

Literacy-Based Science Task

Big Idea/ Topic (Science)

Shadows and the Earth's rotation

Reading/ Writing Skills

Reading Skills: Using diagrams and illustrations to support understanding
Identify the main idea

Writing Skill: Use transition words to show sequence

Standard Alignment

Science Standard:

S2E2. Obtain, evaluate, and communicate information to develop an understanding of the patterns of the sun and the moon and the sun's effect on Earth.

b. Design and build a structure that demonstrates how shadows change throughout the day.

ELA Standards:

ELAGSE2RI7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.

ELAGSE2RI2: Identify the main topic of a multi-paragraph text as well as the focus of specific paragraphs within the text

ELAGSE2W3: Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure.

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Pre-Reading: Shadow Drawings

Activity 1: Shadow on the Wall

Students will use a flashlight to explore making shadow puppets on the wall of the classroom. Use your hands or different size balls to make shadows which appear as dark spots. Ask what you notice about the dark spots made on the wall? What do you wonder? Ask if there was a difference between the dark spots if they were closer to the light or farther away from the light. Ask if they know what the dark spots are called.

Discuss with students as a whole group to help them obtain background knowledge of what shadows are. Use the handout, [“Making Shadows”](#) to guide students.

Activity 2: Shadows during the Day

Have students work in pairs. Use the handout [“Shadows during the day”](#) for students to record their observations. The pair will write a claim (prediction) of what they think their shadow will look like using descriptive language, (long, short, tall, skinny, fat, etc.). In the morning, the pairs will walk outside to a sunny concrete area (sidewalk, basketball court). One student will stand while the buddy uses chalk to trace their shadow. Then the next student will do the same. They will label their shadow with a name, or number to know which shadow belongs to them. Students will return to their classroom and under their prediction, explain that in science a prediction is often referred to as a claim, they will write any observations they have of their morning shadow. As close to noon as possible, make another claim about what the shadow will look like when they stand in it again. Using another color of chalk, have students stand in their shadows and repeat the process again. Allow them to talk once again about what they have observed and allow time to record their observations. Close to the end of the day, have students repeat the process. Upon returning to the class, students will write their final observations. Have a whole group discussion about their observations.

Ask students:

1. What is a shadow?
2. How do you think shadows are formed?
3. What did your shadow look like in the morning?
4. What did your shadow look like midday (lunch)?
5. Was there a change in your Shadow?
6. What kind of change did you observe?
7. What did your shadow look like in the afternoon?
8. What is different about your shadow from the morning, noon and now?

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9. When were your shadows the longest?
10. Why do you think your shadows were longer during the morning and late in the afternoon?
11. Why do you think your shadow was short during the middle of the day (noon)?
- 12.. Why do you think shadows made by the sun change throughout the day?

Chart observations noting that as the day progressed the shadow seemed to move in an arc throughout the day. Relate this observation to the Sun rising in the East and setting in the West.

Activity 3: The Earth Turns

This activity will require a light source (lamp, flashlight, cell phone light), globe and a lump of clay or a sticky note.

Step 1: Set up your light source.

Step 2: Place the sticky note or clay on the portion of the globe where you are located (USA-Georgia).

Step 3: Face the sticky note or clay side towards the light. Slowly turn the globe. If you are using a sticky note, make small marks on the sticky note as the globe turns. You will make a mark where the light seems the brightest on each turn.

Ask students: What do you notice as the sticky note/clay moves away from the light source? This question may be asked several times as the globe is turned slowly.

At the point when the sticky note/clay is totally turned away from the light source ask students: What time of day do you believe it is when the Earth is in this position?

As you continue to turn the globe toward the light source again, ask students: What do you believe the time of day is now?

Step 4: Have a class discussion. Ask students:

1. When we first began to turn the globe, how did the light appear to hit the sticky note/clay?
2. As we turned the globe, how did the light appear to hit the sticky note/clay?
3. When the sticky note/clay was facing totally away from the light, what did you notice about the light on the sticky note/clay?
4. When the globe makes a complete turn, what did you notice about the light on the sticky note/clay?



Reading: Changing Shadows

(Introduce the Reading) Tell students that they have observed what happens to shadows over the course of a day. Now they are going to read about why our shadows behave that way.

Reading Skill: Using diagrams and illustrations to support understanding

Give students the article “Casting Shadows.” Before you read, point out the diagrams in the text. Tell students that in science writing, diagrams often help the words make more sense. When the article says, “look at the diagram,” students should pause in their reading and compare what they see to what the words are saying. You may wish to read this with your class and pause to look at the diagrams together. Instruct students to track with their finger as they read so they can find where they are after they look at each diagram.

