

Keep Cool and Play On: Exploring the Science of Light

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Grade Level 1
Duration 1-2 class periods

National Standards

GEOGRAPHY

Element One: The World in Spatial Terms

1. How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information.

Element Four: Environment and Society

14. How human actions modify the physical environment.

AZ Standards

ELA

Reading

Key Ideas and Details

1.RI.1 Ask and answer questions such as who, what, where, why and how about key details in a text.

Writing

Research to Build and Present Knowledge

1.W.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

SCIENCE

Physical Science

1.P2U1.1 Plan and carry out investigations demonstrating the effect of placing objects made with different materials in the path of a beam of light and predict how objects with similar properties will affect the beam of light.

Arizona Social Science Standards

Geography

The use of geographic representation and tools helps individuals understand their world

1.G1.1 Use, explore and construct maps, graphs and other geographical representations to support focus.

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SIOP Elements

Preparation Adapting content Linking to background Linking to past learning Strategies used	Scaffolding Modeling Guided practice Independent practice Comprehensible input	Grouping Option Whole class Small groups Partners Independent
Integrating Processes Reading Writing Speaking Listening	Application Hands on Meaningful Linked to objectives Promotes engagement	Assessment Individual Group Written Oral

Arizona English Language Proficiency Standards

Grade 1

Receptive Communication-Basic

Listening and Reading

Standard 1 By the end of each language proficiency level, an English learner can construct meaning from oral presentations and literary and informational text through grade appropriate listening, reading, and viewing.

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B-1: ask and answer questions such as who, what, where, why, when, and how about key details in a text.

B-4: identify the central idea of literary texts and presentations.

Standard 2 By the end of each language proficiency level, an English learner can determine the meaning of words and phrases in oral presentations and literary and informational text.

B-1: determine the meaning of general academic, and content-specific words and phrases, and some common expressions.

Interactive Communication -Basic

Listening, Speaking, Reading, and Writing

Standard 7 conduct research and evaluate and communicate findings to answer questions or solve problems

B-1: record information and observations in guided notes.

B-2: respond to a question or problem based on gathered information from provided source.

Overview

In elementary school, students will begin to notice that people are talking about climate change and how the Earth is getting hotter. It is important for students to understand the science of light and how it intertwines with climate change. Then they can think about solutions to the problem.

Purpose

In this lesson, students will learn that some materials allow **light** to pass through them, others allow only some light through, and others block all the light and create a dark shadow or **shade** on any surface beyond them. Students will be given the task of making an effective shade that will block sunlight and keep an area cooler. This lesson contains adaptations for diverse learners (ELLs).

Key Vocabulary

light- the form of energy (from the sun, from a fire, from a lamp) that makes it possible to see things

the Sun - the star that the Earth moves around and that gives the Earth heat and light

temperature- a measurement that indicates how hot or cold something is

thermometer- an instrument used for measuring temperature

shade – an area of darkness that is produced when something blocks the light of the sun

Materials

- One copy of *Sun! One in a Billion* by Wendy Pfeffer
- Computer, Internet, Projection Device

- YouTube Video-- *Sun! One in a Billion* -Read Aloud Picture Book (7.53 min)
https://www.youtube.com/watch?v=lz-05S_2Xdo
- Spanish book option- *Yo Soy el Sol* by Rebecca McDonald (Spanish version)
- Vocabulary Cards
- Southwestern United States: Topography and Rivers (blank)
<https://geoalliance.asu.edu/sites/default/files/maps/SWPHYS4.pdf>
- Southwestern United States: Topography and Rivers (colored and labeled)
http://geoalliance.asu.edu/sites/default/files/maps/SouthwestTopo_Color.pdf
- SummerStateTemperatureAverages
- <https://www.currentresults.com/Weather/US/average-state-temperatures-in-summer.php>
- Infrared thermometer(s)
- Materials for Project
 - Tin foil 6in x 12in
 - Black construction paper 6in x 12in
 - White construction paper 6in x 12in
 - Clear plastic overhead transparencies 6in x 12in
 - 5in Coffee & Cocktail Stirrers / Straws
 - Scissors
 - Playdough
 - Masking tape
- Written Assessment—paragraph frame
- Scoring Guide for Project

Objectives

The student will be able to:

1. Analyze the impact of objects (shades) of different materials on the temperature of an area.
2. Use a map to locate places.
3. Use a chart to gain information.

