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## **My NASA Data - GLOBE Connections**

### **Sea Level Rise: GLOBE Learning Activities**

[Building a Thermometer](#): Students will construct a soda-bottle thermometer, which is similar to the thermometer used by GLOBE schools. Both are based on the principle that most substances expand and contract as their temperature changes. This experiment also demonstrates the principle of heat transfer. The thermometer can be used to measure water temperature.

# Building a Thermometer



Welcome

Introduction

Protocols

Learning Activities

Appendix

## **Purpose**

To build an instrument that can be used to measure water temperature

## **Overview**

Students will construct a soda-bottle thermometer, which is similar to the thermometer used by GLOBE schools. Both are based on the principle that most substances expand and contract as their temperature changes. This experiment also demonstrates the principle of heat transfer.

## **Student Outcomes**

Student will understand why and how a standard thermometer works.

### *Science Concepts*

#### *Physical Science*

Substances expand and contract as they are heated and cooled.

#### *Geography*

The temperature variability of a location affects the characteristics of the physical geographic system.

#### *Scientific Inquiry Abilities*

- Identify answerable questions.
- Design and conduct scientific investigations.
- Construct a scientific instrument.
- Develop explanations and predictions using evidence.
- Communicate results and explanations.

## **Time**

Two class periods

1. To do experiment - one class period
2. To discuss principles of expansion, contraction, and heat transfer through conduction and convection – 15 to 30 minutes

3. To record class data onto board or overhead and make graphs – 30 minutes
4. To have each group present to the class their results, ideas for other variables to test, and any problems that they encountered – 30 minutes

## **Level**

Intermediate

## **Materials and Tools**

(per group of students)

- Ice
  - Water
  - One liter plastic soda bottle
  - Clear or white plastic drinking straw
  - Modeling clay. A one-pound block of modeling clay should be enough for 25 to 30 thermometers
  - Two 2-liter plastic soda bottles – the tops of these bottles need to be cut off
  - Scissors or knife to cut the top off the 2-liter plastic bottles
  - Food coloring (yellow does not work as well as red, blue, and green )
  - A watch or clock with a second hand
  - A metric ruler
  - A marker, grease pencil, or pen to mark the side of the straw
- Building a Thermometer Activity Sheet*

## **Preparation**

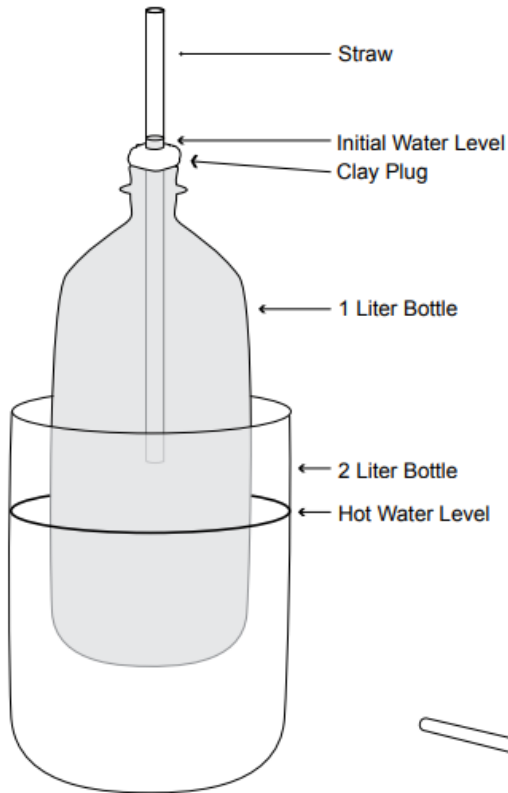
- Assemble materials.
- Review principles of heat transfer.

## **Prerequisites**

Ability to make a graph

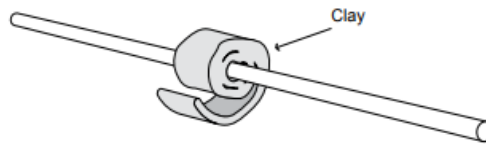
### Building the Thermometer

1. Fill the one liter soft drink bottle to the very top of the lip with cold tap water.
2. Add four drops of food coloring – this helps make the water line easier to see. Blue, green, or red work best.



3. Roll some modeling clay into a small ball about 25 mm in diameter. Then roll it out so that it forms a cylinder about the length and diameter of a pencil. Flatten the pencil-shaped clay into a thick ribbon. Wrap the ribbon around the midpoint of the straw.

4. Place the straw into the bottle and use the clay to seal off the bottle. In doing this, be careful not to pinch the straw closed. You also do not want any holes or cracks in the clay that would allow water to escape. One half of the straw will be inside the bottle and one half will be outside the bottle. Press the clay plug into the neck of the bottle far enough to force the water level up into the straw so that it can be seen.



### Experiment

1. Place the filled one liter bottle (the soft drink bottle thermometer) into the empty two liter plastic bottle container. Place a mark on the straw where you see the water line.
2. Fill the two liter container with hot tap water. Wait two minutes. Mark the straw at the water line. Repeat this marking every two minutes, for ten minutes. At the end of ten minutes use a ruler to measure the distance of each mark from the original water mark at the bottom of the straw. Record your measurements in millimeters under "hot water" in the table below.

## Sphere(s)

- [Hydrosphere](#)

## Phenomenon

- [Sea Level Rise](#)

## Related Links

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- [Building a Thermometer Learning Activity](#)

## Document Resources

Document Resources

- [Building a Thermometer.pdf](#)