Reading Skill: Identify the main idea

This reading will be the second reading for the students. The idea of this reading is to have the students highlight or underline in the text the reason that shadows change shape during the day. This could be an independent or a paired reading activity. Tell students exactly what they are looking for by saying “As you read Changing Shadow highlight or underline the parts of the text that tell

1. What causes shadows to change shape?
2. When do shadows change shape?

Post-Reading: Opinion Writing

Writing Skill: Use transition words to show sequence

Activity 1: Build a Shadow Structure

Have students make a shadow using a fixed light source and a movable object such as a block, a shape cut out of paper, or their hand. Have them change the angle or position of the object, shape, or their hand to show that the shadow can change size according to where the light’s path is blocked.

Have students build a structure using paper, cardboard, or other materials. A handout [Build a Shadow Structure](#) is included. Have them draw or photograph the structure and tell or draw what they think the shadow will look like early in the morning, in the middle of the day, and late in the afternoon. Check to see that the students understand how the position and length of the shadow changes according to the sun’s position in the sky. Encourage them to go out and check their explanation and correct any misunderstanding.

Have them change the shape of their structure and ask them to explain if the shadow will change and how.

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Discuss what they observe and relate it to the position of the sun in the sky and the size of their shadow.

Ask: When was your shadow the longest? When was it the shortest?

Caution: Remind students to never look directly at the sun.

Activity 2: Write about your shadow structure

Tell students that they are going to write a description of how their shadow structure works. They should include at least four parts in their writing: what happens early in the day, what happens in the middle of the day, what happens late in the day, and what makes the shadows change.

This is a great opportunity to help students with transition words that signal timing. Remind students that they can use words like first, second, third, next, then, and finally to help their reader understand what they are saying. Tell students that these words are usually followed by a comma if they are used at the beginning of a sentence. You can use the pre-writing template "[My Sun Structure](#)" to help students plan their writing.

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Print Ready Student Sheets

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Making Shadows



Directions:

Draw what you observed during the activity in the box below.

What did you see?

Fill in the following sentence:

When the flashlight moved closer to the object _____

_____ happened to the
dark spot on the wall.

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Shadows During the Day

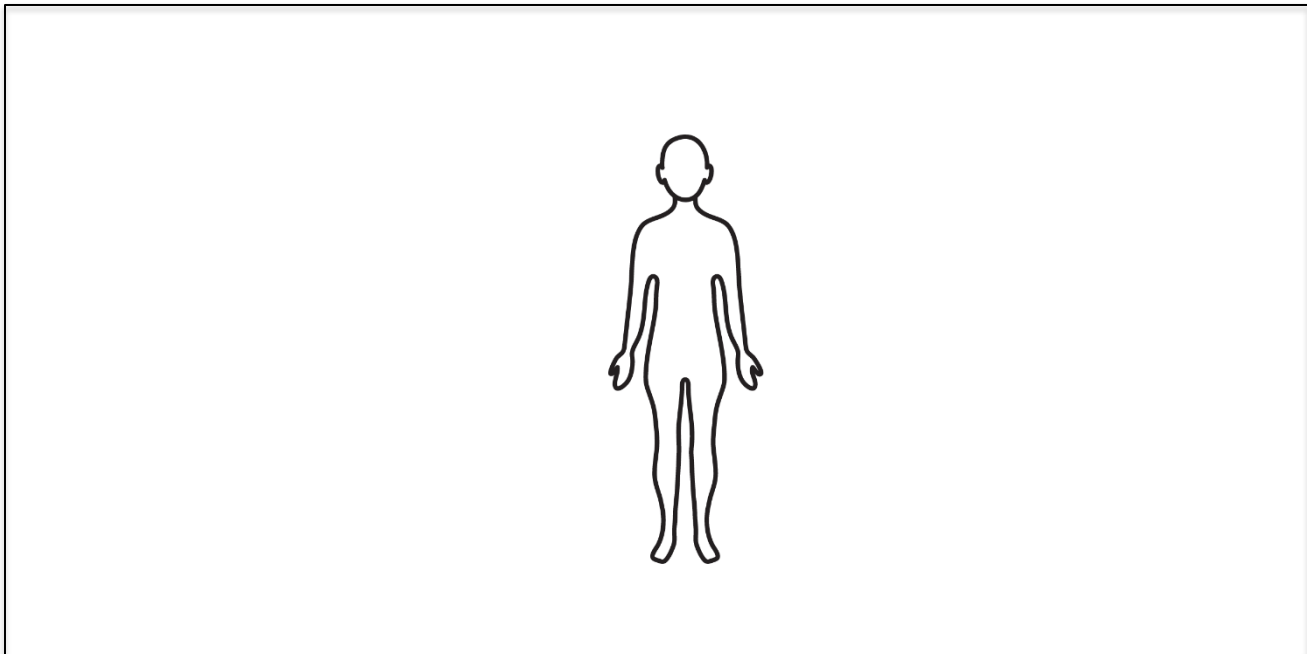
Descriptive Words			
Long	Short	Tall	Skinny
Wide	Small	Large	

