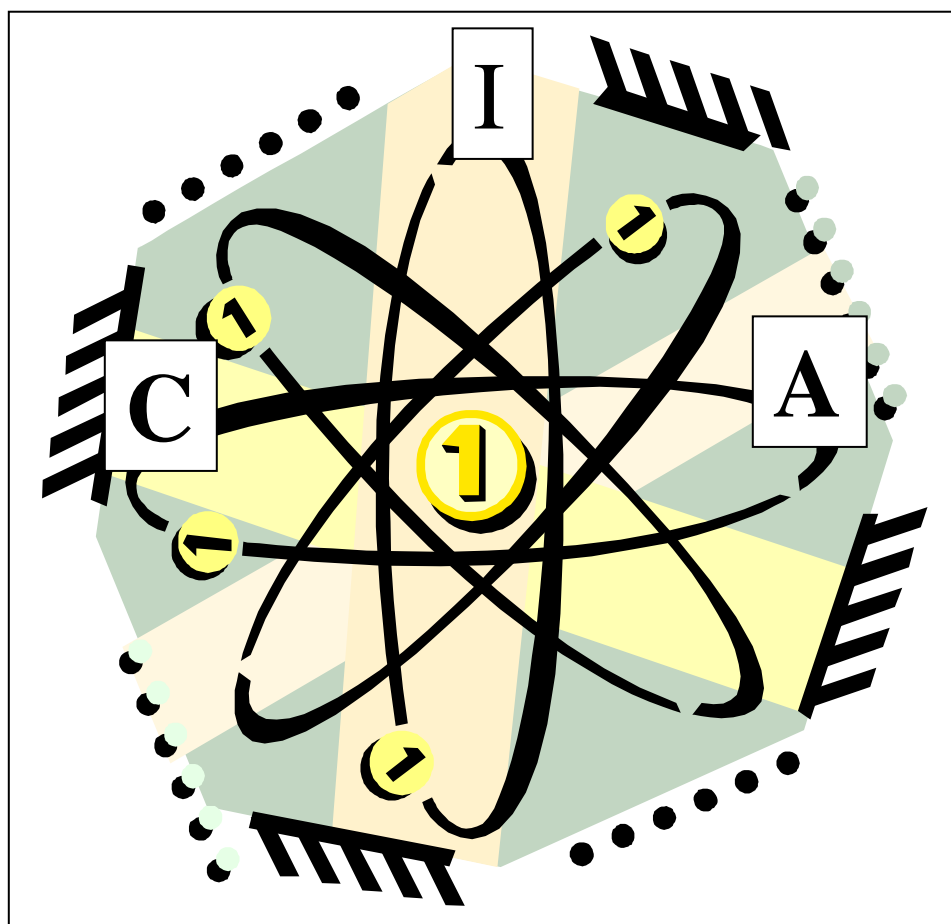


# Curriculum, Instruction, Assessment (CIA) Alignment

## Science, Grade 1 Unit 4: Light and Shadow

### Task Analysis and Hands-on Investigations



**Ronald Blocker, Superintendent  
Orange County Public Schools  
Orlando, Florida**

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**Subject Area:** Science  
**Strand B:** Energy  
**Grade:** 1

**Benchmarks**

SC.B.1.1.1: The student knows that the Sun supplies heat and light energy to Earth.  
SC.B.1.1.2: The student knows that light can pass through some objects and not others.

<b>TASK ANALYSIS</b>	
<b>The student...</b>	
<b>LIGHT AND SHADOW</b>	
• identifies several sources of light, including artificial light and sunlight.	
• identifies the sun as the primary source of light energy and heat energy.	
• creates shadows by blocking light.	
• tracks and measures, using nonstandard units, the sun’s shadow throughout the day and notes the changes.	

# HERE COMES THE SUN!



## **BENCHMARK and TASK**

**SC.B.1.1.1:** The student knows that the Sun supplies heat and light energy to Earth.

- The student identifies several sources of light, including artificial light and sunlight.

## **KEY QUESTION**

What are the sources of light?

## **BACKGROUND INFORMATION**

There are several common sources of light. The primary source of light is the sun. The sun is essential to life on earth. The energy from the sun is changed to heat energy that warms the earth. There are other natural sources of light such as fire and lightning. Artificial light can be produced by bulbs and lasers.

## **MATERIALS**

### **Teacher**

shadow box (shoe box or similar box with lid)

*Our Sun* (Benchmark Education Co.)

*Light* (Benchmark Education Co.)

### **Per group**

shadow box

### **Per class**

various artificial sources of light: overhead projector, flashlight, matches, candle, light bulb, etc.

various other materials which do not produce light (scissors, pencil, plant, book, shoe, etc.)

yarn

2 labels: *items that produce light*

*items that do not produce light*

drawing paper

crayons

## **TEACHING TIPS**

Prepare a shadow box: cut a small hole, 1-2 inches wide, in the lid of the box and another smaller hole in one end of the box. The teacher may want to make one box for each group.

