

Arizona Project WET 5E Lesson One - Where is the Water?

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LESSON 1.1 WHERE IS THE WATER?	
PROJECT WET WATER LITERACY PRINCIPLES	
Water Connects All Earth Systems	a. Water is found in the atmosphere, on the surface, and underground. b. The water cycle connects Earth systems, purifying and renewing water on Earth. c. The Sun drives the water cycle through state changes and energy transfer. d. Climate and water are inseparable—changes in water impact climate, and climate change impacts water resources.
Water Is Essential for All Life to Exist	a. All living organisms have water in them. b. Life processes depend on water—from the cellular to ecosystem levels. c. Both the quantity and quality of water contribute to sustainability of life on Earth.
LESSON SUMMARY	Students will engage with models of water movement, identifying where water can be located, how and what it moves, and how the abundance or lack of water influences the distribution of life and the evolution of adaptations.
MATERIALS	Anchor Phenomena Slides Science Notebook Vocabulary supports Coloring pages Water Cycle Diagram Adaptation Discussion Prompts and Project  V1 Native Arizona Species and Their Required Rainfall Needs V3 Rainfall in Arizona Cities MAP DATA TABLE U.S.A. Drought Monitor CER Writing Exercise
TIME	1-10 Hours
OBJECTIVES	Students will be able to describe the water cycle, the processes that move water from one location to another, and the critical importance of water

	for the persistence of life. Students will be able to model the water cycle and describe the interactions between energy and matter that make the water cycle possible.
GUIDING QUESTIONS	Where is the water where we live? How do organisms adapt in environments with less water?
ARIZONA STATE STANDARDS ADDRESSED IN LESSON	
SCIENCE	4.E1U3.9 Construct and support an evidence-based argument about the availability of water and its impact on life. Students will explore the strategies used by different organisms to conserve water and adapt to arid conditions.
MATH (Elaborate)	4.MD.A.3: Apply the area and perimeter formulas for rectangles in mathematical problems and problems in real-world contexts including problems with unknown side lengths. Students investigate the relationship between area and water collection using word problems. Appendix
ELA (Evaluate)	*4.W.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. a. Introduce a topic clearly and group related information in paragraphs and sections; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension. b. Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic. c. Link ideas within categories of information using words and phrases (e.g., another, for example, also, because). d. Use precise language and domain-specific vocabulary to inform about or explain the topic. e. Provide a concluding statement or section related to the information or explanation presented. Students use the Claim, Evidence, Reasoning framework to explain the relationship between water and life.
Social Studies (Elaborate)	G2.1 Compare the different ways people or groups of people have impacted, modified, or adapted to the environment of the Americas. • Key concepts include but are not limited to disease, farming, family structure, housing, cultural assimilation, cultural amalgamation, climate, transportation, domestication of animals, clothing, recreation, and utilization of renewable and non- renewable natural resources Investigate canteens used by indigenous peoples in Arizona:

	https://statemuseum.arizona.edu/online-exhibit/sustaining-life/landing-page
CTE (Elaborate)	Explore jobs, occupations, and careers to understand the value of all careers to society. Lesson 1.2 Hangin' Together Career Connections
ENGAGE	
Anchor Phenomenon: Saguaro's and Desert Adaptations Sonoran Saguaros are only found in one place on Earth, the Sonoran Desert, where many people in Arizona live. How do these unique plants grow so large and live so long with so little water available to them? Students will have the opportunity to consider where the water in the desert is stored, how plants, animals, insects, and past inhabitants have adapted, physically and behaviorally, to be successful in the desert. This activity can be limited to a classroom discussion and activity with the coloring sheets and graphic organizers or it can be expanded to include the mini-research project and CER writing exercise.	
EXPLAIN	
Use the lesson slides and vocabulary assets to build on student's understanding of the water cycle and the interaction between living organisms and the water available to them in a given habitat. Establish the connections between water, weather, and climate. Guided notes and Quiz	
VOCABULARY	Evaporation, condensation, runoff, transpiration, precipitation, infiltration, percolation, flow. Vocabulary Pages
Resources https://www.usgs.gov/water-science-school/water-cycle#qt-science_center_objects	
EXPLORE	
Mini-research project on water and adaptations in the desert. Use slides, map and data tables.	
 V1 Native Arizona Species and Their Required Rainfall Needs V3	
ELABORATE	
Social Studies: Opportunity to investigate the history of peoples living in the Sonoran Desert and how they survived and thrived before electricity and modern infrastructure. Social Studies Standard G2.1 https://arizonahistoricalsociety.org/education/arizona-history-digital-hub/ https://statemuseum.arizona.edu/online-exhibit/sustaining-life/landing-page Math: Investigate the potential for rainwater harvesting on surfaces of different sizes. See potential practice questions in Appendix 1. AZ Math Standard: 4.MD.A.3: Apply the area and perimeter formulas for rectangles in mathematical problems and problems in real-world contexts including problems with unknown side lengths.	

