Sticky or Comfortable: The Truth About Humidity

You would be amazed at the impact water in the air (and on your skin) has on the way you feel. One of the ways your body stays cool is through sweating. The cooling process occurs when the water on your skin evaporates. **Evaporation is a process in which** liquid absorbs heat and changes to a vapor. When the water on your skin evaporates, it absorbs heat from your body and your skin cools. The faster the water evaporates, the quicker your body cools down.

How quickly the water evaporates is determined by the amount of water already in the air. This is known as **humidity**. **Relative humidity** refers to how much water is in the air at a specific temperature. Relative humidity has a greater impact on your comfort level than plain humidity. If it is hot outside and there is a lot of water already in the air (high humidity), it takes longer for the water on your skin to evaporate and as a result, you don't cool down—instead, you feel hot and sticky. If the air has less water (low humidity), then your sweat evaporates quickly and you feel more comfortable.

This investigation will help you monitor the relative humidity in your classroom over a period of time and allow you to compare the water content in the air to how comfortable you feel.

Vocabulary

- **evaporation:** process by which liquid changes to a vapor at a temperature that is lower than the boiling temperature; evaporation is a heat absorbing process
- **humidity:** moisture in the air
- **psychrometer:** instrument used to measure relative humidity
- **relative humidity:** The amount of water in the air at a specific temperature

What You Need

- Sling psychrometer
- Data table
- Water

The Experiment

1. To get a good idea of how humidity changes over time and how humidity affects your comfort level, you'll want to collect data for a relatively long period of time (1 month, 2 months, or even longer if you can). Determine the number of times per day you are going to record your data.

2. Use the data table at the end of this lab to record the date, time, temperature, relative humidity, and your comfort level for each time you take a measurement. Try to take your measurements at the same time and in the same place throughout the entire investigation.

> To measure the relative humidity in your classroom, you will use a device called a sling **psychrometer** (pronounced "sy-krom-eh-ter"). This instrument is made from two thermometers—one is an ordinary thermometer and the other is a wet-bulb thermometer, which has wet cloth over the end of the thermometer. The difference between the temperatures measured by the two thermometers tells you how wet or dry the surrounding air is.

3. Take a measurement with your sling psychrometer to determine the relative humidity in your classroom.

   a. Quickly dip the wet-bulb thermometer in room temperature water to wet the cloth.

   b. Remove the wet-bulb thermometer from the water and gently whirl the psychrometer around in the air for one minute. As you whirl it around, water will evaporate from the cloth, and the wet-bulb thermometer will cool down (like you do when sweat evaporates off your skin).

   c. Read the temperatures of both thermometers and record them in your data table. If the surrounding air is dry, more moisture will evaporate from the cloth and the wet-bulb thermometer will cool more. If the air in the room is holding as much moisture as possible (relative humidity of 100%), there will be no difference between the two temperatures.

   d. Use the chart below to determine the relative humidity in your classroom.

Difference between dry and wet-bulb thermometer temperatures	Dry Thermometer Temperature							
	16 ˚C	18 ˚C	20 ˚C	22 ˚C	24 ˚C	26 ˚C	28 ˚C	30 ˚C
	Relative Humidity							
0˚C	100%	100%	100%	100%	100%	100%	100%	100%
1 ˚C	90%	91%	91%	92%	92%	92%	93%	93%
2 ˚C	80%	81%	82%	83%	84%	85%	86%	86%
3 ˚C	71%	72%	74%	75%	76%	77%	78%	79%
4˚C	62%	64%	66%	68%	69%	70%	71%	72%
5 ˚C	54%	56%	58%	60%	62%	64%	65%	66%
6 ˚C	45%	48%	51%	53%	55%	57%	59%	61%
7 ˚C	37%	40%	44%	46%	49%	51%	53%	55%
8 ˚C	29%	33%	36%	40%	42%	45%	47%	49%
9 ˚C	21%	26%	30%	33%	36%	39%	42%	44%
10 ˚C	14%	19%	23%	27%	30%	34%	36%	39%
11 ˚C	7%	12%	17%	21%	25%	28%	31%	34%
12 ˚C	1%	6%	11%	15%	20%	23%	26%	29%

4. Record the relative humidity in your data table.

5. Make a note in your data table about how comfortable you feel. Are you comfortable? Do you feel hot and sticky? Does the air feel too dry?

6. Make a graph with time on the x-axis and relative humidity on the y-axis. Add a data point to the graph every time you take a new measurement. Write a note about your comfort level next to each data point on the graph.

7. If you are in an air-conditioned classroom, find a room in your school without air conditioning and complete the same relative humidity steps listed above. Plot the data points for both rooms on the same graph so you can compare the relative humidity of the two rooms over the length of your investigation.

8. **Extension:** Make relative humidity measurements outside of the building and compare them to the measurements you take inside your classroom.

Analysis

1. Review your data. In what range of relative humidity were you most comfortable? At what relative humidity did you start to become uncomfortable?

2. Describe how you felt when the relative humidity was too high or too low.

3. Describe your graph of relative humidity vs. time. Was the relative humidity in your classroom relatively constant for the length of your investigation or did it vary a lot? How often did uncomfortable days occur? Did they occur more often at any particular time of year? If so, when?

4. If you measured relative humidity in both an air-conditioned room and a non-air-conditioned room, did you find that the measurements were similar or very different? Explain why you think this was the case.

5. If you measured relative humidity both indoors and outside, how did your measurements compare to one another? Was the relative humidity higher in one location than the other or were they approximately the same? What are two reasons why the relative humidity inside the building and outside the building might be different?

Real Life Connections

What are some steps that you could take in your classroom that would impact the relative humidity and make your environment more comfortable? Explain how these actions would work to change the relative humidity in your classroom.

Connections to Capuano

Research how the Capuano School has worked to maintain proper relative humidity in the building. What are specific steps that Capuano has taken to maintain a comfortable, energy efficient, and economical environment?