## **ENGAGE**

Show children the shadow box. Demonstrate by putting an object like a teddy bear counter in the box and let students experiment by covering the hole on the top of the box to determine if they can see the object without light. Let them choose other small objects to test in the shadow box.

## **EXPLORE Part 1**

Give each group a shadow box and a small assortment of objects.  
Have them explore by testing each object.

## **EXPLAIN**

Ask:

*Could you see the items when you covered the hole on the top of the box? Why?*  
*What did you have to do to see the object in the shadow box?*

## **EXPLORE Part 2**

1. Ask students to sit in a circle on the floor. Display items that produce light and items that do not produce light together in the center of the circle.
2. Allow students to name and describe the objects.
3. Form two circles with yarn. Label one circle *items that produce light* and the other circle *items that do not produce light*.
4. Students sort objects into the labeled circles.
5. Allow the class to suggest changes in the sorting arrangement until everyone agrees about the arrangement.
6. Encourage students to suggest and draw pictures of other items that are not in the collection (sun, lightning). Add these to the circles.

## **EXPLAIN**

Through the following questions, reinforce the concept that there are many sources of light.

Ask:

*How do we use light?*

*Where do we get light when we are indoors?*

*Where do we get light when we are outdoors?*

*How does the earth get its light?*

Read *Light* and discuss the many sources of light.

## **EXTEND/APPLY**

Students can relate light to their everyday life by discussing power outages.

Ask:

*Have you ever had lights go out in your house?*

*How did it affect you?*

*What did you do?*

*Why do we need light?*

Read *Our Sun* and discuss why the sun is so important to us.

# SHADOW TRACKERS



## **BENCHMARKS and TASKS**

**SC.B.1.1.1** The student knows that the Sun supplies heat and light energy to Earth.

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

- The student creates shadows by blocking light.
- The student identifies the sun as the primary source of light energy and heat energy.
- The student tracks and measures, using nonstandard units, the sun's shadow throughout the day and notes the changes.

## **KEY QUESTION**

How do shadows change?

## **BACKGROUND INFORMATION**

There are several common sources of light. The primary source of light is the sun. The sun is essential to life on earth. The energy from the sun is changed to heat energy that warms the earth. There are other natural sources of light such as fire and lightning. Artificial light can be produced by bulbs and lasers.

Light travels in straight lines. The speed of light is 186,000 miles per second. When light strikes an object, it may go through the object, be blocked by the object, or it may be reflected by the object. Shadows are made when light is blocked. Shadows can be influenced by the source of light, the object that blocks the light, and the surface that receives the shadow.

## **MATERIALS**

### **Per student**

chalk

nonstandard measuring units such as lots-o'-links or interlocking cubes

## **TEACHING TIPS**

1. This activity needs to be started in the morning on a sunny day.
2. Prior to the activity, locate a paved spot outdoors where students can trace their shadow.

## **ENGAGE**

1. Read the following poem to the students:

### MY SHADOW

My dark little shadow  
likes to tag along.  
I walk in the shade,  
then it's all gone.

The silly little shadow  
Who copies me,  
Follows me around  
and can't be free.

Me and my shadow  
like to play around.  
I see it on the wall  
and sometimes on the ground.

by *Deirdre Englehart and Beth Compton*

2. Tell the students that they are going outdoors to find their shadow and to see if it changes during the day.
3. Ask: *What do you think creates shadows?*

### **EXPLORE**

1. Take the students to the predetermined paved area outdoors and demonstrate with one student how they should trace their shadows. Be sure that the foot positions are traced so that students can stand on the same spot for later drawings.
2. Have students write their names and the time of day by their shadow outlines.
3. Show students how to use their cubes or links to measure the length (head to toe) of their shadow. Record the number of units by "the time of day" near their shadow.
4. Explain to students that they will be drawing their shadows two other times during the day. They will record the time of day, and then measure and record the length of their shadows.
5. After students have completed their drawings and recordings, allow them to investigate their shadows by making the shadows move. Some interesting movements to suggest:
  - Make your shadow walk beside you.
  - Make your shadow fat, then thin; long, then short.
  - Make your shadow disappear.
  - Make your shadow shake hands with a partner.
  - Make your shadow stand on top of someone else's shadow.
6. After students have measured their third shadow, tell them to keep their links or cubes together and take them back to the classroom.

