

How can we see if water is in the air?

Teaching and Learning Focus

In this investigation, your students will begin to develop their concept of clouds based upon three basic observations:

- Warm air can contain more water vapor than cold air.
- When air loses heat, some of the water in the air turns to liquid.
- As air loses heat, droplets of water collect and become visible on solid surfaces.

Materials Needed

For the class:

- Foam bucket of ice cubes and water

For each student group:

- Large glass or metal tumbler
- Water

Safety

This investigation question is considered generally safe to do with students. Please review the investigation for your specific setting, materials, students, and conventional safety precautions.

Setting the Scene

Show students a regular cloth hand towel. Tell them that you are thinking about washing the towel, but, since there is no clothes dryer at the school, you wonder how it might get dry. Ask them if they have an idea how you could dry it (some students will eventually suggest hanging it out to dry.) Ask the students where the water that makes the towel wet goes when it is hung out and it dries (some students may indicate that the water is simply "gone", while others may indicate that it is in the air.) How can we see if water is in the air?

Presenting the Investigation Question

Introduce your students to the investigation question: "*How can we see if water is in the air?*"

Have your students discuss the question in pairs, then in groups, and then as a whole class. Record their answers on the flipchart.

Have your students brainstorm ideas about how this investigation question could be investigated.

1. Design an experiment that could be used to test the investigation question.
2. What materials would be needed?
3. What would you have to do?
4. What would be measured?
5. How long would the experiment take?

Assessing What Your Students Already Know

When asked to describe a cloud, most students will portray a remote, white fluffy object in the sky, much like a floating cotton ball. Some students who have had experiences with air travel might be able to describe flying above the clouds or into clouds. Few children will think that they have ever touched a cloud or walked through a cloud.

- Ask your students if they have ever been in fog. (They might be surprised to know that fog is a cloud at ground level.)
- If you live in a climate with cold temperatures, ask if they have ever seen their breath on a cold morning. (If so, they have actually created clouds.)
- Ask your students if they have noticed that fog or breath seems to be wet or damp. (What they are seeing is a collection of tiny water droplets that form as water vapor turns to liquid.)

Tell your students that in this investigation they will learn how to tell that there is water in the air.

Exploring the Concept

1. Give each group of students a metal cup or glass tumbler. Ask them if the cup appears to be able to hold water without leaking any to the outside. (*You might fill yours with room temperature water to verify that it is leak-free.*)
2. Pour an amount of room-temperature water into the cup, leaving room for several ice cubes that will be added next. (*It is best to have a pitcher or bowl of water sitting in the room for several minutes before beginning, to ensure that the water will not be cooler than the air in the room.*) Have students verify that the cup is not leaking. If there is any water on the outside of the cup due to spills, have them dry it off and check again for leaks.
3. Next, distribute the ice into the cup of water so that all cups are about half-filled.
4. Ask the students to observe the cup carefully for a few minutes and record their observations. (*The outside of the cup will begin to show drops of water on the surface. If the room is exceptionally dry, ask the students to blow on the side of the tumbler. Moisture from their breath will condense on the surface.*)
5. Have your students discuss their observations and these questions:
 - What have you seen form on the outside of the cool cup or glass tumbler? (*Tiny water droplets.*)
 - How can you be sure what it is? (*It's wet, and it feels and looks like water.*)
 - Where do they think it came from? (*Some might connect it to the water in the tumbler. If they do so, remind them that the tumbler was tested before the experiment and found to be leak-free.*)
6. Ask your students to report their conclusions about their observations of the ice-filled container to the class. (*Through careful discussion and questioning, your students should be able to agree that the only place the water could have come from was the air.*)
7. Help your students focus on what they have learned. They should be able to figure out that the air contains water that is invisible. But, when the air is cooled, the invisible water in the air forms liquid water on a surface. Finally, introduce your students to the scientific term for this process - condensation.

Applying Students' Understanding

To assess your students' understanding, ask them what they think will happen when you put warm water in your metal tumbler. (*Empty and dry the tumbler before filling it with warm water. This time, air will not be cooled, and it will not form condensation on the surface.*)

Revisiting Investigation Question 1

Complete this investigation question by asking your students to reflect on "How can we see if water is in the air?" and how their answers may have changed as a result of this investigation.

Weather Unit Sections

Introduction

Air

Temperature

Wind

Clouds

How can we see if water is in the air?

How can clouds form?

Revisit the concept of Clouds