Procedures

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Engage:

1. Project the YouTube Video-- *Sun! One in a Billion* -Read Aloud (7.53 min) https://www.youtube.com/watch?v=lz-05S_2Xdo or read aloud *Sun! One in a Billion* by Wendy Pfeffer.
2. Discuss when and how students have felt the energy of the Sun. Ask: "What do you do to stay out of the sun?" When a student mentions staying in the shade, build on that idea with where you can find shade (under trees, in covered walkways, in shadows). (**Integrating Processes: Speaking and Listening;** **Preparation: Linking to background**)

Explore:

3. Tape the Vocabulary Cards up on the board and/or project them. Model the definitions of Vocabulary Cards with body movements or gestures created together with the students. (**Scaffolding: Comprehensible Input;** **Application: Promotes Engagement**)

Explain:

Note: The average temperature is computed by averaging the high and low temperatures of the day. Some of the western states have a great variety in their landscapes (Flagstaff v. Yuma). So there is a great span of temperatures which as adults would not be a good way to look at average temperatures for a state. But young students can profit from these statistics on the average temperature to learn which states are warmer or colder.

The averages are given in degrees F and with decimals. You might want to round off the decimals and explain that the U.S. uses F to measure temperature but some countries use another measurement.

4. Project the map of Southwestern United States: Topography and Rivers (colored and labeled) http://geoalliance.asu.edu/sites/default/files/maps/SouthwestTopo_Color.pdf Point to each state and have the students say the name of the state. Introduce them to the idea that each state has a city called its capital. That capital city is the center of government for the state and cite some of the functions of the government (repair roads, hold elections, make laws, gather taxes for schools, etc.) Then have the students find the circles on the map and say the names of the capitals. (**Scaffolding: Comprehensible input**)
5. Distribute a blank Southwestern United States: Topography and Rivers (blank) <https://geoalliance.asu.edu/sites/default/files/ma>

<ps/SWPHYS4.pdf> and have the students write in the names of the states.

6. Project the Summer Temperature Averages for Every State <https://www.currentresults.com/Weather/US/average-state-temperatures-in-summer.php>
7. Have them find Arizona on their map. Model writing the number given as the average degrees F for the summer in Arizona on a copy of the map. Then continue to do the rest of the states on the map. Have students discuss with a partner which states are cooler or hotter. (**Application: Promotes engagement, Hands on;** **Grouping Option: Partners;** **Integrating Processes: Reading, Listening, Writing, Speaking**)

Elaborate:

8. Ask the students, "How do we measure how hot or how cold something is?" Discuss thermometers they are familiar with. (**Preparation: Linking to background**)
9. Introduce them to the infrared thermometer and how to use it. Be sure to discuss handling safety or use just one with the whole class and you are handling it.
10. Then take students outside and have them use the infrared thermometers in a shady spot and a sunny spot and discuss the differences in temperature. (**Application: Hands on;** **Meaningful: Linked to Objectives;** **Scaffolding: Modeling, Guided Practice**)

Evaluate:

11. In the classroom distribute materials for the project. Instruct students to create their own shade structure that could be used to reduce the temperature on an outside playground.
12. Divide students into small groups and give each group one of the materials (tin foil, white or black construction paper, or clear overhead plastic). Then give each group masking tape, scissors, play dough (anchors the shade screen) and coffee stirrers. If necessary, model making a shade structure so they can see how to suspend their given material on the coffee stirrers and anchor the coffee stirrers in the play dough, so the structure is self-standing. (**Grouping Option: Small group; Application: Hands on**)
13. Go back outside and allow students (or you) to test their shade structure by using the infrared thermometers to measure the temperature under their shade structure with full sun shining on the structure. Record the temperatures for each material used. (**Assessment: Group;** **Application: Meaningful**)

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14. Write the temperatures recorded for the experiment on the whiteboard. Have the students determine the order of the materials from coldest temperature to the hottest. Have students complete the following sentence stem:
15. If I was building a shade structure in Arizona, I would build it out of _____ because _____.

Assessment

Social Science and ELA

The Map Work can be graded using the answer key. Mastery will be considered a score of 90% or higher.

Science and ELA

The Scoring Guide for the Project can be used to grade their structures. Mastery will be considered a score of 24 points or higher.

The Written Assessment—paragraph frame can be graded for their understanding of what makes a good shade. Mastery will be determined as Satisfactory or Excellent paragraph.

The Vocabulary Test can measure language acquisition. Mastery will be considered a score of 80% or higher. (**Assessment: Written, Group, Individual**)

Extensions

Students could create Solar Ovens to demonstrate how to use angles and specific materials to use the sun's energy to heat up food. Build the Best Solar Oven Ever! (5.10 min)

<https://www.youtube.com/watch?v=nsXhfpE5NCY>

To build language skills, groups can report orally on how they built their shade structure and the resulting temperature found using their shade structure. They can then draw a conclusion on the successfulness of their shade structure.

Sources

SummerStateTemperatureAverages

<https://www.currentresults.com/Weather/US/average-state-temperatures-in-summer.php>

Clip art provided copyright free from

<http://office.microsoft.com/en-us/images/>

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Sun! One in a Billion by Stacy McAnulty
ISBN 978-1-250-19932-4

Southwestern United States: Topography and Rivers maps <http://geoalliance.asu.edu>