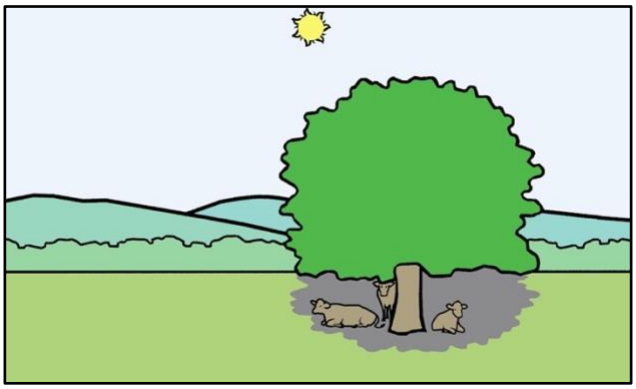
Sun, Shadow, and Shade

Students will learn how sun, shadow, and shade affect the Earth's surface using the story booklet "Sun, Shadow, and Shade" as a model. They will plan how to conduct a fair test of this idea by feeling temperature with their hands on sunny and shady spots that are side by side. They will compare these differences and what they mean and communicate their work in a poster.

Driving Question - Why did the cows go to the shade?



Disciplinary Core Idea (DCI) K-PS3-1. Sunlight warms Earth's surface.
Demonstration of Understanding K- PS3. Make observations to determine the effect of sunlight on Earth's surface.
Science and Engineering Practices (SEP) Planning and Carrying Out Investigations - Make observations (firsthand or from media) to collect data that can be used to make comparisons.
Cross Cutting Concept (CCC) Cause and Effect - Events have causes that generate observable patterns.

This lesson has 6 parts - Each part is intended to take about 20 minutes, though time will vary with student skills and readiness. If it takes two or three periods to work through all the activities in a part, that is ok. If some sections don't take all the time allotted, it is ok to move along to the next part or spend time reviewing or practicing writing and illustrating vocabulary words.

1. **Get Ready** Students share what they already know about sun, shadow, and shade, and learn about some of the words in the story booklet.
2. **Ask Questions** Students listen to the story Sun, Shadow, and Shade and answer and ask questions about it. With help, they develop a research question: **" Why did the cows go to the shade?"**
3. **Make a Plan**. Students, with help, make a plan for investigating whether it is cooler in the shade than in the sun by answering **How, When, Where, and Who** questions.
4. **Investigate**. Students carry out their plan and test the temperature of side by side sunny and shady spots with their hands in three different places.
5. **Make Sense of Results**. Students compare results of testing temperature in places where sunny and shady spots are side by side. They explore the idea of cause and effect.
6. **Share Results**. Students create and share posters of their results and what they mean.

Lesson pp.2-7; Alignments, List of Printables, List of PDFs, Readability p. 8; Printables pp. 9 -11

Supplies and Equipment: index cards, pencils, story booklet, poster blank

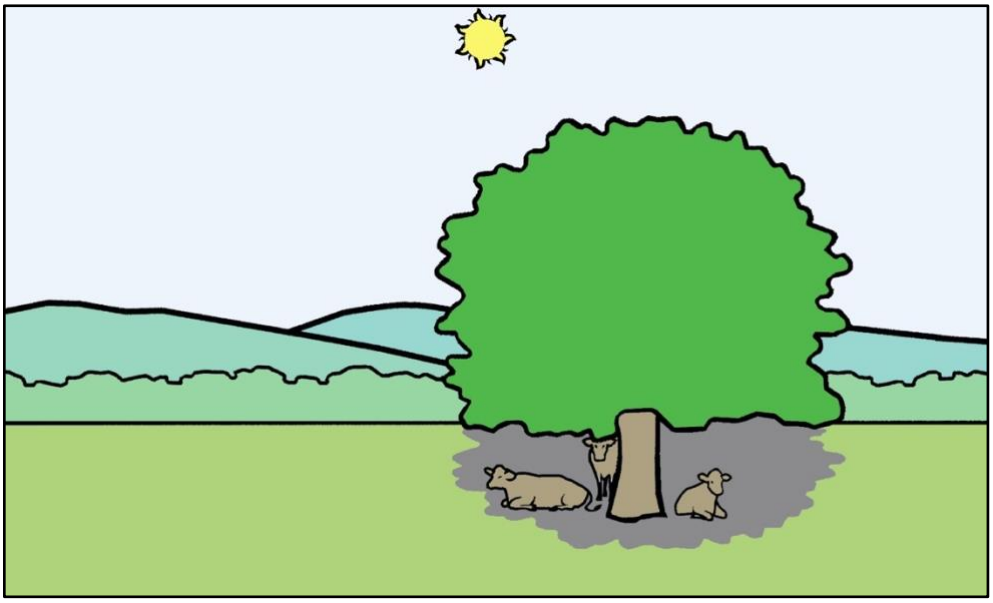
The story booklet comes in two forms, a colored version (a separate pdf) and a black and white version to print out and give to students to have and take home (a separate pdf). You can access them for free here - https://www.youngbirdbooks.com/lessons/sun.html

1. Get Ready

Students share what they already know about sun, shadow, and shade, and learn about some of the words in the story booklet.

