

Lesson Plan

Mission 1: Wayward Water!

Lesson 2 – A Mystery to Pond-tificate!

Grade Level: 6-8



DURATION & AGENDA

1. 45 minute Class Period (w/ Optional 2nd Day for In-Class Experiments)

3 Minutes of Warm-Up Discussion on Daily Plan

3 Minutes for Lesson (“2A”) Video for Investigation Setup

5 Minutes of Teacher/Class Discussion on Observations & Re-State the Question

20 Minutes to complete the Interactive Video Investigation as a Class (Lesson “2B”)

*10 Minutes to Conduct an Optional Short Demonstration, or use as Rock Kit time
OR Teacher Expansion Discussion*

OR Optional 2nd Day - In-House Experiment re-creation

5 Minutes to Watch Final Conclusion Video and Recap

SUMMARY OF LEARNING GOALS

This lesson is a part of our instructor-led investigation of Hydrologic Cycle series within the Hydrosphere unit (Missions 1 and 2). Mission 1 Lesson 2 investigates the processes of evaporation and related processes, using an interactive scene based on a half-filled Oklahoma pond. Initial observations such as noting water levels vs dock height, etc., lead students to formulation of a primary question, “Why is the pond only half-full?”

Through interactive selections, users can select data on plants, the mud or soil beneath the pond, houses and structures near the pond, and the pond water itself. Data is presented which describes the relative inflow and outflow of water, including brief introduction of the concept of groundwater, water tables and zones of saturation; wells and human water use; transpiration of water vapor through plant intake; infiltration and the effects of the sun and wind in converting liquid water to evaporation, and rate of conversion.

Students must watch the videos and discuss clues, noting them as they go, for use to present the most applicable, reasoned claim as to why the pond is not full. Following the choice of claim, the video introduces the concept and provides other examples and experiments which expand on the topic of evaporation.

Alignment to Standards

OK SCIENCE FRAMEWORKS

MS-ESS2-4 Earth's Systems - Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

Science and Engineering Practices: Develop and Use Models

- Students collect data and build model of how water could be removed from a pond by various means, and use the data to reason the best claim/hypothesis leading to discussion on the process of evaporation (and transpiration).
- Includes a simple model of unobservable behavior in discussion about how water is gained or lost in the pond from underground saturated rocks and soil (water table, groundwater).

Disciplinary Core Ideas

- **ESS2.C The Roles of Water in Earth Surface Process**
 - Water continually cycles among land, ocean and atmosphere via transpiration, evaporation, condensation, and precipitation (incl. crystallization), as well as downhill flows on land.
 - Global Movements of water and its changes in form are propelled by sunlight and gravity.

Cross-Cutting Relationships Are A Core Part of Everyday Earth!

- Mission 1 Lessons 2,3,4,5,and 7, and Mission 2 Lessons 1 and 8, are part of a series of lessons focused on exploration of the Hydrologic Cycle processes (captured by the MS-ESS2-4 standard).
- These lessons can be watched linearly and are co-evolved as a “field trip” or “mission” which continually explores location-based cross-cutting relationships with
 - ESS2-2 (Mission 1 Lesson 6; Mission 2 Lessons 2,3,4,5,6 and 7), which relate Hydrologic Cycle to the role of water in changing the Earth's surface.
 - ESS2-3 (Where is Water Found on Earth) in Mission 1 Lesson 1.

NEXT GENERATION SCIENCE STANDARDS (NGSS)

MS-ESS2-4 Earth's Systems - Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

Science and Engineering Practices: Develop and Use Models

- Students collect data and build model of how water could be removed from a pond by various means, and use the data to reason the best claim/hypothesis leading to discussion on the process of evaporation (and transpiration).
- Includes a simple model of unobservable behavior in discussion about how water is gained or lost in the pond from underground saturated rocks and soil (water table, groundwater).

Disciplinary Core Ideas

- **ESS2.C The Roles of Water in Earth Surface Process**
 - Water continually cycles among land, ocean and atmosphere via transpiration, evaporation, condensation, and precipitation (incl. crystallization), as well as downhill flows on land.
 - Global Movements of water and its changes in form are propelled by sunlight and gravity.

Cross-Cutting Relationships Are A Core Part of EveryDay Earth!

- Mission 1 Lessons 2,3,4,5,and 7, and Mission 2 Lessons 1 and 8, are part of a series of lessons focused on exploration of the Hydrologic Cycle processes (captured by the MS-ESS2-4 standard).
- These lessons can be watched linearly and are co-evolved as a “field trip” or “mission” which continually explores location-based cross-cutting relationships with
 - ESS2-2 (Mission 1 Lesson 6; Mission 2 Lessons 2,3,4,5,6 and 7), which relate Hydrologic Cycle to the role of water in changing the Earth's surface.
 - ESS2-3 (Where is Water Found on Earth) in Mission 1 Lesson 1.
 - ESS2-1. The “Sphere”'s Mission 1 Lesson 1.

CARRYING OUT THE LESSON

In this lesson, students will be engaged in active discussion with the instructor on observations of the pond scene, in the video. Discussions on when the students have witnessed water “disappear”, or if they have a pond or pool which loses water over time.

The instructor will show the initial video “2A” to the class. A brief discussion will follow to establish the scene and key information that leads the class to understand the question that will be investigated in Lesson 2B. This is “Why is the pond half-full, and where did the water go?”

The narrative of the water nanodroplet is useful in helping focus the students on tracking a single drop of water as it moves through the earth system, the Hydrosphere. Teachers can adopt the water nanodroplet in their discussions. This is based on real technology, but includes advanced wording, so a discussion early in the Mission may need to occur (what does nano mean? Etc.).

Once the question is established, the instructor loads Lesson 2b, and selects a student to help choose what data to collect first. Students may take note or make sketches in the downloadable “Mission Notes” form individually. The instructor will guide class through all available selections, careful to watch all possible selections - but as in real life, skipping data by watching one section multiple times may affect the outcome.

At the end of the data gathering section, the class will choose the most reasoned claim for that set of observations. The instructor will discuss the data and how we arrived at that claim/hypothesis. The instructor may then introduce the main concept or process, evaporation. The students may watch the final segment of the video introducing the concepts and expansions.

Depending on the instructors time available, an optional 2nd day can have the class perform the in-video experiments in class. IN absence of Day 2, we recommend watching the short experiment video in the lesson and discussing it.

Instructor will conclude the lesson with a wrap-up of what the class did - observe, question, gather data, and use the data to choose the most reasonable claim. Then compare that with established process definitions, experiments and expansion material.

The instructor can add their own material to any part of this lesson plan to further customize the discussion.

Experiment guides are available in the resource tab on each Lesson for download and printing, with materials lists and directions to conduct experiments in the classroom.

SUGGESTED ASSESSMENTS

Each lesson includes, on the “C” level tab, a short quiz called a “Knowledge Scanner”. This quiz can be printed and conducted individually or as a group.

Additionally, a CER Rubric is provided in case the instructor wants to request a written summary of the investigation and learnings. The rubric is located in the Mission Resource Tab.

An End of Mission exam is available at the end of Mission 1, and can be edited as needed by the instructor. This exam covers all material shown in Mission 1, Lessons 1-8.

Sketches, diagrams, and models of various processes and systems can also be requested and evaluated as a general assessment of comprehension of lesson material.