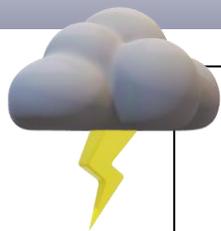


COLD OR HOT - IT MEASURES ON THE SPOT



Experiment Express:

STEM Field of Study:

Technology

Specific STEM Area:

Meteorology

Thermodynamics

Age Group:

All

Cost:

Less than (<) \$10

Time:

1 hour

Materials:

Lab Notebook; Pen; Clear or Light-Colored Plastic Drinking Straw, 16oz Plastic Water Bottle, Food Coloring, Modeling Clay, Water, Paper Towels, 2 large bowls

Safety:

Adult Supervision Necessary

Heat involved - Use extra caution

Individual Education Plan (IEP) Goals:

Academic

Behavioral

Motor

Social

Problem Question: Can you create your own thermometer?

Hypothesis: Before you do this experiment; try to predict the answer to the question above. Write down your Hypothesis in your logbook. Make sure to use a pen.

Directions:



1. Gather all of materials together.
2.  Review safety precautions with an adult.
3. In a clean, empty water bottle pour the following: ½ cup of room temperature water; ½ cup of rubbing alcohol; several drops of a food coloring and gently mix. * Be careful handling the rubbing alcohol.
4. Using the modeling clay; flatten a thick round piece of the clay and poke a hole the size of the straw in the clay. If you use the same straw to place in the bottle –make sure there is no clay stuck in the straw after making a hole in the clay.
5. Place the disk of clay on the opening of the water bottle and then feed the straw through the hole in the clay until it is in the water. You want the straw in the water but not touching the bottom of the bottle.
6. Holding the straw in place; use the clay to wrap around the straw to make a tight seal. Use additional clay if needed.
7. Fill one bowl with Hot Water and the other with Cold Ice Water.
8. Carefully place the water bottle in the bowl of hot water and seeing a quick reaction you can try running the bottle/thermometer under hot water / cold water.



Vocabulary

Celsius: Is also known as Centigrade and is the scale that measures temperature based on 0° being the point at which water freezes and 100° the point at which water boils.

Dynamics -

1 physics: a branch of mechanics that deals with forces and their relation primarily to the motion but sometimes also to the equilibrium

2: a pattern or process of change, growth, or activity population dynamics

3: variation and contrast in force or intensity (as in music)

Fahrenheit: Is a scale that measures temperature based on 32° being the point at which water freezes and 212° the point at which water boils.

Thermo - Mean of or relating to heat.

Thermodynamics - The section of physics that deals with the mechanical action or relations of heat.



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Post Experiment Questions:

1. Did the water travel up or down the straw when you placed it in Hot Water?
2. Why?
3. Did the water travel up or down the straw when you placed it in Cold Water?
4. Why?
5. What makes the liquid move higher or lower in the straw?
6. Was your hypothesis correct?



Log Your Work:

Absolutely!



Real World Applications:

Thermodynamics,

Equilibrium

Weather



Online Resources:

<https://web.extension.illinois.edu/treehouse/seasons.cfm?Slide=8>

http://www.physics4kids.com/files/thermo_intro.html



Literature Resources:

Oh, Say Can You Say
What's the Weather
Today?

by Tish Rabe (Author),
Aristides Ruiz (Illustrator)

How Heat Moves
(Science Readers:
Content and Literacy) by
Sharon Coan (Author)

Let's
Talk!

Post Experiment Answers:

1. The liquid travelled up the straw when placed in the Hot Water.
2. The liquid travels up the straw because the conditions inside the bottle become warmer and create pressure inside the airtight bottle. The bottle expands as much as possible but the liquid has nowhere else to go besides up the straw.
3. The liquid travelled down the straw when placed in the Cold Water.
4. The liquid travelled down the straw because there was less pressure in the bottle to force the liquid up the straw.
5. Pressure. When the temperature is higher inside the bottle, there is an increase in pressure. The airtight conditions inside the bottle force the bottle to expand and force the water in the bottle to move.
6. If your hypothesis was correct, Congratulations! If not, do not worry – this is exactly why we do these experiments.

Draw Your Own Conclusion:

Here at STEM with the Saints – we love history and we couldn't let this experiment pass by without mentioning Galileo. Galileo Galilei lived from 1564 to 1642 and was an astronomer, philosopher, mathematician, scientist and a Catholic. We can thank Galileo for numerous contributions to the sciences and it is no wonder why he is called, "The Father of Modern Physics." Galileo's contribution to weather is due to his observation that the density of a fluid is linked to temperature. He observed that when the temperature is high, the density of fluid decreases and when the temperature is low, the density of a fluid increases.

Our question for you is, does the same observation apply to water? We really want you to take a moment, maybe grab a glass of ice water and think about this question. Does water density increase or decrease when the temperature rises? How about when the temperature drops? After you think about this question and make a hypothesis, visit the following link from Khan Academy for the answer. <https://www.khanacademy.org/science/biology/water-acids-and-bases/water-as-a-solid-liquid-and-gas/v/liquid-water-denser-than-solid-water-ice>

FYI: *To this day you can still find Galileo's Thermometers being used mainly as décor. While the Galileo Thermometer is not as accurate as modern-day temperature gauges, they do work and are quite beautiful.*

Think
Link

Experiment Expansion:

To expand on the notion of density, we have a question for an expansion experiment. What would happen if you placed one ice cube in a ½ glass of water and one ice cube in a ½ glass of rubbing alcohol? Would both ice cubes float? Sink? Or would one float and another sink? Take a moment to develop your hypothesis and write it down.

Next, for this experiment you will need: 2 small glasses, 2 ice cubes, water and rubbing alcohol. Fill one glass ½ way with water and the other glass ½ way with rubbing alcohol. Drop one ice cube in each of the glasses and observe. Based on what you have already learned, why do you think this occurred. Let us know at: www.stemwithsaints.org

