**Global warming laboratory – Teacher’s guide**

**Purpose:**

The purpose of this lab is to teach students about our environment. Global warming has been a major concern for our society and students need to be aware of the importance of greenhouse gasses and the over use of resources that lead to the main issues. this lab allow students to use their scientific skills to research the best type of insulation that will be used for households to help prevent the excess use of heating and air conditioning in houses. This laboratory will also give rise to a discussion on other ways we can help protect the Earth.

**Objectives:**

Students will be able to recognize what global warming is and how greenhouse gasses affect the rising temperature on Earth through a power point lecture and greenhouse affect questionnaire.

Students will be able to experimentally discover the best insulator for a house by using correct skills with the thermometer and following the protocol.

Students will be able to define an insulator and connect the insulation concept of energy saving to greenhouse gasses and global warming.

Students will be able to accurately create a graph of the data they collected and comprehend the general setup, trend, and conclusion of the best insulator.

**State Standards:**

Stage I- 13 B3

Analyze how resource management and technologies accommodate population trends, explaining factors needed to sustain and enhance the quality of Earth's water, quantifying benefits, costs, limitations and consequences involved in using scientific technologies or resources, or assessing global consequences of ecosystem modifications.

**Materials:**

Each group of 2 will need…

* 10 Styrofoam cups
* a thermometer
* 5 round cut outs of paper towel, saran wrap, foil, and news paper

Each station should include…

* 5 sets of doubled Styrofoam cups. (one cup should be placed inside the other. there will be 5 groupings of doubled cups, 10 total Styrofoam cups).
* Hotplate and thermometer
* a stack of 5 round cut outs ( about 5 inch diameter) of..
  + foil, newspaper, saran wrap and paper towel
  + Each stack will be laid out separately next to the cups. (4 of the cup pairing should have one of the four material rounds next to it with the fifth cup pairing standing along as the control)

**Length of lab:**

|  |  |
| --- | --- |
| Portion of lab | Time allotted |
| Powerpoint/ instructions/ heating water | 10 minutes |
| Temperature taking/ recording | 15 minutes |
| Data analysis and graph making | 10 minutes |
| Clean up/ conclusion | 5 minutes |

**Safety issues:**

For this lab, students will be required to wear safety goggles while the hot plates are on and the water is being heated. This is to help prevent hot water from being splashed into the student’s eyes. When the temperature recordings are finished and the hotplates are off, students will be allowed to take off their goggles while completing their worksheets.

**Prelab questions/ postlab questions:**

Powerpoint will be available in class the day of the experiment. From the information presented, students will be required to fill out..

The process of heating and cooling accounts for\_\_\_50\_\_\_\_\_ to \_\_\_\_\_70\_\_\_\_\_\_ % of the energy used in the average American home.

It is predicted that the average temperature will rise another \_\_\_3\_\_\_\_\_ to \_\_\_10\_\_\_\_degrees F in the next 100 years.

What is an insulator?

Does not allow the flow of electrons, keeps cold cool and hot warm. Relate this to a blanket, Styrofoam coffee cup, and any other examples the students come up with.

Before taking temperatures, students will make a prediction on which insulation will keep the water at the highest temperature the longest.

After recording the temperatures, students will need to graph all 5 cups (one being control) with time on the x axis and temperature on the y axis. The graph should include a title, labels for each of the 5 lines drawn, and axis labels. This will be turned in with the rest of the packet.

After graphing students will answer these questions:

What is the best insulator, how do you know?

Foil should be the correct answer but depending on the situation, results may vary. The best insulator will be defined by the cup that keeps the water at the highest temperature the longest.

Was your prediction correct or incorrect? What do you conclude from your results?

This will depend on their answers, discuss how foil is actually a conductor but traps the air and moisture within the cups so the temperature does not decrease.

What general trend do you notice from ALL of the cups’ temperatures?

The general trend is a gradual decrease in temperature as time increases from 0 to 15 minutes. (temperatures will decrease at different rates depending on the insulation used) the best insulator will decrease the least over the 15 minute time period.

**Lab set up:**

Depending on time, students can grab the materials from the front cart or the teacher can have them distributed in the classroom on each lab bench for a group of 2 to share.

Beaker

Hot plate

Control

Foil/ paper towel/ saran wrap/ newspaper

Styrofoam cups (doubled up)