

Sun and Shade

Student Objective

The student:

- will be able to explain the affect of solar thermal energy on temperature
- given locations in the Sun and in the shade will be able to predict which location is warmer.

Key Words:

solar thermal
trial

Time:

½ hour

Materials:

- primary thermometers (2 per group)
- tape
- Science Discovery Sheets

Background Information

On a hot summer day, a patch of shade is a welcome sight! Shade not only cools the person standing in it, but also the soil and the air temperature above the ground which helps to stabilize the entire area. A city street lined with trees has sidewalks that are much cooler than a city street without trees, and because of this, people are more likely to show signs of heat stress in a city where there are few trees and shade.

Procedure

(Note: For kindergarten students large outdoor thermometers can be used. Place a sticker on each one with a sun or a shade graphic)

1. Divide students into working groups of 3 - 4 students per group.
2. Explain procedure to the class:
 - tape one thermometer to each Record Sheet
 - place one sheet in the Sun and record the temperature at three minutes and six minutes
 - place second sheet in the shade and record the temperature at two minutes, four minutes and six minutes.
3. Lead the students in a discussion about what they think will happen.
4. Pass out materials.
5. Help groups as needed during experiment. Call out the time intervals for the groups to record the temperatures.
6. Back in the classroom, lead a discussion of the results the groups obtained from their experiment:
 - Was the hypothesis of the class supported?

- If not, what is their conclusion after doing the experiment?
 - Did all the groups have exactly the same data? Discuss with the class the factors that could have caused the differences in the data (i.e. more or less Sun or wind in their chosen locations). Lead the students to understand that even though the data points gathered might be slightly different, they support or refute the hypothesis equally.
7. For older students, create a simple two line graph with a set of data. Have the groups make a similar graph using their data.

Further Activities

1. Compare the results of this experiment during a different season (winter vs. spring/fall). Is the difference between the Sun and shade conditions the same, or greater during one season or the other?
2. Compare the air temperature of Sun and shade areas by hanging the thermometers in the air in these locations. How does the difference in air temperature compare with the difference in ground temperature? How does wind affect the temperature differences? Do the experiment on a windy day and on a still day and compare the temperature difference between Sun and shade.
3. Conduct an experiment on how sunlight fades colored paper. Tape objects like leaves or shape cutouts on pieces of colored construction paper. Place the sheets of colored paper (dark colors work best) in areas that will be in the Sun or in the shade. Leave the papers for several days before checking the results.
4. Another very visual experiment of solar thermal energy can be done with ice cubes. Attach screen to the top of mason jars. Divide class into groups of 'sun' and 'shade'. Put an ice cube on the top of each jar. The sun groups place their jars in the sun and the shade groups place theirs in the shade. The groups call out when their ice cube is completely melted. For older students, time measurements should be taken and graphed.

EnergyWhiz

Make your class internet 'stars'! Send in a video of your class performing the Sun and Shade experiment. If your video is selected for the site, we will recognize your class and school.

Sun and Shade

			.1	.2	.3	.4	.5
Energy	Standard 1	SC.B.1.1-	X	X		X	
	Standard 2	SC.B.2.1-					
Force and Motion	Standard 1	SC.C.1.1-					
	Standard 2	SC.C.2.1-	X				
Nature of Science	Standard 1	SC.H.1.1-	X		X	X	X
	Standard 2	SC.H.2.1-					
	Standard 3	SC.H.3.1-	X				

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

Grade Level Expectations

The student:

Kindergarten

- knows the effects of sun and shade on the same object

First

- knows that heat from the Sun has varying effects depending on the surface it strikes

Second

- knows that a thermometer measures the amount of heat absorbed by an object.

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

Grade Level Expectations

The student:

Kindergarten

- knows that light can pass through some objects, but cannot pass through other objects

First

- predicts which materials will allow light to pass through and which ones will not

Second

- understands that some materials will allow light to pass and others will not.

Benchmark SC.B.1.1.4 - The student knows that heat can be produced in many ways.

Grade Level Expectations

The student

Second

- knows different heat sources (i.e. solar).

