How Hot?

Summary

Students will design and carry out an experiment to compare the rates of heat absorption and of heat release of both soil and water. They will observe how these differing rates of heat absorption and release affect the air above the soil and above the water

Time Frame

1 class periods of 60 minutes each

Group Size

Small Groups

Materials

- ring stand
- soil
- metric ruler
- boxes -- they can be clear, plastic or a shoe box,
- thermometers -- 4
- overhead light with reflector or sun
- water
- tape
- colored pencils
- graph paper
- student sheet (attached)

Background for Teachers

Note to the teacher

: Students might want to and should be encouraged to place their thermometers in different places.

Student Prior Knowledge

The sun's energy that is absorbed by Earth is spread throughout the atmosphere in three ways: conduction, convection and radiation. Conduction is the direct transfer of heat energy from one substance to another. As air above the earth's surface comes in contact with the warm ground, the air is warmed. Soil, water and air are poor heat conductors. Convection is the transfer of heat in a fluid. Air is a fluid. When air near the earth's surface is heated, it becomes less dense and rises. Cooler, more dense air from above sinks. Radiation is the transfer of heat energy in the form of waves. When the sun's energy moves by radiation, it does not need the presence of a solid, liquid, or gas.

Instructional Procedures

This experiment can be done as an inquiry activity or with more teacher direction. The student sheet is set up as an inquiry, the procedures listed below can be copied into the procedures if you wish.

Directions:

Set up two boxes, one with soil and the other with water. The soil and water should be 5 cm's deep.

Place two thermometer bulbs 3 cm's deep. Place the other two close the first two, but the bulb should be 1 cm above the soil line. Use the tape to secure the thermometers and to label the

thermometers 1, 2, 3, and 4.
Write a hypothesis.
With the light on, take the temperature of each thermometer every minute for 25 minutes. Write your data down.
With the light off, take the temperature of each thermometer every minute for 10 minutes.
Use your colored pencils and the graph paper to graph your data.
Write down your conclusion.

Assessment Plan

Scoring Guide

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1. Students design experiment and record procedures……..20 pts.
2. Students conduct experiments and record data……..20 pts.
3. Students graph results……5 pts
4. Students correctly answer questions……5 pts
5. Student writes thoughtful conclusion……5 pts

Answers to Questions:

Soil should heat up more quickly
The air above the soil should heat up more quickly. Why? Water absorbs heat slowly and releases it slowly. Soil heats quickly and releases heat quickly.
Soil should lose heat more rapidly. Why? Soil has less heat capacity than water; it does not store heat as well.
Answers will vary. Explanation should be logical.
A clear lid should increase temperatures.

Bibliography

Lesson Design by Jordan School District Teachers and Staff.

Authors

Utah LessonPlans