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Grade 9, Earth Science

Objective: The objective of this lesson will be to give the students an understanding of how the specific heat of a particular substance affects its ability to be heated and retain heat. The student's will use the calculators to construct data tables as well as graphs. They will also use the calculators and the graph to answer questions at the end of the procedure.

Standards: 2, Key Idea 1(Information technology is used to retrieve, process, and communicate information as a tool to enhance learning)
Standard: 4, key Idea 2, performance indicator 2.2a (Characteristics of the materials absorbing the energy such as color, texture transparency, state of matter, and specific heat)

1.) The students will use the calculators to plot the data and construct graphs of the different heating patterns of one soil container and one water container.

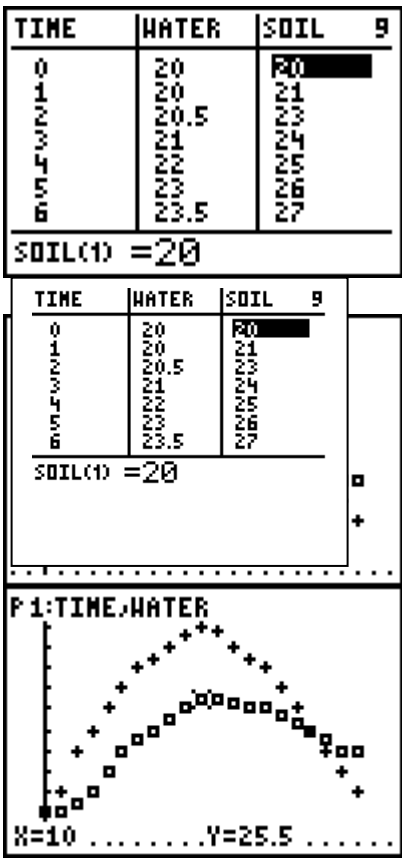
Procedure: This lab will not only use the calculators to plot the data and construct graphs but they will also take measurements and apply their previous knowledge of specific heat to answer questions from the lab.

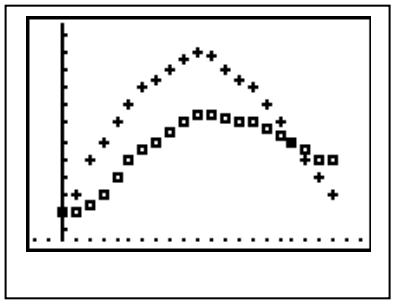
I will begin the class by showing the students step by step how to set up, and enter the data that they collect onto the graphing calculator. The students will also receive directions work sheet that details the steps needed to construct a graph. Following the tutorial on the functions needed to complete the graph, I will begin to demonstrate to the students the procedure for the lab.

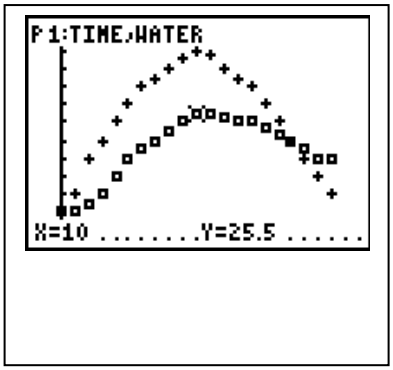
This lab will have the students in groups of three, and each member of the group will have a specific task to complete the lab. One student will be the timer, and one will be the person reading the thermometer, and the last person will be the one enters the data into the calculator.

The groups of students will each be give a container of water, and a container of soil that is equal in volume. The students will each be given a heating lamp that they will set above the containers. Each container needs to receive the same amount of radiation, or the data will be incorrect. The student groups will also be given stop watches and thermometers so that they may take measurements at the designated times. The groups will also have the graphing calculators to plot their data and construct the graphs.

The students will heat each of the containers for ten minutes taking a temperature measurement every minute for the first ten minutes. After the ten minutes is up the lamp will be turned off, and a temperature reading will be taking every minute for the remaining ten minutes. The students will compile the data and enter it into the calculator to construct a graph that shows the heating and cooling of both the soil, and the water.







(The first diagram is the data collected from both the containers during the experiment; the second and third pictures illustrate the graphs constructed using the data. The squares represent heating of the water, and the plus symbols represent the heating of the soil.)

After the students finish the graphs they will have some questions on the back of the instruction page of the lab. The students will answer questions using the calculator and its trace function. There will also be a series of questions that the students will need to answer that relate their knowledge of specific heat with the data they collected during the lab. The student groups will also require the students to show me the graphs and the data they collect in order to receive full credit on the lab.

This lab will give the students experience using the graphing calculators as well as creating a model of the sun and how it heats land and water. During the lab the students will see that the land will be heated much more quickly, and will then loose its heat more quickly than the water. This is because of the higher specific heat of the water.

Rubric for Grading: The lab will be graded out of **five points**

1.) The first point will be given if the students work together, and each member of the group completes a task that contributes to the completion of the lab.
2.) The second point will be given if the students are able to set up the lab, and are able to execute the task of taking measurements of temperature each of the twenty minutes of the lab.
3.) The third point will be awarded if the students are able to follow the directions and enter the data into the calculator, and complete the graph using the calculator.
4.) The fourth point will be given if all of the questions on the back side of the lab instructions are completed.
5.) The fifth point will be given if all of the question are answered completely and are all correct.