

Feel the heat

Kindergarten: Temperature Probe

Aligned with National Standards

overview

This is a teacher-led whole class inquiry activity where students demonstrate and observe the effects of sunlight on the Earth's surface. Students will learn about how the surfaces of the Earth absorb energy in the form of sunlight at different rates. This activity is set-up in two 15-25 minute lessons, with an optional extension activity.

This activity uses the WARD's Single Temperature Probe to collect data, allowing students to focus on the science discovery and leaving more time for learning and developing higher level thinking skills. If you prefer, a simple thermometer can be used in this activity.

Pre-made data charts have been included on page 8 and 9 for your convenience, but you may want to encourage your students to create their own data charts.

time requirement:

This activity can be completed in two sessions of 15-25 minutes per day.

materials required for the activity:

Potting soil	Thermometer/temperature probe
Sand	Clock/timer
Data chart & graph worksheets (pages 8 and 9)	Sun (light/heat source)
Gravel	Newspaper (to cover work surfaces)
Cups/containers	Water (room temperature)
Marker/labels	

Instructions (this booklet): Teacher's Guide and Student worksheets as needed.

safety precautions

general safety:

- Consider establishing a safety contract that students and their parents must read and sign. This is a good opportunity to identify students with allergies (e.g., latex) so that you (and they) will be reminded of specific lab materials that may pose risks to individuals.
- Remind students to read all instructions before starting the lab activities, and to ask questions about safety and safe laboratory procedures. For the early grades that may not be proficient in reading yet, review the safety and lab procedures together with your students.
- Have students wash their hands after completing this and all lab activities.



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or call 800-962-2660 to get started.

framework for K-12 science education © 2012

DIMENSION 1 Science and Engineering Practices	×	Asking questions (for science) and defining problems (for engineering)	×	Use mathematics and computational thinking
	×	Developing and using models	×	Constructing explanations (for science) and designing solutions (for engineering)
	×	Planning and carrying out investigations	×	Engaging in argument from evidence
	×	Analyzing and interpreting data	×	Obtaining, evaluating, and communicating information
DIMENSION 2 Cross Cutting Concepts	×	Patterns		Energy and matter: Flows, cycles, and conservation
	×	Cause and effect: Mechanism and explanation		Structure and function
	×	Scale, proportion, and quantity		Stability and change
		Systems and system models		
DIMENSION 3 Core Concepts	Discipline		Core Idea Focus	
	Physical Science		PS3: Energy	

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**NGSS
STANDARDS**

Elementary School Standards Covered
K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface.

national science education standards © 1996

Content Standards (K-12)			
	Systems, order, and organization		Evolution and equilibrium
×	Evidence, models, and explanation		Form and Function
×	Constancy, change, and measurement		
Physical Science Standards Elementary School			
×	Light, heat, electricity and magnetism		

× Indicates standards covered in activity

prior to class

- You may want to cover work surfaces with newspaper to collect and absorb spills.
- Set up four cups. Using a marker or stick-on label, label one cup “water”, one cup “sand”, one cup “soil”, and one cup “gravel”. Add the appropriate substance to the cups, filling each about three-fourths full.
- Make copies of worksheets if desired.
- Review basic information about how to use and read a thermometer and/or the WARD’s Single Temperature Probe.

objective

Students will understand how the sun’s energy affects different surfaces on Earth.

background

The Sun’s Effect on Earth

The sun is very important to the Earth. We could not live on Earth without the sun. It is the largest supplier of energy to the Earth’s surface. The sun provides solar energy in the forms of light and heat energy. The sun’s energy warms the Earth, heating the surfaces (land and oceans) and the atmosphere. Parts of the Earth absorb the sun’s energy differently.

The sun can influence the Earth’s environment in a variety of ways. Climate is affected by how much energy the sun gives off and how much energy is absorbed and retained by the land. The land in a desert is dry and sandy. Farmland is moist and rich in soil. This activity will help you investigate how light energy from the sun is absorbed and retained by the different surfaces of the Earth.

build upon prior knowledge:

- Show students a picture of a beach landscape with land and water.



http://en.wikipedia.org/wiki/File:Matara_Beach,_Sri_Lanka.JPG

- Have the students imagine being on the sand in the picture. Ask how they would feel. (*Student responses may include warm, hot.*)
- Ask students what would cause them to feel warm or hot in the place pictured. (*Student response – the sun.*)
- Now ask students to imagine being in the water. How would they feel now? (*Student response may include – warm, cool.*)
- Ask students to think about why the sand and the water feel different (temperature) when the energy from the sun is the same for the sand and the water.
- Ask students to identify the science tool they could use to determine the temperature of the sand and the soil. (*thermometer, temperature probe*)