Preparation

- Have the page 4 illustration ready to show on the board (p. 9 in this packet)



1. Ask students what they notice about the picture. Write down the words they say that are used in the story booklet. If they don't mention one of the words below, add it to the list. Ask them to explain what the words mean if they can. If they can't, explain the meanings. Practice saying them.

- sun - the light in the sky during the day that gives light and heat to the planet/world/earth
- shadow - the shape made on the ground by a thing when it blocks a light
- shade - the space between a thing that blocks the light and its shadow
- tree - a large plant whose leaves are held up by a big stem made of wood
- cows - big animals that eat plants that we use for milk and meat

2. Ask them what else they know about sunlight, shadow, and shade. Ideas they might contribute are:

- where to find shadows and shade - everywhere there is a light source and something to block it
- how sun, shadow, and shade are connected - the shadow blocks the sun's light and makes shade in the space between the thing blocking the light and itself
- it is usually cooler in the shade

3. Explain sight words. These are words used in lots of different stories, so it is useful to know them by sight. The sight words to focus on in this story are **the** and **is**. Let them know to listen and look for all these words in the story.

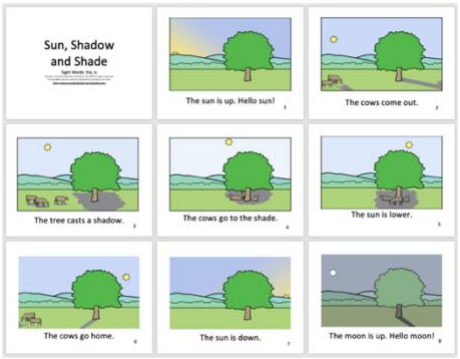
2. Ask Questions

Students listen to the story Sun, Shadow, and Shade and answer and ask questions about it. With help, they develop a research question: **" Why did the cows go to the shade?"**

Preparation
Download the colored pdf of the story from https://www.youngbirdbooks.com/lessons/sun.html and have it ready to read on your classroom screen or as a print out.

1. Read the story **Sun, Shadow, Shade** aloud, a page at a time, using the colored version projected on the screen. Emphasize the vocabulary and sight words you shared with students in the previous lesson.

2. Show the picture with all the pages of the book. Ask the students **what** they notice, what things changed from page to page. Note the answers on the board with a word or two. Guide students towards these answers.



- The sun went up and then went down.
- The shadow cast by the tree changed its shape.
- The cows moved into the shade under the tree.
- The moon showed up after the sun went down.
- There was a shadow at night.
- other answers....

3. Ask students what they wonder or have questions about. Tell them they have to start their sentences with **What or Why**. Note the questions on the board with a word or two. Guide students towards the hi-lighted question. Try to not answer the questions for now. Answers below are just FYI for instructor.

- Why does the sun go across the sky? It really stays in place, we are the ones turning.
- What makes the shadow change its shape? The position of the thing relative to the sun.
- Why does the tree have a shadow in the nighttime? All it takes to make a shadow is light.
- **Why did the cows go to the shade?**
- other questions....

4. Tell the students the question "**Why did the cows go to the shade"** is a good one to investigate. Ask them what they think. Guide them to it with these questions.

Ask them: Why do animals move from one place to another?
-----Work to elicit answers like food, water, shelter, and company.
Ask them: What was different about the places away from and in the shade?
-----Work to eliminate food (grass is the same), water (neither place has water), and company (the cows were always with other cows), leaving the answer shelter.
Ask them what kind of shelter the shade gives
----- Work to have them agree it is shelter from the heat of the sun. Guide the students towards making a prediction like: **The cows go to the shade to be cooler.**

5. Explain that the idea of it being cooler in the shade is a prediction that they can investigate. In the next lesson, they will plan how to investigate if their prediction is right.

3. Make a Plan

Students, with help, make a plan for investigating whether it is cooler in the shade than in the sun by answering **How, When, Where, and Who** questions.

