

INVESTIGATING SOLAR ENERGY

NGSSS:

SC.8.N.1.1 Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.8.N.1.2: Design and conduct a study using repeated trials and replication.

SC.8.N.1.3: Use phrases such as “results support” or “fail to support” in science, understanding that science does not offer conclusive ‘proof’ of a knowledge claim.

SC.8.N.1.6: Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.

SC.7.P.11.1: Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.

SC.7.P.11.2: Investigate and describe the transformation of energy from one form to another.

SC.7.P.11.4: Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.

COMMON CORE:

CCSS.ELA-Literacy.RST.6-8.3

Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

CCSS.ELA-Literacy.RST.6-8.4

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

CCSS.ELA-Literacy.RST.6-8.7

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

CCSS.ELA-Literacy.RST.6-8.9

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

OBJECTIVES:

Students analyze the heat that reaches them in the form of light from the sun and identify the sun as the major source of energy for supporting life on earth.

SKILLS:

- Students gain experience conducting the following procedures:
- Calculating the solar energy that reaches them by using a temperature sensor to measure the change in temperature of coffee as it is warmed by sunlight
- Using math skills to compute differences in temperatures, times and rates of warming.
- Organizing and comparing their data in simple tables or graphs, and identifying relationships the temperature patterns reveal

MATERIALS:

- Eurosmart datalogger
- Temperature sensor
- Polystyrene coffee cups (2)
- Graduated cylinder
- Black coffee
- Rubber bands (2)
- Clear plastic wrap

DRIVING QUESTION: *How much heat is in sunlight?*

LAB SUMMARY: Student groups will select an area with direct sunlight and an area in the shade. Each group of students will pour cold coffee into a cup and record its volume in mL. Students cover the top of the cup with plastic wrap secured with a rubber band. Nestle the plastic cup with the coffee in the other cup as an insulator. Cover both cups with plastic wrap and secure with a rubber band. Poke a hole in the plastic and insert the temperature sensor. After capturing the temperature over a period of 10 minutes, students will record the amount of sunlight, air temperature, time interval and initial and final temperature of the coffee. Students will find the rate of temperature increase and amount of sunlight energy absorbed by the coffee in both the direct sun and shaded area and compare the two.