

Blinded by Water Vapor

Background Information:

Water vapor is the key component to weather. Without water vapor, we would not have the consistent weather pattern that we know. While many children have seen water vapor in the form of steam, it is usually not correlated to weather. Before the lesson begins, review the meaning of solids, liquids and gases. Discuss the form water takes as it relates to each one. Help students understand that water vapor is usually invisible, but it is still a form of water. This is a good discovery activity for condensation, and its role with the water cycle. Twin satellites, named GRACE, will map the Earth's gravity field and help track water movement on and beneath Earth's surface. GRACE will help scientists improve the accuracy of scientific measurements related to climate change.

Objectives:

At the end of the lesson, students will be able to:

- Describe orally what has occurred through the steps in this experiment.
- Correlate today's lesson with condensation and water cycle
- Understand that GRACE will be used to study climate change and gravity.

Standards:

Science: science as inquiry; physical science; unifying concepts & processes

Vocabulary:

water vapor fog condensation

Materials:

Eye glasses
Cup of Hot Coffee, Tea or Water
Some place cold – refrigerator, cooler, cold weather

Procedure: *The teacher performs this experiment because hot water will be handled.*

1. Ten minutes before the lesson begins, put a pair of eyeglasses into a cold place [refrigerator, out on window ledge, inside a cold cooler]. Prepare a hot cup of liquid

[coffee, tea or water]. As the lesson begins, tell the students that you need to get your glasses out of the refrigerator [or wherever they are]. Put on the cold glasses and bring the hot cup of liquid up to your mouth as if to take a sip [do not drink]. When the cup is near your mouth, blow air out of your nose. This will cause steam to come up towards your face and fog up your cool glasses. The glasses may remain fogged for a minute or more depending upon how cool the glasses are and how warm the coffee is.

2. Students will immediately see what has happened and excitement will fill the room. They have always seen people drink coffee, but never with any unusual side effects.
3. Ask what they think has happened. To get them thinking on the right track, have them think about what they know about the experiment. First, they know that your glasses were cold. Secondly, they know that the coffee was hot. There will be many kinds of explanations, and if your class still needs some better clues, ask them if they've ever seen a window or mirror fogged up like the glasses. They may respond that they've seen the mirror fog up after a shower. You are ready to connect the activity with weather after the idea has been discussed about the effects of the warm water vapor touching the cool glasses.
4. Ask the class what happens to the temperature as you go higher up into the atmosphere. Have them think about what happens to the temperature in mountainous regions if they are having a difficult time conceptualizing the idea of an upper atmosphere. Explain that the temperature cools as you go higher in altitude.
5. Now ask students to imagine what happens when water evaporates from the oceans and rivers. Where does that water vapor go? Water vapor that is in the air is known as humidity. When humid air warms, it rises. It cools down as the altitude increases. The water vapor that is in the air will soon cool too and the water vapor will condense, just like the water vapor did on the glasses.
6. Review the experiment, and while explaining its components, also discuss the weather connections.

Extensions:

- Look at a United States map. Where might you see water vapor?
- Draw a water cycle showing where the water vapor goes.
- Write a paper on evaporation, water vapor, fog, or condensation.

References / Resources:

<http://www.geographic.org/climate/glossary.html>

<http://www.srh.noaa.gov/oun/severewx/glossary.html>
