

**Project FOCUS
Best Lessons
THIRD GRADE**

Title of Lesson: Making Thermometers

Theme: Physical Science

Unit Number: **Unit Title:** Heat Energy

Performance Standard(s) Covered (enter code):

S3P1. Students will investigate how heat is produced and the effects of heating and cooling, and will understand a change in temperature indicates a change in heat.

a. Categorize ways to produce heat energy such as burning, rubbing (friction), and mixing one thing with another.

c. Investigate the transfer of heat energy from the sun to various materials.

d. Use thermometers to measure the changes in temperatures of water samples (hot, warm, cold) over time.

Enduring Standards (objectives of activity):

Habits of Mind

- Asks questions
- Uses numbers to quantify
- Works in a group
- Uses tools to measure and view
- Looks at how parts of things are needed
- Describes and compares using physical attributes
- Observes using senses
- Draws and describes observations

Content (key terms and topics covered):

Thermometer
Heat
Heat energy
Fahrenheit
Celsius

Learning Activity (Description in Steps)

Abstract (limit 100 characters): Students will make their own working thermometers.

Details:

1. Give each student an empty bottle, a straw, and a piece of modeling clay.
2. Have groups of 4 or 5 come to the room sink and fill the bottle $\frac{1}{4}$ of the way full with a 50/50 mixture of alcohol and tap water.
3. While you are doing this, talk to the students about temperature. What kind of weather it is at the time. Ask questions like, "Is the temperature higher in the winter or in the summer?" "Why is that?"
4. Ask if any of them have a thermometer at home, where it is, and what is it

used for? You will find that a lot of your students have them and have a lot of different reasons for it.

5. After filling the bottles and all of the students are back in their seats, explain to them that the red stuff in the thermometer raises when it's hot because when it is hot, there is more energy, and the molecules expand. Explain that when things are in motion, they need room to move around.
6. Then explain that when it's cold, the air has less energy, so it doesn't need as much room.
7. Next, make the thermometers. Show them that they have to mold the clay around the top of the bottle to hold the straw. The straw should be in the water, but **NOT TOUCHING THE BOTTOM**. Make sure they have enough modeling clay so that there is no opening on the bottle. It must be tightly sealed for this to work!
8. Now, you have made a thermometer!!!
9. Tell the students to rub their hands together (talk about friction) and then to put them on the side of their "thermometer". The mixture should rise. It may not rise in all of them, so have the students share their observations. Tell them to leave them on their desks or in a sunny window and to watch them through the day.
10. Have the students hypothesize what would happen if they had their thermometers in different environments. Have the students record their observations.

Materials Needed (Type and Quantity):

- Tap water
- Rubbing alcohol
- Clear, narrow-necked plastic bottles - 1 per student
- Food coloring (red)
- Clear plastic drinking straws - 1 per student
- Modeling Clay

Notes and Tips (suggested changes, alternative methods, cautions):

- **Tip:** Advise the students not to squeeze their bottles when they touch the sides with their hands. The pressure, not the heat energy, will cause the water to rise.
- **Tip:** A smaller scale version of this experiment can be done with film canisters or smaller water bottles and coffee stirrers (the very narrow, straw-like kind).
- **Tip:** You might want to help the students seal their straw into the lid by first circling the hole with either hot glue or rubber cement. You should be the one to apply these, not the students!
- **Caution:** Do not let the students take these home! The alcohol and food coloring mixture will spill and get everywhere.
- **Caution:** Be careful that the students do not attempt to drink the contents of their thermometers.

Sources/References:

- 1) Originally submitted by Autumn Higginbotham, edited by Jessica Valle (2010)

- 2)
- 3)