[Living Labels Activity -Arizona Game and Fish](#)

EVALUATE

[Vocabulary quiz](#), [CER](#), [Research Project Notes Quiz](#)

REFLECT

What went well? What resources could be improved, added, or removed to increase the usability or effectiveness of this lesson? [General Feedback Google Form](#)

CONTENT KNOWLEDGE AND SUGGESTED READING FOR TEACHERS

• When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. • Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. • For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

Sources:

<https://globalfutures.asu.edu/azclimate/wp-content/uploads/sites/35/2026/04/13-PRISMA-nnualPrecipNorms.pdf>

LESSON 1.2 Molecules in Motion

PROJECT WET WATER LITERACY PRINCIPLES

Water Has Unique Physical and Chemical Characteristics

- The nature of the water molecule, as two hydrogens and one oxygen, determines the physical properties of water and its behavior.
- Water is the only naturally occurring substance on Earth that can be found in three physical states: solid, liquid, and gas.
- The bipolar nature of water molecules results in the properties of cohesion and adhesion.
- Water is the best solvent out of all liquids—it can dissolve more substances than others.

LESSON SUMMARY

Students will continue to investigate the water cycle, considering water's unique physical and chemical characteristics which determine its importance to life and to all Earth systems processes.

MATERIALS	Slides Notes Vocabulary Quiz Investigation Materials: For classroom demonstration: • 2 one-quart size glass jars • Blue Food color • Ice • Large container of boiling water (an electric kettle or hotplate can be used) • Large container of room temperature water • Large container of ice-cold water • Sticky notes • Time record and graph page if using (Appendix) Each table group will need: • 2 clear cups approximately 5 inches in height • 2 rubber bands • 2 popsicle sticks or wooden skewers • 2 small clear vials
TIME	1-3 Hours
OBJECTIVES	Students will be able to describe the water cycle, the processes that move water from one location to another, and the critical importance of water for the persistence of life. Students will be able to model the water cycle and describe the interactions between energy and matter that make the water cycle possible.
GUIDING QUESTIONS	What are the relationships between matter and energy in the movement of water in the water cycle?
ARIZONA STATE STANDARDS ADDRESSED IN LESSON	
SCIENCE	4.E1U1.6 Plan and carry out an investigation to explore and explain the interactions between Earth's major systems and the impact on Earth's surface materials and processes. Cross Cutting Concepts: Systems and System Models, Cause and Effect Science and Engineering Practices: Ask Questions and Define Problems Engage in Argument from Evidence Analyze and Interpret Data Conduct and discuss the results of the Molecules in Motion experiment/demonstration.

MATH (Elaborate)	4.MD.B.4: Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Solve problems involving addition and subtraction of fractions by using information presented in line plots. Use the student-led portion of the experiment, when the cold and hot water from your demonstration jars is distributed via smaller vials to measure the time it takes for each sample to diffuse until water color looks uniform. Have students measure using a timer, then plot the differences in a simple line graph and compare the sample with faster diffusion as a fraction of the slower condition.
ELA (Elaborate)	*4.RI.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. Read the “Hangin’ Together” page and write a summary sentence for one paragraph, using a direct quote from the passage.
CTE (Elaborate)	Explore jobs, occupations, and careers to understand the value of all careers to society. Investigate at least one of the careers listed at the bottom of the Hangin’ Together Career Connections in Appendix 2.

ENGAGE

Anchor Phenomenon: Clouds

Discussion Questions: What are clouds? Ask students to describe their reasoning and then vote: Are clouds a solid, liquid or a gas?

Use the attached video https://www.youtubeeducation.com/watch?v=68A_Azsqqg4 (in slides) to generate discussion and surface knowledge around clouds and the movement of water through Earth systems.

EXPLAIN

https://www.usgs.gov/water-science-school/water-cycle#qt-science_center_objects

VOCABULARY	Liquid water, solid water, gaseous water, water molecule, kinetic energy, heat energy, weather, climate, gravity.
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EXPLORE

Whole Body Simulation and/or Phet Lab

*Earth Materials Lab will be recreated at Water Festival - so this is a fine one to skip for time.

Hangin Together Activity and reading with vocabulary and Hangin’ Together Reading Page

Read suggested water books in google classroom and answer comprehension questions.

ELABORATE

Science and ELA

Hangin Together Activity and reading with vocabulary and Hangin' Together Reading Page

Read suggested water books in google classroom and answer comprehension questions

Cloud in a Bottle

Cloud Scavenger Hunt

Learn how clouds are categorized

Make a cloud with your mouth

Math and CTE Opportunities

Molecules in Motion Simulation Worksheet (Appendix)

EVALUATE

[Vocabulary Quiz](#), Water Cycle Quiz (use diagram), [CER](#)

REFLECT

What went well? What resources could be improved, added, or removed to increase the usability or effectiveness of this lesson? [General Feedback Google Form](#)

CONTENT KNOWLEDGE AND SUGGESTED READING FOR TEACHERS

From AZ Science Standards: Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. • The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. • Rainfall helps shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4.E1U1.7)

Fourth Grade Rain Harvest Word Problems

Based on Real Arizona Rainfall Data

Data Sources:

- National Weather Service, National Centers for Environmental Prediction
 - NOAA Annual Climate Reports for Arizona (2023)
 - Average Annual Rainfall: Prescott, AZ: 20.1 inches | Tucson, AZ: 12.0 inches | Phoenix, AZ: 8.3 inches
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Problem 1: Prescott Rain Barrel

Real-World Context:

The Rodriguez family lives in Prescott, Arizona. They want to build a rectangular rainwater collection surface on their roof to collect rainwater. The surface will be 12 feet long. The perimeter of the rectangular surface needs to be 40 feet.