Use the descriptive words to make a claim about your shadow at different times during the day.

Morning

Claim: My shadow will be _____ in the morning.

Now draw what you saw outside below



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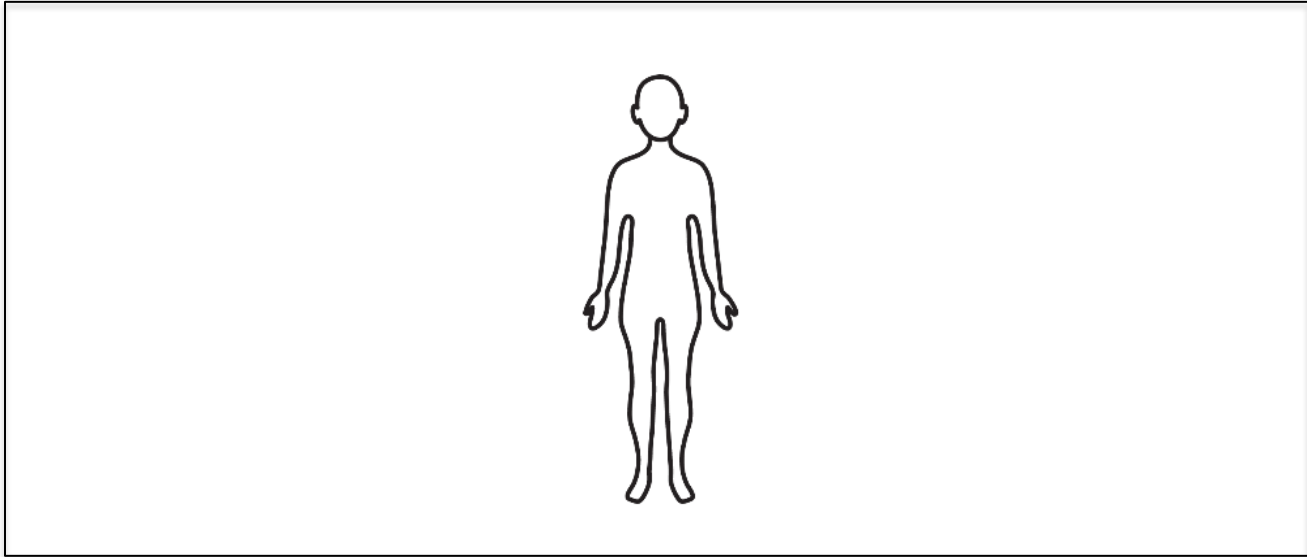
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Midday

Claim: My shadow will be _____ in the middle of the day.

