



### Greenhouse Gas Modeling Experiment

**Grade Level:** 4<sup>th</sup> and 5<sup>th</sup>

**Objective:**

To understand the concept of the greenhouse effect and atmospheric gases associated with climate change and global warming.

**Introduction:**

Thermometers should be at room temperature. An extra thermometer will serve as the control thermometer for the class.

**Materials and Equipment:**

- Seven large mason jars or plastic cups with lids
- Seven stopwatches
- Thirteen thermometers
- 3 pieces of white paper
- 3 pieces of black paper

**Keywords and Concepts:**

Greenhouse effect

Solar radiation

Atmosphere

Global Warming

**Research Questions:**

Have you ever sat in a hot car with the windows rolled up?

How did it feel?

How do you think this related to global warming and the build up for gases in the atmosphere?

**Experimental Procedure:**

In this experiment we want to make a model that will act like the atmosphere on a small scale. The jar's surface walls acts like the atmosphere and greenhouse gases by allowing sunlight to enter the jar but not allowing the sun's heat to escape easily. We want to see if the air in the jar will heat up just from sunlight passing through and warming the surface inside. The open air beside our jar allows heat to escape more easily, so this will be our control experiment.

1. Review and demonstrate the following procedure:

- One thermometer will be used as the control thermometer for the class.
- Check that your thermometers are starting from the same temperature. Record the starting temperature at Minute 0 on your chart before we go outside.

- Outside, arrange your jar on its side, and prop it up with a rock or some sticky tape so it won't roll away.
- Place the thermometer firmly through the lid hole so that you can see the temperature gauge outside of the lid and screw the lid onto the jar.
- Then set up your control thermometer as your control experiment right beside your jar.
- Use the stopwatch to measure when to read the temperature. You'll take 5 readings, during a 10 minute period.

2. Draw the data chart on the board. Explain that each group of four will need to have a timekeeper, 2 observers, and a recorder. The timekeeper will use the stopwatch and say 2, 4, 6, 8, and 10 minutes at the appropriate times. Each observer will read and report the temperature from the thermometer. The recorder will enter temperature readings on the data chart and share results at the end. Pass out materials to students. A group of students should be assigned to monitor the control thermometer.

3. On a handout, ask students to write their names, what they think will happen on the hypothesis line, and to look at the thermometers and record their starting temperatures. The group for the control thermometer should share the recorded temperatures with the class.

4. Go outside and set up the jars and the control thermometer as described above. All of the jars should be on the same surface, such as a bench or the grass. The temperature of the surface will affect the temperature in the jars.

5. Every 2 minutes, each group should record the temperatures on both thermometers.

6. After all groups have reached 10 minutes, ask groups to complete their data tables and discuss the results among themselves and then come back to the classroom to share data and discuss results:

- "What happened during the experiment?" (The thermometer in the jar registered a higher temperature than the thermometer outside the jar.)
- "Were everyone's results the same?" "Was it what you expected in your hypothesis?"
- "Why do you think the air inside the jar was warmer?"