Humidity in the Air: Teacher Instructions[i]

This is a two-part activity to introduce the concept of humidity. Part 1 consists of a phenomenon to engage students in the concept of humidity and activate their thinking about water vapor as one of the components found in air. Part 2 consists of a modeling activity where students develop the concept of relative humidity and learn about percentage scales.

Part 1: The Phenomenon of Condensation

This opening phenomenon can be run as a classroom demonstration or in small groups.

Materials:

- Water
- Ice
- 2 identical glasses (jars or beakers)

Directions

1. Before class begins, fill one glass with the ice water and the other with room temperature water. After several moments, condensation will begin to accumulate on the glass of ice water.
2. Have students examine the two glasses of water and discuss the differences between them.
3. Feel the outside of the glasses. How did one glass get wet on the outside? Where did the water come from? This may be a good opportunity for students to draw a conceptual model of what is happening.
4. As an extension, put an empty glass in a freezer before class. Remove the glass from the freezer and let students observe it. Condensation should begin to form on the glass. The cold glass permits students to understand that the glass does not need to be filled with water for condensation to form.

Part 2: Modeling Relative Humidity

In this activity, students model what is meant by relative humidity and how to develop a percentage scale. *Relative humidity* (RH) is the ratio of the air's water vapor content compared to the maximum amount of water the air could hold at the same temperature. Prior knowledge for this activity includes that water can exist both as a liquid and as a gas (vapor). This activity should be run in groups of 2-4 students. See the student data sheet.

Materials for each group:

- 1 dry small kitchen sponge
- 1 small dish or plate that will hold the sponge
- 1 spoon
- 1 cup of water
- calculator

Directions

1. Have students examine and squeeze the sponge so that they see that it is dry.
2. Using the spoon, students should add water to the sponge one full spoonful at a time and keep track of the number of spoons added.
3. After several spoons have been added, have students consider where the water is going. Can they continue to add water the sponge forever? What will happen when the sponge can't hold any more water?
4. Have students continue adding water one spoon at a time until the water leaks or drips out of the sponge into the dish. Have students explain why the sponge won't hold any more water.
5. Explain the concept of saturation – that water could be added to the sponge until it cannot hold any more and the sponge is *saturated*.
6. Guide students to complete the data sheet calculating the percent saturation of the sponge for each spoon of water added.
7. Discuss with students the meaning of the fraction of saturation in the table (column 2). For example, a fraction of 0.5 is one-half. That means that half the number of spoons of water were added before the sponge was saturated.
8. Discuss with students the meaning of the percent (%) saturation in column 3.
9. Have students discuss how this activity could be a *model* for humidity or water in the atmosphere. The sponge represents the atmosphere; the water added to the sponge represents water vapor in the air; the saturated sponge represents the saturated atmosphere and the water dripping from the sponge represents precipitation or fog. Explain to students that when the atmosphere is saturated with water vapor, that the excess water vapor may condense and form precipitation like rain.
10. Discuss the concept of relative humidity and that the percentage is amount of water vapor in air compared to the total amount of water vapor that air could hold at the same temperature.
11. Have students reconsider their observations in Part 1. What caused the water to condense on the outside of the glass of ice water? They should all agree that a lower temperature caused the water vapor in the air to condense. Ask students to consider how changing the temperature of air might affect the relative humidity. Considering the results from Part 1, would you expect that the relative humidity would increase or decrease if the temperature decreased. What would happen to the relative humidity if the air temperature increased?

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[i] Adapted from Dripping Wet or Dry as a Bone?
https://www.teachengineering.org/activities/view/cub_air_lesson04_activity3