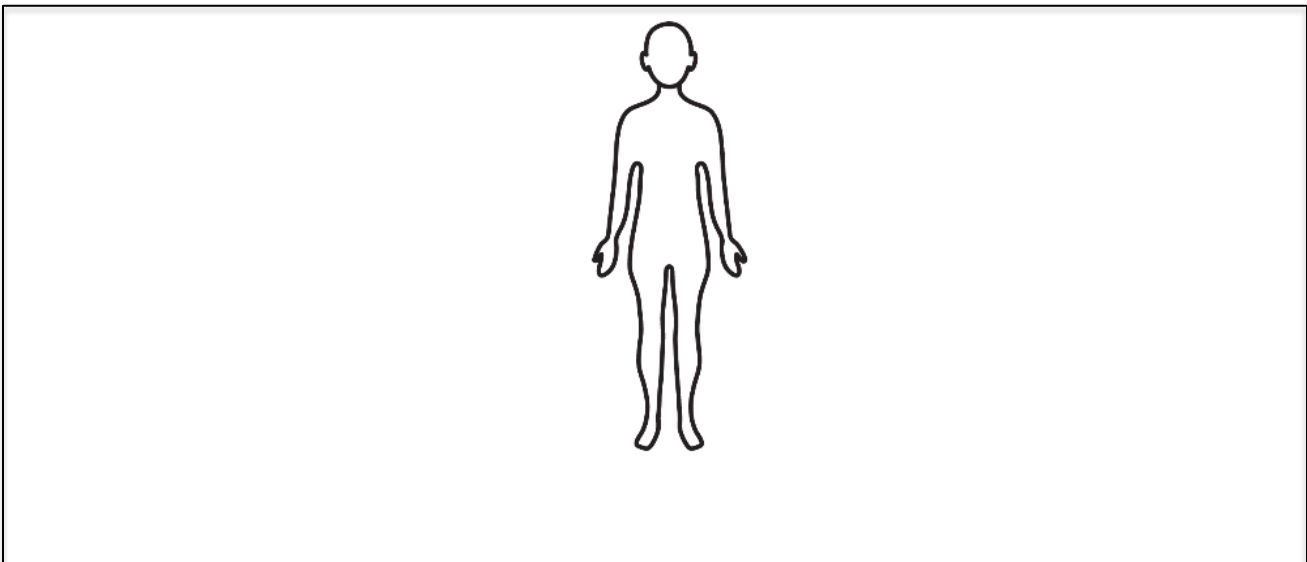
Now draw what you saw outside below



Afternoon

Claim: My shadow will be _____ in the afternoon.

Now draw what you saw outside below



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Build a Shadow Structure

Name _____ Date _____

Directions: How can you measure how shadows change throughout the day? Design a structure to measure the shadows. Use the questions below to help you design your structure.

1. What materials will you need to build your structure?
2. How did the strength of the materials help you in building the structure?
3. Where will you put your shadow structure?
4. Will your structure receive sunlight throughout the day? Record the times that you checked to see.
5. Draw a picture of the structure. Use different colors to show how the shadow changed as the angle of the sun changed by drawing the shadow at three different times of the day.



6. At the bottom of the drawing, label the different colors of the shadows with the times you drew them.



7. How did the shadows change throughout the day? (fill in the sentences below with your observations.

Transition Words for Timing			
First	Second	Third	Next
Then	Meanwhile	Later	Finally

Describe what happens to the shadow of your sun structure at each time of day. Pick a word from the word bank to include in your sentence. Then use what you know about the sun and the Earth to explain why it happens.

Pick a transition word to put here!

In the morning

<p>_____ ,</p> <p>Transition word</p>	<p>_____</p> <p>_____</p> <p>What happed with the shadow?</p>
<p>This happens because _____</p> <p>_____</p> <p>Why did your shadow appear this way?</p>	

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In the middle of the day

<hr/>	<hr/> <hr/>
<p>This happens because _____</p> <hr/>	

In the afternoon

<hr/>	<hr/> <hr/>
<p>This happens because _____</p> <hr/>	

Print Ready Article

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Changing Shadows

Stand outside in the sun. You can see your shadow. Your shadow is the dark shape where your body blocks the sunlight.



