Rocks

Earth & Space Science | Lesson Guide

5th Grade

Photo Description

This image shows a house with a beautiful stone water fountain made from stacked flat rocks in the front yard. Water flows down through the different levels of stones, creating a small waterfall. The fountain is surrounded by plants and sits in a garden with mulch covering the ground.

Scientific Phenomena

The anchoring phenomenon is water cycling through a human-made system that mimics natural processes. Water is pumped from a reservoir at the bottom through hidden tubes back to the top of the stone stack, where gravity pulls it down through the gaps between rocks. This demonstrates how water moves in continuous cycles, just like in nature where water evaporates, condenses, and flows downhill due to gravitational force. The fountain shows properties of water including flow, adhesion to rock surfaces, and the water cycle in action.

Core Science Concepts

1. Water Cycle Components: The fountain demonstrates evaporation (water turning to vapor), condensation (if you observe early morning), and precipitation (water flowing down like rain).

2. Gravity and Water Flow: Water always flows downhill due to gravitational pull, following the path of least resistance through gaps in the rocks.

3. Properties of Matter: Water maintains its liquid state while demonstrating properties like adhesion (sticking to rocks) and cohesion (water molecules sticking together).

4. Human Impact on Water Systems: This artificial system shows how humans can create water features that support local ecosystems and provide habitats for wildlife.

Pedagogical Tip:

Have students trace the water's journey with their finger in the air while explaining each step. This kinesthetic movement helps cement the concept of cyclical processes in their minds.

UDL Suggestions:

Provide multiple ways for students to represent their understanding: drawing the water cycle, acting it out with body movements, or building a model with clay and small rocks to accommodate different learning preferences.

Zoom In / Zoom Out

1. Zoom In: At the molecular level, water molecules are constantly moving and forming hydrogen bonds with each other and with the rock surfaces. This molecular attraction causes water to stick to rocks (adhesion) and flow in streams rather than individual droplets.

2. Zoom Out: This fountain connects to the larger watershed system. The water that evaporates joins the atmospheric water cycle, potentially becoming clouds and precipitation that feeds rivers, lakes, and groundwater systems across the region.

Discussion Questions

1. How does this fountain model the natural water cycle happening in our local environment? (Bloom's: Analyze | DOK: 3)

2. What would happen to the fountain if the pump stopped working, and how does this compare to what drives the natural water cycle? (Bloom's: Evaluate | DOK: 3)

3. What evidence can you observe that shows water is interacting with the rock materials in this fountain? (Bloom's: Apply | DOK: 2)

4. How might this fountain affect the plants and animals in the surrounding garden ecosystem? (Bloom's: Synthesize | DOK: 3)

Potential Student Misconceptions

1. Misconception: "The water disappears and new water appears at the top."
Reality: The same water is recycled continuously through a pump system, just like nature recycles water through evaporation and precipitation.

2. Misconception: "Water flows uphill naturally in fountains."
Reality: A mechanical pump uses energy to move water uphill against gravity, similar to how the sun's energy drives evaporation in the natural water cycle.

3. Misconception: "Only rain and rivers are part of the water cycle."
Reality: All water on Earth is part of one continuous cycle, including water in fountains, puddles, plants, and even our bodies.

Cross-Curricular Ideas

1. Math - Measurement & Volume: Have students measure the height of the fountain and calculate how much water might flow through it per minute. They could estimate the volume of the reservoir and predict how long the water would last if the pump stopped. This connects to measurement, estimation, and real-world math applications.

2. ELA - Descriptive Writing & Poetry: Ask students to write descriptive paragraphs or poems about the fountain using sensory language (what they see, hear, and feel when observing water features). They could also research and write about famous fountains around the world, combining research skills with creative writing.

3. Social Studies - Human Geography & Community Design: Explore how fountains and water features are used in different cultures and communities. Discuss why people design gardens and water features, and how they reflect human needs and values. Students could research water management in their own community and how it affects residents.

4. Art - Design & Sculpture: Have students sketch their own fountain designs using natural and recycled materials, or create 3D models using clay, stones, and found objects. This allows them to apply artistic thinking while understanding the engineering and science principles that make fountains work.

STEM Career Connection

1. Hydrologist: A hydrologist is a scientist who studies water on Earth, including how it moves, where it comes from, and how it affects our environment. Hydrologists help communities manage water resources, predict floods, and protect water supplies. They might study rivers, groundwater, and water cycles like the one shown in this fountain. Average Annual Salary: $84,000

2. Landscape Architect: A landscape architect designs outdoor spaces like gardens, parks, and yards. They plan where to place plants, water features like fountains, and other elements to create beautiful and functional spaces. They use science to understand how water flows and how plants grow in different conditions. Average Annual Salary: $70,000

3. Environmental Engineer: An environmental engineer designs systems to protect and clean our environment, including water systems. They might design fountains, water treatment systems, or irrigation systems that help conserve water. They combine science, math, and design to solve problems related to water and nature. Average Annual Salary: $96,000

NGSS Connections

- Performance Expectation: 5-ESS2-1 - Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- Disciplinary Core Ideas: 5-ESS2.A - Earth's major systems interact through physical and chemical processes
- Disciplinary Core Ideas: 5-ESS2.C - Human activities affect Earth's systems
- Crosscutting Concepts: Systems and System Models - A system is a group of related parts that make up a whole
- Crosscutting Concepts: Energy and Matter - Matter and energy can be transferred between systems

Science Vocabulary

* Evaporation: The process when liquid water changes into invisible water vapor and rises into the air.
* Gravity: The force that pulls objects toward Earth, causing water to flow downhill.
* Adhesion: When water molecules stick to other materials like rocks or glass.
* Reservoir: A place where water is collected and stored for later use.
* Cycle: A series of events that repeat over and over in the same order.
* Precipitation: Water that falls from clouds as rain, snow, sleet, or hail.

External Resources

Children's Books:
- The Magic School Bus at the Waterworks by Joanna Cole
- A Drop Around the World by Barbara Shaw McKinney
- The Water Cycle by Rebecca Hirsch