Preparation

- 3 x 5 cards and pencils, one for each student

How can we find out if it is cooler in the shade than in the sun?

a. Ask students to offer suggestions. Note them on the board.
b. It they don't suggest using their hands to feel temperature, have them put their hands together and then on the floor or their desks to see if they can tell the difference in temperature. Once they understand they can use their hands as "thermometers" ask them how they could use these thermometers to test temperatures of surfaces. (the other hand should be warmer)
c. Guide the talk towards a fair test of 1) two spots, one in shade, one in sun; 2) that are on the same kind of surface, concrete, brick, or asphalt; and 3) that are next to each other.
d. Suggest that they each repeat tests in <u>three</u> places. (Repeat tests are called replicates. It is a way to make extra sure that chance differences don't give unreliable results.)
e. Ask how they will keep track of results. Show them a blank data card (3 x 5 blank index card). They will need to put their name on the card. Then they draw a line in the middle and put a sun on one side of the line and a black box on the other side (for shade)

f. For each place they test, they should put a dot on the side that is warmer. When they are done, their card should have 3 dots, one for each test. If the shady and sunny spot feel the same, they should put an X on both sides.

When are we going to do the test?

a. Ask students when they should do the test. Get them to a sunny day when it is not too cold outside

Where are we going to do the test?

a. Ask them for suggestions on where to do the tests - Like in places where sunny and shady spots are side by side. Tell them you will find an area for the tests based on their suggestions

Who is going to do what?

a. Students will do the temperature tests and record their results.
b. You will decide if it is sunny enough to get good results.
c. You will pick the places to do the tests. Pick places that will have sunny and shady spots side by side at the *time of day you will do the test*. They can be on the ground or on walls.
d. Decide if you want them to work individually, in pairs, or in small groups. Give some thought to how you can quickly direct students to places and keep them spread out - mark places ahead of time, make a map, or give really clear directions.

If time permits, have students role play the investigation activity inside. Have them practice feeling differences in temperature on different surfaces. Include time for them to wash hands afterwards. Note: Try to give them time to run around and blow off energy outside before they do the test.

4. Investigate

Students carry out their plan and test the temperature of side by side shady and sunny spots with their hands in three different places.

Preparation

- Make sure every student has a card with their name on it and a pencil

Students collect data

1. Students go outside to the first assigned places they are going to take a measurement. *

2. They put their hand on a surface on the sunny spot and then on a surface on the shady spot and decide which is warmer.

3. They put a dot under the sun ☼ if it is warmer in the sun or under the shade ■ if it is warmer in the shade. If they could not tell a difference, they put an x in both places.

4. They repeat steps 1-3 two more times in different spots so they have 3 replicates.

5. They go back inside and hand in their cards to you. You will save them for part 5.

* After they have had a chance to blow off some energy - if time permits.

5. Make Sense of Results

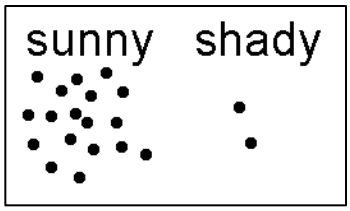
Students compare results of testing temperature in places where sunny and shady spots are side by side. They explore the idea of cause and effect.

Preparation

- Have cards ready to give back to students

1. Have students compare their results with each other at their tables. Give the students their cards. Tell them to see if there is a pattern in how many sunny spots were warmer than shady spots. Did they all get the same pattern, or did they get different results?

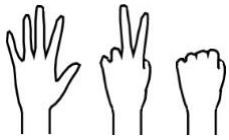
2. While they do that, write sunny and shady on the board side by side. If they are able, ask them to count up the number of spots in the sun side and the number of spots in the shade side at their table and report them. If they can't just have each student report their own numbers. As they report them, put dots representing the numbers they report. If a table says 12 sunny spots were warmer, put 12 dots on the sunny side.



3. When they are done reporting, and you are done recording, explain that making a picture like this with the numbers is a good way to show patterns of differences.

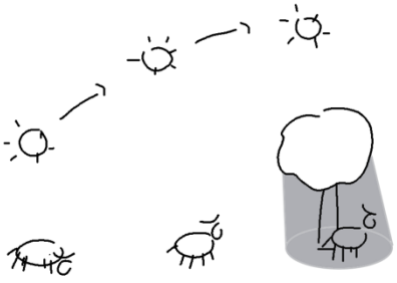
5. Ask if they think it is warmer in the sun, warmer in the shade, or about the same. Then have them hold their hands to their chests and make the signs below with their hands. (This "Hidden Code" will help them learn to figure out what ***they*** think about a question instead of looking to others. It may take some practice.)