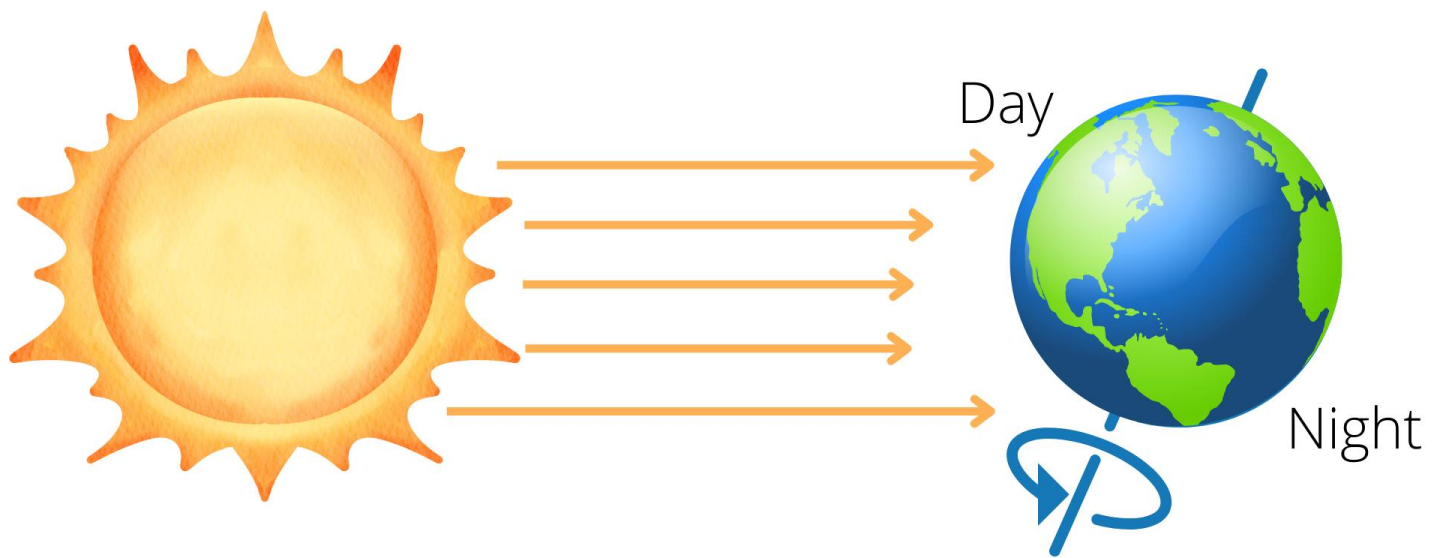
Notice that your shadow does not exactly match your body. In the morning you have a long, skinny shadow. It may look like a superhero. At noon your shadow will be short. It may look like a puddle around your feet. Late in the afternoon, your shadow will be the long, thin superhero again. This time, your superhero self will be facing the other direction! Your body does not change like that. So, what is happening with your shadow?

Look at the diagram below. It shows that the Earth is turning. It takes one day for the Earth to rotate all the way around. The sun does not move. But from Earth, it looks like the sun is moving. It looks like the sun comes up in the East. The sun rises and gets higher and higher in the sky. Then it looks like the sun moves down. The sun sets in the West.

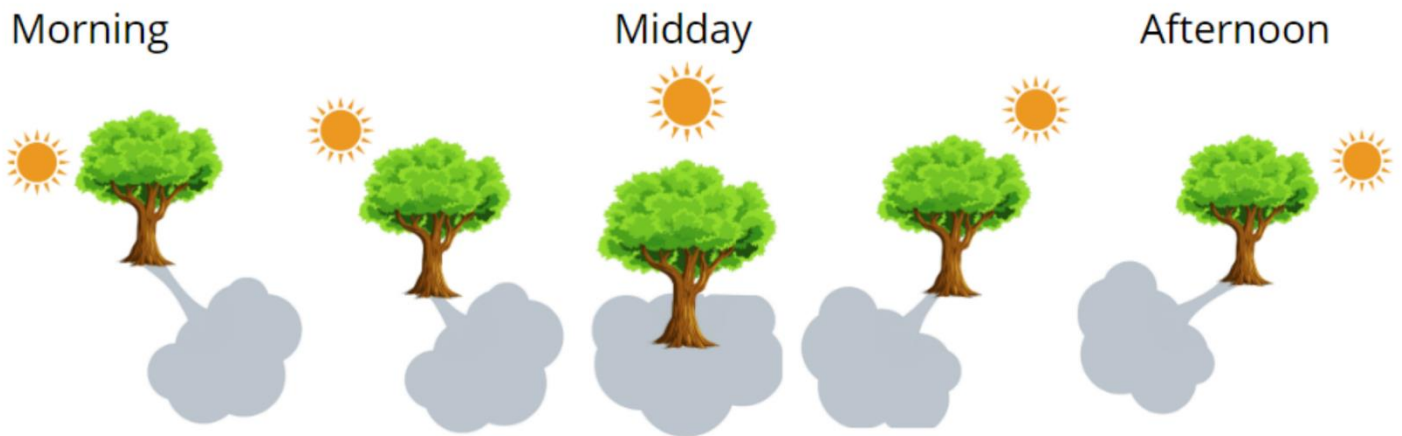
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As the sun appears to move, our shadows change. Look at the next diagram. When the sun is low in the sky, the tree blocks a lot of the light. Its shadow is long. As the sun gets higher, the tree blocks less light. The shadow gets shorter.



In the middle of the day, the Earth has rotated to face the sun completely. The sun appears directly overhead. Notice that the shadow of the tree is like a puddle. Only the top of the tree is blocking the light.

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As the Earth continues to rotate, the shadow will shift again. It will grow longer. But it will face the other direction as the sun sets.

You can watch your shadow change. You can watch a tree's shadow change. Shadows change because the Earth rotates and faces the sun from different directions.

