# Is It Hotter?

**Strand** Earth Resources
**Topic** Energy from the sun
**Primary SOL** 3.11 The student will investigate and understand different sources of energy. Key concepts include
a) energy from the sun.
**Related SOL** 3.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
a) observations are made and are repeated to ensure accuracy;
b) predictions are formulated using a variety of sources of information;
e) length, volume, mass, and temperature are estimated and measured in metric and standard English units using proper tools and techniques;
f) time is measured to the nearest minute using proper tools and techniques;
g) questions are developed to formulate hypotheses;
h) data are gathered, charted, graphed, and analyzed;
j) inferences are made and conclusions are drawn;
m) current applications are used to reinforce science concepts.

## Background Information

The sun is the major source of energy for Earth. The sun produces light and thermal energy. The sun heats Earth unevenly causing wind which can be used to power wind turbines. The temperature on Earth, due to our distance from the sun, enables us to have liquid water which can be used for hydropower. The sun is the energy source for most food chains. The plants use this energy to produce food. Animals eat the plants which pass the energy to other animals throughout the food chain. The animals and plants die, and after millions of years, they become fossil fuels that are used today.

## Materials

Per group of students:

- Two Celsius thermometers
- Stopwatch or timer
- Pencil and paper
- One cup of water per student:
- Copies of Scientific Investigations handout

## Vocabulary

*energy, renewable energy, thermal (heat) energy, thermometer, temperature*

## Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

*Introduction*

1. Draw the students into the activity by carrying an umbrella around quite obviously as you explain that part of the science lesson will be done outside. Ask students why they think you might need an umbrella today, since it's sunny. Lead the students to suggest that umbrellas can be used to provide shade on sunny days, as well as protection from the rain on rainy days. Include the following points in the discussion:
2. The sun provides heat.
3. Heat is a form of energy.
4. Ask the students, "How can you prove that the sun provides heat?" Guide the discussion to using a thermometer to measure temperatures in shade and direct sunlight.

*Procedure*

1. Divide the class into groups of three, and equip each group with two thermometers, a stopwatch, and pencil and paper and copies of the "Scientific Investigations" sheet.
2. Take the class outside, and have each group choose a sunny and a shady area to place the thermometers. Have the groups wait about five minutes for the thermometers to register, and then have them read and record the temperatures on their data sheets. Have students record the temperature reading. Check to make sure the students are reading the thermometers correctly.
3. Have each group repeat the place-wait-read-record process three times so that each group collects data from three trials. Discuss why scientists conduct multiple trials.
4. Have the groups observe how the temperature *feels* in the sun and in the shade. Encourage them to describe the difference in feel between the two areas.
5. Repeat this process by measuring the temperature of water in a container in the sun and the shade over a three day period.

*Conclusion*

1. Return to the classroom, and have students graph the data they collected on a class line graph.
2. Discuss observations and conclusions.
3. After the graph is completed, ask them to make some conclusions on their "Scientific Investigations" sheet and discuss their conclusions as a class.

## Assessment

- **Questions**
  - What is the major source of energy for Earth?
  - Why is it important to conduct multiple trials in an experiment?
- **Journal/writing prompts**
  - You have a clubhouse for you and your friends. It is located in an open area of the school playground. Describe how it feels inside during: a sunny day and a rainy day. Explain the differences between the temperatures inside your clubhouse during the two days.

- **Other**
  - Use the Scientific Investigations handout completed by the students for assessment.

## Extensions and Connections (for all students)

- Have students design and then conduct another investigation to determine the effect of sunlight in warming two different objects. Distribute the "Scientific Investigations" handout to aid their design work. After individually designing their investigations, they might work in groups and pick one investigation to conduct.
- Have students determine the effect of sunlight in warming different colored examples of the same object. They should discover that sunlight more readily warms the dark colored example than it does the light colored one.

## Strategies for Differentiation

- Assign strength-based roles within the group of students during the outside thermometer activity.
- During the observations and conclusions, provide the individual line graph templates to be completed simultaneously with the class line graph to provide focus for the students not immediately involved in constructing the class line graph.
- During the experimenting investigation portion of the lesson, partners can work together to complete the Scientific Investigations handout.
- During discussion, to encourage active engagement, use a strategy to provide students with opportunities to respond (i.e., personal, white board/slate, responsive cards, etc.).

# Scientific Investigations

**Name:** _____ **Date:** _____

**Before Experimenting**

Title of my experiment:

"The effect of _____ on _____"
Independent (changed or manipulated) variable — Dependent variable

My experiment is about: _____

_____

My hypothesis (prediction) is: If_____, then

_____

My procedures (what I will do): _____

_____

_____

_____

_____

_____

_____

_____

## During Experimenting

My data that I collected:

| Temperature in Shade | Temperature in Sun |
|---|---|
| Trial 1_____ | Trial 1 _____ |
| Trial 2 _____ | Trial 2 _____ |
| Trial 3 _____ | Trial 3 _____ |

| Water Temperature in Shade | Water Temperature in Sun |
|---|---|
| Trial 1_____ | Trial 1 _____ |
| Trial 2 _____ | Trial 2 _____ |
| Trial 3 _____ | Trial 3 _____ |

## <u>After</u> Experimenting

The result (what happened) was: _____

_____

_____

My conclusion was (Be sure your conclusion is based on the evidence and the data, not just on your opinion.):