- warmer in the sun - an open hand
- warmer in the shade - a fist
- about the same - two fingers



Tally the answers. Then ask one student from each group of responses (if there is more than one) what evidence or facts they have for their choice.

6. Explain cause and effect. When one thing changes and then another thing changes because of that, we call that cause and effect. The first thing is the cause and the next thing is the effect.



- What changed first in the story? The sun got higher in the sky. (draw a cartoon of the sun getting higher)
- What happens when the sun gets higher? It gets hotter (If students are stuck, ask if it is warmer in the morning or at lunch time.
- What happened after the sun got higher in the sky? The cows moved under the tree. (add the cows and the tree)
- What caused the cows to move under the tree? If they are stuck, ask them how they feel when they have to stand in the sun for a long time. (add the shade)

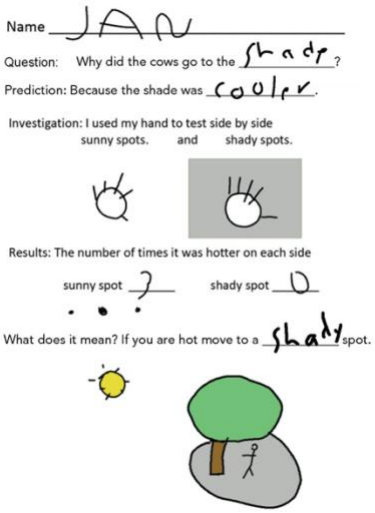
6. Share Results

Students create and share posters of their results and what they mean.

Preparation

- Make copies of the sun, shadow, and shade poster.

Lead a discussion to prepare students to fill out their results in a poster.



1. Ask students "What was the question the class tried to answer?" (Part 2)
Question: Why did the cows go to the _____?
Students should write the word "shade" in the blank.

2. Ask students "What was their prediction?" (Part 2)
Prediction: Because the shade was _____.
Students should write the word "cooler" in the blank

3. Ask students "How did you investigate the question? "(Part 3)
Investigation: I used my _____to test side by side sunny spots and shady spots
Students should write the word "hand" in the blank and draw a picture of a hand in a sunny spot and a hand in a shady spot.

4. Ask students " What did you find? " (Parts 4 & 5)
Results: The number of times it was warmer on each side**.**
Students should put dots for each time it was warmer on each side and write the number of dots for each side in the blank.

5. Ask students "What should you do if you feel hot in the sun?" (Part 5)
What it means: If you are hot, move to a _____ spot
Students should write shady in the blank and draw a picture of a sun and a person standing in the shade of a tree.

Optional discussion: What other questions do they have after learning about sun, shadow, and shade?

- Why is there a shadow after the sun sets?
- What other animals go to the shade when it is hot?
- What other things, besides trees, make shade

Give each students a copy of the black and white line drawing booklets to keep and color for their own.

Alignments by Lesson Part

1. Get Ready. Students are obtaining, evaluating and communicating information, and developing and using models (NGSS-SEP*), understanding spoken words and high frequency words, making connections between words and use (CC ELA), Engage, Explore (5E)

2. Ask Questions. Students are obtaining, evaluating and communicating information, are asking questions and defining problems, and developing and using models (NGSS-SEP). They are becoming familiar with print concepts, understanding spoken words, high frequency words, identifying key ideas and details, integrating knowledge and ideas and engaging in group reading with comprehension and purpose (CC ELA), Engage, Explore, Explain (5E)

3. Make a Plan. Students are planning investigations (NGSS-SEP). They are using words and phrases acquired through conversations and reading (CC ELA). Extend (5E)

4. Investigate. Students are carrying out investigations and engaging in argument from evidence (NGSS-SEP). They are sorting objects, making connections between words and use, using words and phrases acquired by conversations and reading, and asking and answering questions (CC ELA). They are thinking about measurable attributes (CC M). Extend, Explore, Explain (5E)

5. Make Sense of Results. Students are analyzing and interpreting data, constructing explanations, and engaging in argument from evidence (NGSS-SEP). They are sorting objects, making connections between words and use, using words and phrases acquired by conversations and reading, and asking and answering questions (CC ELA). They are representing objects with written numbers, counting to answer how many, comparing counts, and classifying objects (CC M). Explain, Extend, Evaluate (5E)

6. Share Results. Students are constructing explanations, engaging in argument from evidence, and obtaining, evaluating and communicating information (NGSS-SEP). They have an opportunity to write information text, recall from experiences to answer a question, ask and answer questions, present information, add drawings, and express thoughts, feelings and ideas clearly (CC ELA). Explain, Evaluate (5E)