Benchmark SC.B.2.1.1 - The student recognizes systems of matter and energy.

Grade Level Expectations

The student:

Second

- understands ways energy and matter interact.

Benchmark SC.H.1.1.1 - The student knows that in order to learn, it is important to observe the same things often and compare them.

Grade Level Expectations

The student:

Kindergarten

- knows that learning can come from careful observation

First

- knows that scientific investigations generally work the same way in different places.

Benchmark SC.H.1.1.3 - The student knows that in doing science, it is often helpful to work with a team and to share findings with others.

Grade Level Expectations

The student:

Kindergarten

- works with a partner or small group to collect information
- shares findings about scientific investigations with others

First

- works with others to complete an experiment or to solve a problem
- listens, records, and compares the ideas and observations of others

Second

- participates in groups to conduct experiments and solve problems
- understands that one can gain confidence in scientific methods by comparing and verifying scientific results with others.

Benchmark SC.H.1.1.4 - The student knows that people use scientific processes including hypothesis, making inferences, and recording and communicating data when exploring the natural world

Grade Level Expectations

The student:

Kindergarten

- poses questions, seeks answers, draws pictures of observations, and makes decisions using information

First

- uses simple graphs, pictures, written statements, and numbers to observe, describe,

record, and compare data

Second

- keeps science records.

Benchmark SC.H.1.1.5 - The student uses the senses, tools, and instruments to obtain information from his or her surroundings.

Grade Level Expectations

The student:

First

- uses a variety of tools to identify characteristics of objects.

Second

- uses a variety of tools to observe, measure, analyze and predict changes in size, mass, temperature, color, position, quantity, sound, and movement.

Benchmark SC.H.3.1.1 - The student knows that scientists and technologists use a variety of tools to obtain information in more detail and to make work easier.

Grade Level Expectations

The student:

Kindergarten

- knows some appropriate tools for collecting information and extending the senses

First

- knows that scientists and technologists use a variety of tools to obtain information in more detail and to make work easier

Second

- knows ways in which tools are used by scientists.

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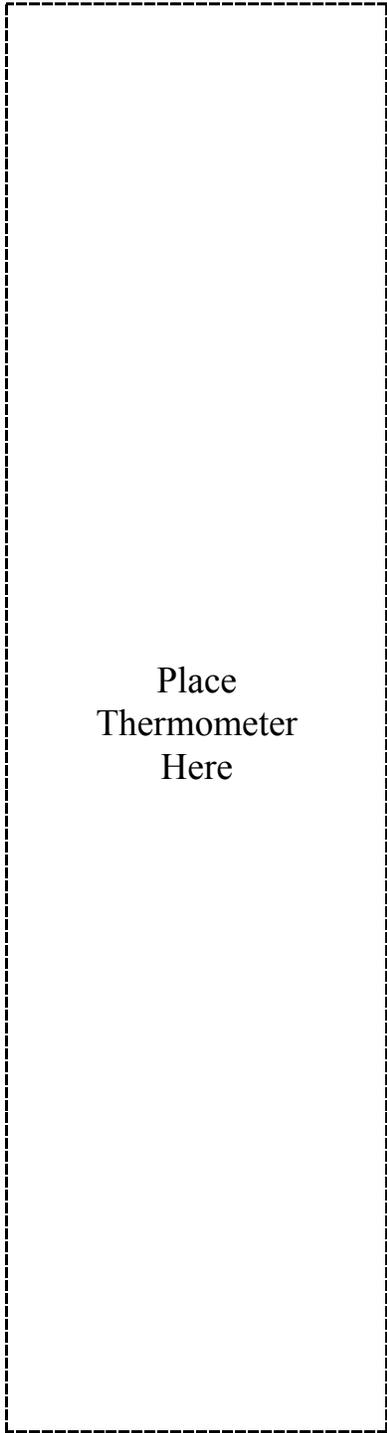
solar thermal - energy from the sun used to heat something

trial - the action of testing, as in an experiment. A trial refers to one set of data collected within an experiment.

Sun and Shade

Place
Thermometer
Here





Place
Thermometer
Here



Shade