(continued on next page)



guiding questions

- ✦ What do you think will happen? (Hypothesis)
- ✦ What do you expect to learn?
- ✦ What tools are needed?
- ✦ What can we use to represent the sun?
- ✦ How long should we keep the samples in the sun/light source?
- ✦ How can we record our findings?

procedure

Day 1: Sand and Water

1. Ask students to plan an investigation to help them understand the effects of sunlight on sand and on water. Show students the labeled cups containing the sand and the water. Have students think about the picture of the beach. Ask students how they can carry out their investigation. (See guiding questions, in sidebar.) (ELA Literacy connection SL.K.3)
2. Have students make and write predictions about which substance will be warmer than the other after being in the sun. (ELA Literacy connection SL.K.3 – write a sentence as a group or individual)

Record the students' predictions in a tally graph. (Math connection K.MD.A.2, K. MD.A.1)

# of students who think the sand will be warmer than the water after being in the sunlight	
# of students who think the water will be warmer than the sand after being in the sunlight	

Sample Tally Graph

3. Data Collection - Before placing the cups in the sunlight, take the temperatures of their contents, and record in a data chart.
4. Place cups in the sunlight so that all cups are equally exposed. Make sure that all cups are on the same surface. Observe the starting time, and record it in the data chart.

(continued on next page)

5. After 5 minutes, use the thermometer to take the temperature of each substance; have students record their readings in the data chart.

Repeat after 10 minutes and again after 15 minutes. (suggested time intervals)

6. Use the information in the data chart to create a bar graph. This can be done as a whole class or as an individual activity.
7. Interpret and analyze the data compared to student predictions. Ask students which substance absorbed the most energy from the sun, which absorbed the least.

Day 2: Soil and Gravel

1. Review the information students learned on Day 1. Remind students of the procedure used to carry out their investigation.
2. Ask students what other types of materials can be found on the Earth's surface. (*Students responses may include soil, stone, grass.*)
3. Follow steps 2-7 from Day 1, using the soil and gravel.

summarize

Ask students what they have learned about the effect of sunlight on Earth's surface. (*Student responses may include: The sun heats substances on the Earth's surface differently. Some surfaces heat more quickly than others.*)

extension

Help students to understand that Earth's surfaces heat and cool at different rates. Continue to take the temperature of the four substances after they are removed from the heat source. Take and record the temperatures in a data chart in five minute intervals over a 15 minute period as the substances cool.

Follow the same procedure as listed above to create a bar graph and interpret and analyze the data collected.

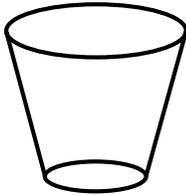


teacher notes

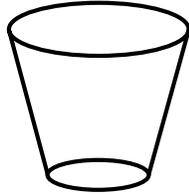
- ✦ The activities can be done as a classroom demonstration or students can work individually or in small groups.

data tables

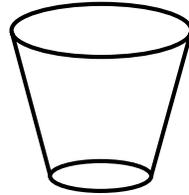
Write the beginning temperature for each substance on the cup.



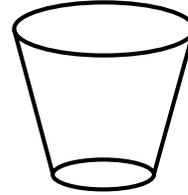
Sand



Water

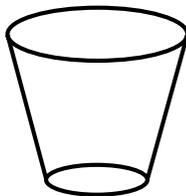


Soil

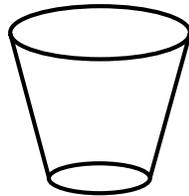


Gravel

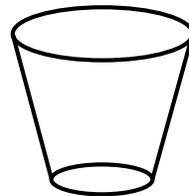
After 5 minutes, record the temperature of the material in each cup.



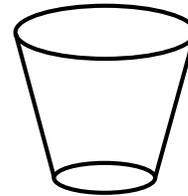
Sand



Water

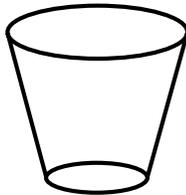


Soil

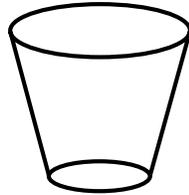


Gravel

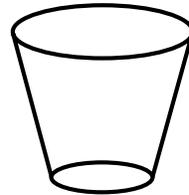
After 10 minutes, record the temperature of the contents of each cup.



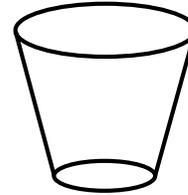
Sand



Water



Soil

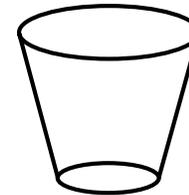


Gravel

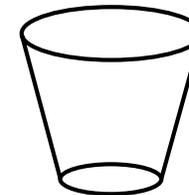
After 15 minutes, record the temperature of the contents of each cup.



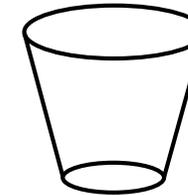
Sand



Water



Soil



Gravel

Temperature Bar Graph

