

Daily Plan		Instructor:
<b>Daily Topic:</b>	The Water Cycle	
<b>Unit Title:</b>	Weather and Climate in Our Lives	
<b>Course:</b>	8 <sup>th</sup> Grade Physical Science	
<b>Materials, Supplies, Equipment, References, and Other Resources:</b>		
Water cycle PowerPoint presentation, pre-painted water cycle artwork (various brushes, poster paints, and butcher paper), student water cycle direction cards (5"x7" blank index cards, string, stapler, and colored markers), 4" pots, potting mix, metric rulers, corn seeds, labels, pencils, 100 and 400 ml beakers and tap water, greenhouse or plant growth cart/light bank with fluorescent or wide spectrum bulbs, worksheet, computer/digital projector or Smart TV.		
Reference: United States Geological Survey. <i>The fundamentals of the water cycle</i> . Retrieved from <a href="https://water.usgs.gov/edu/watercyclesummary.html">https://water.usgs.gov/edu/watercyclesummary.html</a>		
<b>Intended Outcomes</b> <i>What do you want students to know (K), understand (U), and be able to do (D)?</i>		
<b>AFNR Standards and Benchmarks:</b> <b>Natural Resources and Environmental Services Systems</b> <b>Standard III: Apply scientific principles to natural resource management activities.</b> <b>Benchmark III-A:</b> Apply scientific principles to natural resource management (Performance Standards 1-3). <b>Standard III: Apply scientific principles to natural resource management activities.</b> <b>Benchmark III-C:</b> Examine natural cycles and related phenomena to describe ecological concepts and principles (Performance Standards 1 and 8).  <b>Plant Systems</b> <b>Standard I: Apply principles of anatomy and physiology to produce and manage plants in both a domesticated and natural environment.</b> <b>Benchmark I-A:</b> Analyze and evaluate nutritional requirements and environmental conditions to develop and implement a fertilization plan (Performance Standard 4).	<b>Next Generation Science Standards:</b> <b>MS-ESS2-4: Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.</b> Emphasis on the ways water changes its state as it moves through multiple pathways of the hydrological cycle. <b>MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.</b> Local environmental conditions could include availability of food, light, space, and water. Examples of evidence could include drought decreasing plant growth. <b>MS-LS2.1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.</b> Emphasis is on cause and effect relationships between resources and growth of individual organisms.	
<b>Essential Question:</b>	What is the water cycle? What impact does water have on corn plants?	
<b>Objective(s):</b>	1. After viewing water cycle PowerPoint slides, students will correctly match 6 of 9 water cycle terms with their place on a water cycle graphic rubric. 2. Through a water cycle drama, students will demonstrate their knowledge of the water cycle by correctly following direction cards indicating where their water molecule goes. 3. Within a small group setting, students will be given 4" pots, potting mix, metric rulers, corn seeds, labels, and pencils to set up an experiment on rainfall variability. Students will be able to complete all three experimental steps correctly.	

	<p>4. Given prior instruction about the scientific process and hypothesis writing, students will formulate and test their own hypothesis for a rainfall variability and plant height experiment (or another dependent variable like stem diameter) for a 7-week period. (1 hypothesis written in the if/then/because format)</p> <p>5. Given water cycle instruction and the learning activities presented in this lesson. Students will score at least a 4 out of 6 on two science knowledge, science skills, and reasoning ability multiple choice questions for this lesson that are on the unit test.</p> <p><b>Learning strategies used:</b> Lecture and discussion, water cycle drama exercise, group work, scientific experiment, writing, and reading. Learning is differentiated through a variety of activities and exercises.</p> <p><b>Literacy:</b> Understanding of the terms in the water cycle, following instructions on the direction cards in the water cycle drama, following instructions for the corn growth experiment, and writing a hypothesis.</p>
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<p><b>Activating Strategy</b>  <b>Preflection/Introduction (Interest Approach)</b>  <i>How will you prepare students for what you want them to learn today and link today's activities with previous classes?</i></p>	<p><b>Estimated Time:</b></p>	<p><b>10-20 minutes</b></p>
<p>Generate a list on the whiteboard of the ways water is important in our lives. We'll start our Weather and Climate Science unit with an overview of the water (or hydrologic) cycle so we understand where our water comes from and where it goes to. Show a short PowerPoint presentation (see attached PowerPoint) introducing the water cycle. Students will complete an empty graphic of the water cycle by labeling all of the missing parts from a word list. (See attached water cycle worksheet)</p>		

