The Water Cycle
5th Grade
Meghan Knapp/Trent Grove

References:

- Images accessed via www.google.com
- www.edhelper.com/plants.htm
- www.wildlifedeartment.com/lizard.htm
- home.earthlink.net/~deanna1jc/moondoves_spiral_animals.htm
- www.blm.gov/nstc/soil/bacteria
- http://news.bbc.co.uk/1/hi/programmes/correspondent/1363320.stm
- www.sidwell.edu/us/science/vlb5/Labs/Classification_Lab/Bacteria/Proteobacteria

Benchmarks:

SLC 13: Demonstrate an understanding of cycling of resources on earth, such as carbon, nitrogen, and/or water.
Benchmark: Students will identify organisms and pathways through which carbon, nitrogen and water are cycled. (S)%-3.13A)

SLC 3: Make inferences from observations of phenomena and/or events.
Benchmark: Students will identify inferences that explain or help interpret their observation (S05-1.03A)

Objectives:

Students will identify organisms and processes involved in three cycles: the water cycle, the carbon cycle, and the nitrogen cycle. Students will produce a pictorial or abstract water cycle. Students will appropriately place life forms onto an existing carbon or nitrogen cycle.

Materials:

- Water cycle model kit (Fisher Science Education CVS45140A)
- plastic cups (one per group)
- Ice
- Journals
- hot or warm water
- Cut outs for each cycle
- food coloring

Initial Demonstration:
A. Throughout the lesson students will observe the water cycle kit. They will make initial observations as the kit is set up and the only water appears to be in the lake. Throughout the days of the lesson they will observe as water condenses on the clouds and ends up on the land, in the pond and in the rivers.

B. Each group will receive a plastic cup with ice water (and food coloring), preferably as soon as the ice water is added. They will then make observations of the cup. As time passes they will observe water condensing on the outside of the cup.

**Target Observations:**

- There is water in a plastic cup.
- There is ice in a plastic cup. The cup is dry and cool at first, then wet and cold.

**Initial Model:**

Students may say:
- There is water seeping through the cup.
- The cup is “sweating”
- Water is condensing from the air.
- Water spilled outside the cup.

**Procedure:**

Ask the students where the water came from. Ask them if the water outside the cup was colored like the water inside the cup. (no). Ask them if an empty cup can “sweat”. Have a dry cup that has been kept cold and show them that it too will get water droplets, but a warm dry cup will not. Introduce the word “condensation” and have the students write a definition in their journal.

Ask the students. “What will happen next?” Lead the discussion by asking what happens to puddles after it rains. Ask, “what do we mean when we say that it dries up?”. If they students say only that the water seeps into the ground, ask what would happen if there was a puddle in the classroom? Ask “what do we mean when we say that it disappears? Where does the water go?” Have the students write down the word “evaporation” and define it.

Ask the students, how can we make the water on the outside of our cups evaporate quickly? Brainstorm ideas and put them on the board. Ask the students how they will know whether or not it is “quickly” and lead them to using a control. Have each group select a method to test and place the cup somewhere in the room. If lamps are needed, provide them. The students should record the time they put their cups in the “test spot.” They should check the cups every 5-10 minutes to determine the level of dryness. They will dry more quickly if the ice water is removed, but this can be one of the tests.
As the cups are drying, discuss the difference between an observation and an inference. Have the students go back to their initial observations of the cup, and circle only those that are observations. Observations use the senses, they are things we can see, measure, hear, smell, etc. They can be qualitative (the cup is wet) or quantitative (the cup with ice in it has a lot more water droplets on the outside than the cup with warm water in it). Help the students to use details when writing observations (The cup is wet... does it have big drops of water or tiny drops of water?

Ask the students how they could measure how much water was on the outside of the cup. (They could weigh the cups, or use a piece of tissue to dry it and see how much of the tissue got wet, they could try to let the water drip into a graduated cylinder). Ask them what is a variable, and what is a control? What are the controls and variables in this experiment? (Controls—the same type of cup was used in each case, they were filled at the same time, and set in their “test spots” at the same time, they were all checked for dryness at the same time). Students should record these and their observations on the worksheet attached.

When the test is over, perhaps the next day, each group should present their findings to the class. This can be a simple statement of one or two sentences. (“We put our cup by the window and it was dry 5 minutes faster than the cup at the front of the room”). Have the class record things that seemed to make the water evaporate faster. Remind students that heat, light, and wind are all forms of energy.