Printables in Lesson Packet

Picture of cows in shade (part 1) p. 9
Picture of all the pages of the story booklet (part 2 for discussing the story) p.10
Sun, Shadow, Shade Poster - (part 6 for students to fill in by drawing, coloring, or pasting images into) p.11

Separate PDFs

Story Booklet - colored in (for part 2 for reading to whole class) pdf
Story Booklet - black and white line drawings (for students to have, color, take home) pdf

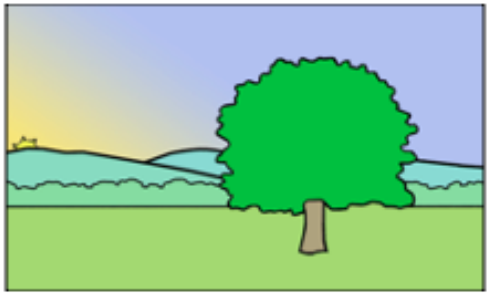
Words and Readability Statistics

39 words; 19 unique words; 3 decodable words (sun, a, up); 5 sight words (the, go, to, down, is); 10 vocabulary words (hello, cows, higher, tree, casts, shadow, shade, lower, home, moon)
Flesch reading ease - 100; Flesch-Kincaid grade level - 0

*NGSS - SEP stands for Next Generation Science Standards - Science and Engineering Practices

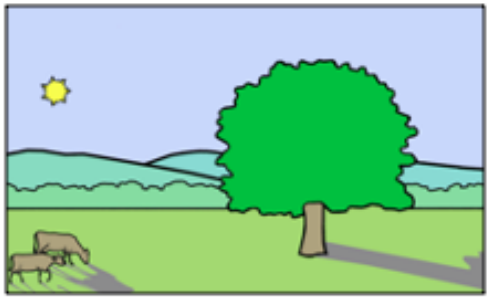
Sun, Shadow and Shade

Sight Words: the, is



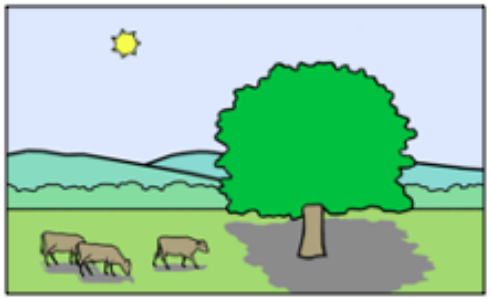
The sun is up. Hello sun!

1



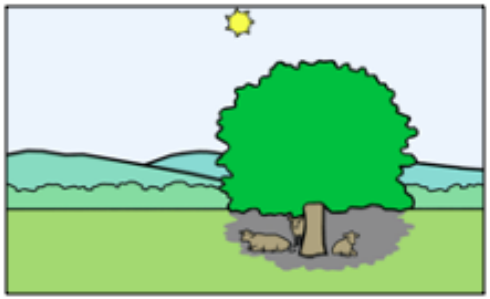
The sun is higher.

2



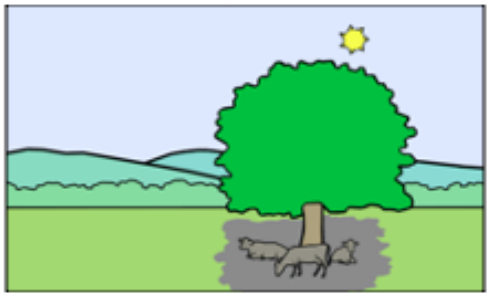
The tree casts a shadow.

3



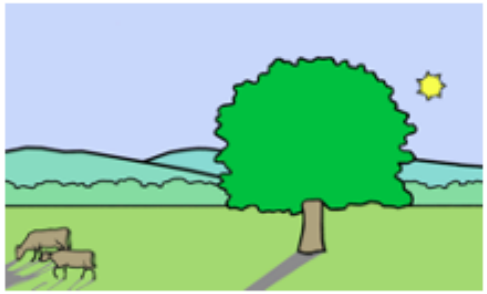
The cows go to the shade.

4



The sun is lower.

5



The cows go home.

6

The sun is down.

7

The moon is up. Hello moon!

8

Name _____

Question: Why did the cows move to the _____?

Prediction: Because the shade was _____.

Investigation: I used my _____to test side by side

sunny spots and shady spots.

Results: The number of times it was hotter on each side.

sunny spot _____ shady spot _____

What it means: If you are hot, move to a _____spot.