Questions:

- a) What is the width of the rectangular collection surface?
 - b) What is the area of the collection surface in square feet?
 - c) Prescott receives an average of 20.1 inches of rainfall per year. If 1 square foot of surface collects approximately 0.62 gallons of water per inch of rainfall, how many gallons of water could the Rodriguez family collect in one year?
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Problem 2: Tucson Garden Water System

Real-World Context:

Ms. Chen teaches at a school in Tucson, Arizona. The school wants to create a rainwater collection tarp over their garden. The rectangular tarp has a width of 8 feet. If the area of the

tarp is 96 square feet, they need to find the length to order the correct amount of edging material.

Questions:

a) What is the length of the rectangular tarp?

b) What is the perimeter of the tarp?

c) Tucson receives an average of 12.0 inches of rainfall per year. Using the same collection rate of 0.62 gallons per square foot per inch, how many gallons of water could be collected annually from this tarp? (Round to the nearest whole number.)

Problem 3: Phoenix Community Center Challenge

Real-World Context:

The Phoenix Community Center is designing two different rainwater collection surfaces for their outdoor learning area. One surface will be a rectangle measuring 15 feet by 10 feet. The other surface will be a rectangle measuring 20 feet by 6 feet.

Questions:

a) What is the area of the first collection surface (15 ft $\times$ 10 ft)?

b) What is the area of the second collection surface (20 ft $\times$ 6 ft)?

c) Which surface has the larger area? By how many square feet?

d) Phoenix receives an average of 8.3 inches of rainfall per year. Using the collection rate of 0.62 gallons per square foot per inch, how much more water could the larger surface collect in one year compared to the smaller surface? (Round to the nearest whole number.)

Answer Key

Problem 1: Prescott Rain Barrel

a) Finding the width:

- Formula: Perimeter = $2(\text{length} + \text{width})$
- $40 = 2(12 + \text{width})$
- $40 = 24 + 2(\text{width})$
- $16 = 2(\text{width})$
- Width = 8 feet

b) Finding the area:

- Formula: Area = length $\times$ width
- Area = 12×8
- Area = 96 square feet

c) Finding annual water collection:

- Water per year = Area $\times$ rainfall $\times$ collection rate
 - Water per year = $96 \text{ sq ft} \times 20.1 \text{ inches} \times 0.62 \text{ gallons/sq ft/inch}$
 - Water per year = $96 \times 20.1 \times 0.62$
 - Water per year = 1,195.392 gallons
 - Approximately 1,195 gallons per year
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Problem 2: Tucson Garden Water System

a) Finding the length:

- Formula: Area = length $\times$ width
- $96 = \text{length} \times 8$
- Length = 12 feet

b) Finding the perimeter:

- Formula: Perimeter = $2(\text{length} + \text{width})$
- Perimeter = $2(12 + 8)$
- Perimeter = $2(20)$
- Perimeter = 40 feet

c) Finding annual water collection:

- Water per year = Area $\times$ rainfall $\times$ collection rate
- Water per year = $96 \text{ sq ft} \times 12.0 \text{ inches} \times 0.62 \text{ gallons/sq ft/inch}$
- Water per year = $96 \times 12.0 \times 0.62$

- Water per year = 714.24 gallons
 - Approximately 714 gallons per year
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Problem 3: Phoenix Community Center Challenge

a) Area of first surface (15 ft $\times$ 10 ft):

- Area = length $\times$ width
- Area = 15 $\times$ 10
- Area = 150 square feet

b) Area of second surface (20 ft $\times$ 6 ft):

- Area = length $\times$ width
- Area = 20 $\times$ 6
- Area = 120 square feet

c) Which surface is larger and by how much:

- Difference = 150 - 120
- The first surface is larger by 30 square feet

d) Difference in water collection annually:

- Water from larger surface = 150 $\times$ 8.3 $\times$ 0.62 = 771.9 gallons
 - Water from smaller surface = 120 $\times$ 8.3 $\times$ 0.62 = 617.52 gallons
 - Difference = 771.9 - 617.52 = 154.38 gallons
 - The larger surface collects approximately 154 more gallons per year
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Standards Alignment Notes

These problems meet the fourth-grade standard by requiring students to:

- ✓ Apply area formula ($A = l \times w$) to find missing information
- ✓ Apply perimeter formula ($P = 2(l + w)$) to find missing dimensions
- ✓ Solve problems with unknown side lengths
- ✓ Apply formulas in real-world contexts (rainwater harvesting)
- ✓ Use real data from authentic sources

- ✓ Extend understanding by combining area/perimeter concepts with multiplication and multi-step problem solving