### **EXPLAIN**

1. Make sure students have had the opportunity to trace their shadows three different times during the day. After they have completed the third tracing, remain outside and ask the following questions to reinforce the concept that shadows change:  
*In what ways did your shadow change?*  
*At what time of the day was your shadow the longest?*  
*At what time of the day was your shadow the smallest?*  
*What do you think your shadow would look like two hours from now?*  
*What is creating the shadows?*  
*What do you think is causing the shadow to change?*

*When you were playing with your shadow, how did you make it disappear?*

*Why is it important to do this activity on a sunny day?*

*Do you face the sun or have your back to the sun to see your shadow?*

2. Help students understand that the sun is now in a different position relative to the earth and that, as the day progresses, the shadows will keep changing.

### **EXTEND/APPLY**

Explain that before clocks were invented, people told time by the position of the sun in the sky. They used a device called a sundial. The sundial was similar to the shadow clock they made today.

### **EXTENSION**

With the links or cubes saved from the third shadow measurement, have students order them from shortest to longest and make comparison statements such as:

*My shadow is the same length as Tony's shadow.*

*Sandra's shadow is longer than my shadow.*

*My shadow is shorter than Sandra's shadow.*

*Mary's shadow is in the middle.*

*There are 8 students with shadows shorter than Mary's.*

*There are 8 students with shadows longer than Mary's.*

### **ASSESSMENT**

Have students identify the three things (light, something to block the light, and something on which the shadow can fall) needed to make a shadow.

# SHADOW SHENANIGANS

## BENCHMARK and TASK

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

- The student creates shadows by blocking light.

## KEY QUESTION

How are shadows made?



## BACKGROUND INFORMATION

Light travels in straight lines. The speed of light is 186,000 miles per second. When light strikes an object, it may go through the object, be blocked by the object, or it may be reflected by the object. Shadows are made when light is blocked. Shadows can be influenced by the source of light, the object that blocks the light, and the surface that receives the shadow.

## MATERIALS

### Teacher

flashlight

opaque, transparent, and translucent material

white cardboard (to be used as a screen)

class chart

3 pieces of tag board (8 ½ x 11 each)  
(see **Teaching Tips**)

### Per group

flashlight

white cardboard (to be used a screen)

items to be tested

plastic cup

pencil

book

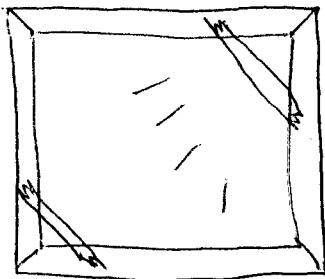
tissue paper

glass of water

wax paper

## TEACHING TIPS

1. To use clear plastic wrap as the **transparent** material, make a frame from an 8 ½ x 11 piece of tag board. Attach a piece of plastic wrap to the frame with tape as shown in the illustration. Be sure that material fills the entire frame opening. The same thing can be done with wax paper for testing **translucent** material. Use an 8 ½ x 11 piece of cardboard as **opaque** testing material.



2. When conducting the test, darken the room as much as possible.

**ENGAGE**

Have students seated in small groups. Turn off all the lights, making the room as dark as possible. Focus a flashlight beam on the cardboard screen. Place the transparent frame between the light source and the screen. Have students make observations about the light reaching the screen. Continue the investigation by placing the translucent frame and then the opaque cardboard between the light source and the screen. Each time, have the students make observations about the amount of light reaching the cardboard screen.

**EXPLORE**

1. Distribute flashlights and other materials to small groups.
2. Darken the room and allow students to determine whether or not light passes through an object by shining a flashlight on objects and observing whether or not the light reaches the cardboard screen.
3. Students should group items into two categories:  
*lets light through*  
*does not let light through*
4. Students should name the objects that let light pass through and those that did not.
5. Bring class together to discuss their findings.
6. Record responses on a class chart.

<u>Lets light through</u>	<u>Does not let light through</u>

**EXPLAIN**

Develop the concept of shadows with the following questions.

*Did the light pass through all the objects?*

*Did some objects let the light pass through partially?*

*What happens when light can't go through an object?*

Using a flashlight, put your hand between the light and a screen.

Ask:

*Can light go through a person?*

*What do you see on the screen when my hand is in front of the light?*

*If you are outside and the sun shines on you, what will you see on the ground?*

*How are shadows made?*

*What three things are needed to make a shadow? (light, something to block the light, and something on which the shadow can fall)*

Allow groups the opportunity to make shadows with their “objects that do not let light through.”

## **EXTEND/APPLY**

Ask:

*What objects at home let light shine through?*

*What objects at home do not let light shine through?*

*How do objects that block light help us?*

Encourage students to discuss how items such as window shades, lampshades, awnings, sunglasses, umbrellas, and car shades help them.

## **ASSESSMENT**

In a center, have a flashlight, three frames: transparent, translucent, and cardboard, and some objects for students to determine whether or not light passes through an object. Students can classify on their paper the objects that allow light to pass through and those that do not.