

# How Do You Dew?

**Science Standard I:**

Students will understand that water changes state as it moves through the water cycle.

**Objective 1:**

Describe the relationship between heat energy, evaporation and condensation of water on Earth.

**Intended Learning Outcomes:**

3. Understand Science Concepts and Principles
4. Communicate Effectively Using Science Language and Reasoning

**Content Connections:**

Math IV-2; Writing VIII-6; Art IV-3

## Science Standard

### I

## Objective

### 1

## Connections

## Background Information

The purpose of this activity is to provide students with a hands-on experience of seeing how the processes of *condensation* and *evaporation* occur.

Water is made up of molecules that are always moving. It can be found in different states: solid, liquid, or gas. Adding or taking away heat causes the molecules to speed up or slow down.

*Condensation* is when water changes from a gas to a liquid. The opposite of this is evaporation. *Evaporation* is when water changes from a liquid to a gas. When water is in the state of a gas it is called water vapor. We cannot see it because the molecules are too far apart. As the molecules collect together during condensation, we can see evidence that this process takes place.

A common misconception is that when we see water droplets on the grass early in the morning, that we are seeing condensation. What we are really seeing is the result of condensation called dew. Dew is made up of small drops of water that form from the night air and collect on the ground or another surface. The *dew point* is the temperature at which condensation occurs.

Temperature, humidity, and wind are factors that cause these processes to occur.

Increasing the amount of thermal energy causes water to change states from a solid to a liquid and from a liquid to a gas. At sea level, water heated to 100° C (212° F) boils. Water freezes at 0° C (32° F). In Utah, water boils at about 96° C. This is why it takes longer to cook food at higher elevations.

## Invitation to Learn

Have you ever gotten out of the shower and tried to look in the mirror to comb your hair and the mirror was all covered with water? You probably rubbed off the water with your hand or a towel so that you could see yourself, but did you ever wonder how it happened?

## Instructional Procedures

### Materials

- Pint-size canning jar with lid
- Ice
- Hair dryer
- Food coloring
- Vanilla extract
- Spoon
- Small bowl
- Thermometer
- Water
- Magnifying glass
- Journal
- White napkins
- Crayons

1. Discuss evaporation and condensation.

Have students give examples of the processes of evaporation and condensation that they may have seen (e.g., water boiling, rain puddles shrinking, water vapor from our breath condensing on the windows, looking like clouds of smoke on a cold winter day, etc.).

Discuss how heat is involved in these processes. For example, if you heat water to 100° C (at sea level), it turns into water vapor. As it cools, the molecules slow down and return to a liquid state. Remind students that the sun is the main source of heat that causes these processes to occur.

2. Have students sit in groups of three or four and take turns completing the steps in the activity.
3. Have one student pour a half-spoonful of vanilla into a small bowl and place it in the center of the group. Instruct the group to lean their heads over the bowl and see if they can smell the vanilla.
4. Have an inquiry session. Ask them how it was possible for them to smell the scent of the liquid vanilla? (The molecules float through the air into our nose.)

Compare how the vanilla evaporates and the molecules travel through the air in the same way that water vapor does.

Ask: What would happen if heat and wind were applied to the vanilla?

The teacher can demonstrate using a hair dryer to provide heat and wind, making the vanilla evaporate quickly.

Compare this process to the way the sun creates heat and wind to causing water to evaporate.

- \*\*\*This is a good point to explain how to measure with a thermometer and record data in a journal.

5. Give each group an empty jar and tell them to measure and record the temperature inside of it.

Ask each group to fill the jar half-full of cold water. Then measure and record the temperature again.

Next, add ice until the jar is almost full. Have students measure and record the temperature one more time. Add food coloring or punch powder.

*Option:* To help students see how water molecules are always moving, add food coloring one drop at a time. Add the drops in this order: red, blue, yellow. Watch each drop spread out into the water before adding one drop of the next color.

Ask someone to screw the lid onto the jar to prevent the water inside from escaping.

6. Ask each student to illustrate the experiment in his/her journal. Then take turns using a magnifying glass to see if there is any water forming on the outside surface of the closed jar. Explain that the temperature of the water inside when the first droplets appear is the dew point, or the temperature at which condensation has occurred. Also discuss where the water came from and what this process is called (condensation). Students can blow softly toward the jar to help provide water vapor. The results will vary depending on the humidity in the classroom.

\*\*\*This is a good point to discuss the misconception of condensation. We don't see condensation on the jar. What we see are droplets of water. Condensation is the process that caused the water to appear.

Have students draw a second picture of the jar, showing droplets of water on it.

7. Demonstrate how a hair dryer can be used to blow hot air on the outside of the jar until the water disappears. Discuss where the water went and what this process is called (evaporation).
8. Have the students draw a third picture of the jar with the droplets missing. Include the hair dryer or the sun as the source of heat. Include labels for all of the objects in the pictures (e.g., jar, water, ice, droplets, hair dryer or the sun).

### ***Possible Extensions/Adaptations/Integration***

- See if breathing slowly on the jar causes droplets to appear faster.
- Check to see if the water on the outside of the jar is the same color as the colored water in the jar. Use a napkin to wipe off the outside of the jar, then unscrew the lid and carefully dip another napkin into the colored water. Compare the color of the napkins.

- Try adding some drops of perfume to a spoonful of water instead of using vanilla.
- Students with special needs can be paired with a partner who can help with the drawings and following the directions.

## ***Assessment Suggestions***

- The drawing learners complete during the experiment may be assessed.
- Students may describe or draw what they learned in a science journal.

## ***Additional Resources***

### **Books**

*The Search for the Water Cycle*, available through the Living Planet Aquarium, 522 S. 400 W. Suite 200, Salt Lake City, UT 84101, 801-320-9951.

*The Comprehensive Water Education Book* (1994 edition) and additional experiments and information on water is available through Utah State University in Logan, Utah 84322 or 1-800-922-4693.

### **Web sites**

The USOE science Web site has Internet links for lesson plans and ideas

<http://www.usoe.k12.ut.us>

*USU Water Quality Extension*

[http://extension.usu.edu/waterquality/kids\\_page.htm](http://extension.usu.edu/waterquality/kids_page.htm)

Water Science for Schools

<http://ga.water.usgs.gov/edu/>

## ***Family Connections***

- Take an early morning walk through a grassy park or field. Observe how the dew has formed on the grass and how it gets your shoes wet.
- Try using a hair dryer on the mirror in the bathroom after taking a steamy shower to see if you can make the water evaporate.
- Discuss with your family why you can “see your breath” when you exhale on a cold winter day.
- Students may display their experiments at a school science fair.