<p><b>Learning Approach 1</b></p>	<p><b>Estimated Time:</b></p>	<p><b>15-20 minutes</b></p>
<p><b>Teaching Strategy / Materials</b></p>	<p><b>Brief Content Outline</b></p>	
<p>Water Cycle Drama</p> <p>Teacher will coach students during the drama to complete the water cycle.</p>	<p><i>K: What do you want students to know (facts, figures, vocabulary, etc.)?</i></p> <p>1. Make a set of 5"x7" reusable water cycle direction cards (3-foot long pieces of string stapled twice to the two top corners of each card so students can wear them around their necks during the drama). Students will read from their card where they (as water molecules) will travel along the water cycle after all starting in the atmosphere as water vapor and condensing at the painting of the cloud. Other poster paintings of different parts of the water cycle can be created by the students, attached to classroom walls, and reused for this activity. (See attached list and pictures of a set of cards, and pictures of example student artwork) Following the teacher's direction to move, students move to the appropriate paintings as their water molecule progresses through the water cycle.</p> <hr/> <p><i>U: What do you want students to understand (what is the big picture)?</i></p> <p>1. Students will be able to identify key vocabulary words and can switch water molecule direction cards with other students (if time) to develop water cycle mastery. Students learn by doing and moving around the room to visualize the cycle.</p>	

	<p><i>D: What do you want students to be able to do (tasks, skills, etc.)?</i></p> <p>1. Through repetition, students will be able to predict where water molecules will go next in the water cycle.</p>
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<b>Learning Approach 2</b>	<b>Estimated Time: 20-30 minutes</b>
<b>Teaching Strategy / Materials</b>	<b>Brief Content Outline</b>
Corn Growth and Rainfall Experiment	<p><i>K: What do you want students to know (facts, figures, vocabulary, etc.)?</i></p> <p>1. In small groups of four, students will follow a set of directions on how to set up and conduct the experiment. Each group will plant and label one control and one treatment pot or two treatment pots (or more pots depending on class size and space availability on a plant growth cart, under a light bank, or in the greenhouse). (See attached water cycle worksheet for directions)</p>
	<p><i>U: What do you want students to understand (what is the big picture)?</i></p> <p>1. Setting up and conducting an experiment following the scientific method. The teacher will monitor student groups to make sure they do all steps correctly.</p>
	<p><i>D: What do you want students to be able to do (tasks, skills, etc.)?</i></p> <p>1. After the experiment is set up, students will formulate on their worksheets a clear hypothesis (in the if/then/because format with teacher guidance) about plant height in centimeters (or another variable like stem diameter) depending on the timing of watering the plants receive over a 7-week period of time. (See attached water cycle worksheet for directions and how to coach students on writing their hypothesis)</p> <p>2. At the end of seven weeks, the corn plants will be ready to measure. It is recommended that the teacher assist the students in developing a table for recording their data based on the dependent variable or variables studied and their units of measurement. Once data and averages across control pots and the three treatments are obtained for the class, have a discussion about the results. Have the students write if their hypotheses were correct or incorrect and why on the data recording sheet. (Estimated time: An additional 50 minutes)</p> <p>3. If more than one class does the experiment, data and averages across all classes for the control and the three treatments can be calculated and discussed. This approach highlights the value of being able to replicate an experiment.</p> <p>4. After cleanup, pots, and potting soil can be saved for future use.</p>

**Summarizing Strategy (Reflection)**

*How will you have students reflect on what they have learned today and prepare them for the next class?*

**Estimated Time: 5 minutes**

Exit Ticket: Ask each group one or two of the following six questions. (They can discuss their answer before answering)

Define evaporation.

What are some examples of freshwater storage?

What are 3 parts of the water cycle?

What is really old ground water called?

Name 2 of the 3 treatments used in the experiment.

How many weeks are we observing before recording and analyzing data from our experiment?

**Assessing Strategy (Evaluation)**

*How will you determine if students know (K), understand (U), and can do (D) what you intended?*

Students will be able to label the water cycle, participate in the water cycle drama, set up a water cycle experiment, develop a data recording sheet, and formulate and test a hypothesis. Two science knowledge, two science skills, and two science reasoning multiple choice questions are on the unit test for this lesson. (See unit test)