**Target Revised Model:**

- Cold temperatures cause water to condense from the air onto a cup.
- The water will eventually evaporate (go back into the air).
- Water will evaporate quicker if there is energy: heat, light or wind.

**Procedure:**

As the students write their observations of the water cycle kit, have them use their words from the previous lesson (condensation and evaporation) to describe what is going on. Ask the students how the water got into the rivers and pond above the lake. (If they don’t know, ask them where water comes from in our rivers, ponds, and on the land). Have them write the word “precipitation” in their journal. Ask them if rain is the only way water can get from the clouds to the sky. (Snow, hail, sleet, freezing rain). Ask the students what are the forms water can take. They will probably remember water and ice (liquid and solid) but may need to be reminded of water in the air.

Have a bowl of warm/hot water at the front of the room. Have two cups (as with yesterday) with ice and ask the students what will happen if you hold one cup over the bowl of warm water and the other just over the desk. They may need reminding that both cups will have condensation, but the cup over the bowl will have more. Ask the students what part of the water cycle kit the bowl is like (the pond or the lake). Ask the students where water in the air comes from. (Standing water or wet things, it evaporates).
Ask the students where water can be found in nature. As they name each item, put it up on the board (Clouds, precipitation, rivers and streams, air, lakes and oceans). Ask the students, “how water can be made to move from one form to the other? (how did we get the water to evaporate).” Use the sun to represent energy. Have the students use these pictures to draw a picture in their journal of the picture of the water cycle. Ask them, “How can we show that water is moving from one form to the other?” Have the students put in arrows and the vocabulary words they have learned. (Condensation, evaporation, precipitation, energy).

Have the students use only the words, not the pictures to show the water cycle. You may want to list what words should be part of the water cycle (Condensation, evaporation, precipitation, energy, clouds, rivers and streams, air, and lakes and oceans).

**Target Revised Model:**

- Water is constantly in a cycle of condensation, evaporation, and precipitation
- In all parts of the cycle, whether it is a gas, liquid, or solid, the substance is still water

Ask the students why water is important (Living things need water). Ask the students where plants would go on their picture of the water cycle. Ask the students what are other things living things need (they will probably say food). Food gives us two very important things: energy (which comes from the calories in sugar and fats) and building blocks for making and repairing cells (which comes from the proteins).

Tell the students there are two more cycles that are important for living things. In turn, give them the arrows that form each cycle. Have the students put the arrows together in a way that makes sense. Check them as they do this. Then have them put the organisms on the arrows in the appropriate places. Write this on the board and have the students copy the correct cycle onto their paper or into their journals. (Vocabulary: glucose, respiration, photosynthesis; nitrogen fixing bacteria, decomposers, nitrogen compounds).

Ask the students if carbon dioxide can come from anywhere besides respiration. Point out that we could add cars (which burn fossil fuels) and volcanoes to the cycle, so it could quickly become more complicated. (They will see more of this next year). Ask the students if water is always in living things (No, it is “stored” in oceans, rivers, and in the air when living things aren’t using it). Ask the students where nitrogen could be “stored” when it is not being used (in the soil, but much of it is in the atmosphere which is ~80% N₂). Show them how you can add two more arrows to the nitrogen cycle, and that there are special bacteria (denitrifying bacteria) that return the nitrogen to the atmosphere. Again, this picture can quickly become quite complicated, and they will learn more in the 6th grade.
**Target Revised Model:**

- Carbon also moves through our environment in a cycle
- Nitrogen also is cycled through different forms

**Summary:**

Cycles are everywhere in nature. Some very important cycles are those of water, carbon, and nitrogen. These cycles are important for living organisms to survive.
Water, Water, Everywhere!

Group Members:
Materials manager (obtains and returns supplies): _________________________
Tester (puts cup in “test spot” and checks wetness): _________________________
Recorder (records the group’s observations): _________________________________
Reporter (presents findings to the class): _________________________________

Safety:
____________________________________________________________________

My Theory: (what will make the water evaporate faster?)
____________________________________________________________________
____________________________________________________________________

Variables:
Controls (things that are the same) ________________________________________
____________________________________________________________________

Independent variable (the thing that is different) ____________________________
Dependent variable (what we are measuring or comparing)____________________

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Inferences about my observations: _________________________________________
_______________________________________________________________________

Things that make water evaporate faster: _________________________________
_______________________________________________________________________

If I could, next time I would test: ______________________________________
_______________________________________________________________________