

Learning Cycle Lesson Plan Template

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Lesson Title: Lesson 3 (2 days)

Grade Level: 4

Lesson Topic: Day 1: Condensation, Sweating Cup

Day 2: Condensation, Making Rain, Movement

Main Concept:

Water on Earth changes from a gas to a liquid through the process of condensation. Water on Earth cycles in different forms and in different locations.

Additional concepts that are important to Expansion: N/A

Materials Needed: (per group)

Activity 7: Condensation, Gas to Liquid, Movement “Sweating Cup/Gatorade Bottle”

Room temperature water (approx. 3 Cups)	Ice cubes (approx 2 Cups)
White paper towels (3)	Food coloring (1 color)
Clear plastic cups (3)	Apron (1)

Activity 8: (Day 2) Making Rain, Evaporation and Condensation, Movement

1 empty glass jar	1 large dinner plate
1 ruler	1 permanent marker
2 pitchers to transport water and ice	2 cups of ice cubes
hot water (enough to fill jar about 2 inches)	

Safety Precautions and/or Special Procedures:

- Never drink or taste any liquids in science class unless instructed to do so.
- When handling the ice, do not hold it in hands for more than a few seconds as it may “burn” and cause uncomfortable sensations. You can pour it directly from your pitcher without even touching it.
- Use caution when adding the **2 drops** of food coloring, it will stain clothing. The student handling food coloring should wear an apron.
- Make sure students understand the time intervals for their observations, refer them to page 2 in their booklet to clarify.

Phase 1: Engagement

What sports do you like to play? Do you play on a team? If you don't like sports, what do you like to do outside in the summer? Do you get sweaty? Can objects sweat like people? Have you ever seen

something sweat? Let's brainstorm and write down some items. Break kids into groups, assign roles, and encourage them to get started. Student Answer and Data Booklet will focus students more on a "sweaty" Gatorade bottle; they will hypothesize what caused the sweat and where it came from.

Phase 2: Exploration: Activity 7: What happened to my Gatorade? (Sweating glass)

Process skills: Estimating, observing, reading, writing, communicating, interpreting data, inferring, experimenting.

Exploration Activity:

1. Place a white paper towel on your work surface and put the cups on the paper towel.
2. Label the cups (1,2,3) with a permanent marker.
3. Put several cubes of ice into cup 1 and 2. Do not add ice to cup 3.
4. Add 2 drops of food coloring dye to cup 2.
5. Pour water into each cup, about $\frac{1}{2}$ to $\frac{3}{4}$ full. (If you dribble down the outside, please wipe dry)
6. Observe the cups for several minutes record your observations in the chart.
 - What do you notice about the outside of the cups? Is there anything forming on one but not the other? What does the outside of the cups feel like? Is the water on the outside of the cup changing shape, size, color? What is the ice doing to the water in the cup? What color is the water on the outside of the cup? Is it the same color as the water inside the cup? (Cups with ice will be cloudy on the outside, wet, cold, slippery, no color in the outside wetness. The cup without ice will be dry, not cold, clear. The ice makes the water, cup, and air around the cup colder, it lowers the temperature).

Phase 3: Explanation of the Concept: Activity 7

What do you think caused the liquid to appear on the outside of two cups and not the other? What is difference between your samples? (The cups with the ice sweated, the cup without the ice did not sweat. The cups with ice were colder than the cup without the ice).

Where did the water on the outside of the cup come from? What evidence do you have to support your answer? (The water came from outside the cup, it didn't come through the cup because the sweat on the side of the cup would be the same color as the water inside the cup, and it wasn't, it was clear).

What conclusions can be drawn from this experiment? Use the following sentence starter: The air around the cups contains water vapor, the cups with ice _____(there is moisture around the cup because of evaporation, the ice makes the moisture from the water vapor stick to the outside of the cup). Use your data to support your answer (the cup without the ice didn't have the water on the outside, so the cold from the ice makes the water appear on the cup). Refer students to their Student Resource Data Book for further explanation and to compare answers.

Phase 4: Expansion of the concept

Process Skills: recognizing, reading, writing, classifying

Activity (procedures/steps): Students will individually reflect on a one scenario and apply a written answer or labeled drawing to explain condensation in that example. The students will then brainstorm and list where else they may have witnessed condensation.

- How is a fogged up bathroom mirror after a warm shower an example of condensation?
- How is dew on grass in the morning an example of condensation?
- Where else have you seen examples of condensation? Briefly explain why you think they are examples of condensation. Student examples can be shared during a whole group summarizing activity.

Day 2

Phase 2 Exploration: Activity 8: "Making Rain"

Students will investigate water vapor and its role in the water cycle.

Process Skills: Measuring, estimating, observing, reading, writing, communicating, interpreting data, experimenting.

Exploration Activity

1. Using your ruler, measure up from the bottom of the jar 2 inches. Put a small dash with permanent marker on the outside of your jar to serve as your 2 inch reference point (to stop pouring the water).
2. Pour hot water into the glass jar until the water level is about 2 inches high.
3. Place the dinner plate, face up, over the jar opening.

What do you observe taking place inside the glass jar? (Sides are getting cloudy) What do you predict what will happen after you add ice to the dinner plate?

4. Place the ice cubes to the top of the plate.
5. Students will record observations at 5 minute time intervals. initially sides are cloudy, slowly the cloudy film turns into tiny droplets, the droplets will continue to grow in size, at the 10 minute mark, the droplets are typically large enough to start rolling down the sides of the jar = "rain").

Phase 3: Explanation of the Concept: Activity 8

Retell in your own words what happened inside the jar. Use the following sentence starter. The atmosphere in the jar contained water vapor, when ice was added to the plate, I observed (initially the sides (inside) of the jar are cloudy, slowly the cloudy film turns into tiny droplets, the droplets will continue to grow in size, at the 10 minute mark, the droplets are typically large enough to start rolling down the sides of the jar = "rain").

Compare and Contrast the "Sweating Cup" experiment to the "Making Rain" experiment, what is the common variable(s) in each investigation (water vapor and a cold surface).

How does condensation help water move from one place to another? (Consider what you know about the water cycle & reference the Student Resource Book). (Water vapor is water that has turned into a gas; the gas is in the air, so wherever air moves the water vapor is moving too. Also, when it condenses high in the atmosphere it forms clouds. The wind can move clouds. As the clouds move, the water vapor droplets in the clouds move too. Then the droplets get big and fall as precipitation. Rain will flow when it falls to the ground. It can also fall into water, such as a river, or ocean and it will move that way too.

Aside from rain, what other forms of precipitation have you seen? (Snow, hail, sleet). What would cause the water droplets to fall as snow or sleet versus rain? (Colder temperatures)

I will show the class a clip from Magic School Bus: Wet All Over cartoon which explains the phases of water in the water cycle. Retrieved from Discovery Education, United Streaming plus

<http://player.discoveryeducation.com/index.cfm?guidAssetId=1b5a191c-68b5-46be-9b74-580e25b94a78&blnFromSearch=1&productcode=HUB>

<http://player.discoveryeducation.com/index.cfm?guidAssetId=7465FD96-A981-4EDC-B996-D40E8CB62EC&blnFromSearch=1&productcode=US>

Phase 4: Expansion of the Concept:

Process Skills: computing, recognizing, reading, writing, classifying

Activity (procedures/steps): Students will visit a website to view and read about condensation in their environment and then report out on their topic (Cloud, Fog, Dew, Frost, or Snow).

Science and Technology: Site for kids to view examples of condensation/evaporation in nature (Cloud, Fog, Dew, Frost, Snow). <http://acswebcontent.acs.org/scienceforkids/index.html#Evaporation>

Phase 5: Evaluation of the Concept

Reflective Assessment: I will read from *The Drop in My Drink: The story of Water on our Planet* by Meredith Hooper. Students will write in their science journal something they learned today about condensation. You have witnessed water as a solid, a liquid, a gas, and then back to a liquid again. You have investigated freezing, melting, evaporation, and now condensation. In all your scientific investigations, you have made water move from one place to another. Take a moment and think about condensation, water vapor gas condensing into water, everything you've done today. Refer students to their journal, the language usage prompt and their reflective writing assignment.

References and Internet Supplements

Bass, J. E., Contrant, T. L., & Carin, A. A. (2009). *Teaching science as inquiry eleventh edition: Instructors copy*. Boston: Pearson.

Hooper, M. (1998). *The drop in my drink: The story of water on our planet*. New York: Penguin Group.

Moyer, R. H., Hackett, J. K., & Everett, S. A. (2007). *Teaching science as investigations: Modeling inquiry through learning cycle lessons*. Upper Saddle River: Pearson.

Wick, W. (1997). *A drop of water: A book of science and wonder*. New York: Scholastic Press.

Condensation examples retrieved from:

<http://acswebcontent.acs.org/scienceforkids/index.html#Evaporation>

“Cool it and Pool it!” retrieved from:

http://portal.acs.org/portal/fileFETCH/c/CSTA_015085/pdf/CSTA_015085.pdf

Magic School Bus retrieved from:

<http://player.discoveryeducation.com/index.cfm?guidAssetId=1b5a191c-68b5-46be-9b74-580e25b94a78&blnFromSearch=1&productcode=HUB>

<http://player.discoveryeducation.com/index.cfm?guidAssetId=7465FD96-A981-4EDC-B996-D40E8CB6B2EC&blnFromSearch=1&productcode=US>

Making “Rain” retrieved from:

<http://www.fofweb.com.felix.albright.edu/Juniors/default.asp?ItemID=WE50>

The Water Cycle visual retrieved from:

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

Water and water vapor retrieved from:

http://www.fofweb.com/Electronic_Images/Onfiles/JrSci11-08c.pdf

