Shoebox Water Cycle Powered by Sun and Gravity

Teacher		**Class**	Grade 6
Subject	Science	**Topic**	The water cycle
Date		**Room**	
Lesson length	60 minutes	**Country**	United States

Students learn how Sun energy and gravity move water in a loop. They build a shoebox model and label the main processes.

Curriculum links

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

Learning objectives

- Students will trace how Sun energy lifts water and gravity pulls it down.
- Students will build a shoebox model labeling evaporation, condensation, precipitation and runoff.

Success criteria

- I can explain how the Sun lifts water up and gravity pulls it down.
- I can label evaporation, condensation, precipitation and runoff on my model correctly.

What students already know

Show a puddle photo. Ask: Where does puddle water go on a sunny day? Listen for evaporates into air.

Key words

evaporation	liquid water changing into invisible gas that rises into air [8]
condensation	cooled gas changing back into tiny liquid drops that make clouds [4]
precipitation	water falling from clouds to the surface as rain, snow or hail [8]
runoff	rainwater flowing over land downhill toward streams and oceans [8]
gravity	invisible pull that brings falling water down toward the ground

Materials

- shoeboxes or trays
- blue and green paper
- cotton balls
- arrows on sticky notes
- glue, scissors, markers
- pre-cut shapes and printed labels for evaporation, condensation, precipitation, runoff
- Slides 2-12 and Video clip 1

Before the lesson

- Print process labels and yellow Sun arrows and brown down arrows for each team
- Pre-cut blue ocean strips, green hill shapes, and cotton clouds; test Slide 6 Video clip 1 (0:00–5:00)
- Set out shoeboxes, glue, scissors, markers and sticky-note arrows in team trays
- Clear floor space for 1-minute model tours and check projector and whiteboard

Lesson outline

0–7 min **Starter** 7 min · Whole class

Surface ideas about where water goes and introduce the model challenge.

YOU DO

1. Welcome class and ask the hook: Can you build Earth’s water trip so small it fits in a shoebox but still shows what powers it?
2. Show Slide 2 Where Next? and take a vote: A raindrop lands on school grass. What happens next?
3. Show Slide 5 Think, pair, share: What lifts water up to clouds, and what pulls it back down?
4. Collect 3 ideas and promise to test them with a model powered by the Sun and gravity.

STUDENTS DO

1. Vote for soaks, flows, taken up, or evaporates on Slide 2.
2. Pair-talk Slide 5 question and share one idea about up and down.
3. Listen for the two drivers: Sun energy up, gravity down.

Say: Can you build Earth’s water trip so small it fits in a shoebox but still shows what powers it? Vote on Slide 2, then tell your partner what lifts water up and what pulls it back down. We will prove it with our models.

Ask: Yesterday the parking lot had puddles. Today they are gone. Where did it go? (Heat from sunlight caused it to evaporate into invisible vapor [4].) · What lifts water up to clouds and what pulls it back down? (Energy from the Sun lifts it by evaporation; gravity pulls rain and runoff down [7][8].)

Check understanding: Hands up for Sun lifts, gravity pulls. If mixed, repeat gestures: fingers rise for Sun, hands fall for gravity.

Support: Offer vote cards with pictures and sentence starter: I think the water ___. **Stretch:** Ask to predict which vote wins on hot sunny days versus rainy days and why.

Use: Slides 2, 5

7–17 min **Teaching** 10 min · Whole class

Explain stores, state changes, and Sun and gravity drivers.

YOU DO

1. Show Slide 3 and explain 97.5% of Earth's water is salty [3] and oceans store 96% of all water [5].
2. Show Slide 4 and explain the same water has cycled for billions of years and the total amount stays constant [12].
3. Teach Slide 7 words with gestures: evaporation, transpiration, condensation, precipitation, runoff.
4. Stress the system is powered by energy from the Sun as exchange between oceans, atmosphere, and land [7].

STUDENTS DO

1. Choral-repeat terms and gestures for up for evaporation and down for precipitation.
2. Copy Sun arrow up and gravity arrow down in notebooks.
3. Tell partner where most water is stored.

Say: Water is stored in the atmosphere, on land, and below ground as liquid, solid, or gas [5]. Heat from sunlight causes water to evaporate from oceans, lakes, and streams [4]. Cooled vapor condenses into clouds [4], then gravity pulls precipitation down and moves runoff toward streams [8].

Worked example: Follow one drop: 1. Start in ocean. 2. Sun heats it, it evaporates to vapor and rises. 3. High up it cools and condenses to cloud drops. 4. Drops get heavy and fall as precipitation. 5. On land it runs off downhill in streamflow back to ocean [8][4].

Ask: Where is most of Earth's water stored and in what states? (In oceans as salty liquid; also ice, groundwater, lakes, rivers and vapor [5][3].) · What changes water from liquid to gas and gas back to liquid? (Sun heat drives evaporation to vapor; cooling drives condensation to drops [4].)

Check understanding: Mini whiteboards: draw up arrow and write Sun, draw down arrow and write gravity. Reteach if reversed.

Support: Provide word bank with pictures and have students point to Sun or gravity for each term. **Stretch:** Ask where transpiration fits: water pulled from soil and released to air by plants [8].

Use: Slides 3, 4, 7

17–25 min **Watch and spot** 8 min · Whole class

See Sun lifting water and gravity pulling water in action.

YOU DO

1. Show Slide 6 Follow a Water Molecule and play Video clip 1 (0:00–5:00).
2. Pause twice to point out vapor rising after heating and clouds, rain and downhill flow.
3. Narrate that evaporation from water bodies provides nearly 90% of atmospheric moisture [7].
4. Ask students to call Sun when water rises and Gravity when water falls.

STUDENTS DO

1. Watch the clip and track the molecule with a finger up or down.
2. Call Sun or Gravity and name evaporation, condensation, or precipitation.
3. Note one Sun example and one gravity example to use in the shoebox.

Say: Watch how water changes state. Spot Sun lifting water up and spot gravity pulling water down. Call out Sun when you see vapor rise and Gravity when you see rain fall or water flow downhill.

Ask: In the video, what showed Sun energy at work? (Water evaporating from oceans and lakes and vapor rising [4][7].) · In the video, what showed gravity at work? (Precipitation falling to the surface and runoff moving toward streams [8].)

Check understanding: Thumbs up if you saw both drivers. Replay 30 seconds if students missed one.

Support: Give a two-column sheet: Sun / Gravity to tick when they see each. **Stretch:** Ask students to also spot condensation and infiltration and decide up or down.

Use: Slide 6, Video clip 1 (0:00–5:00)

25–50 min **Main activity** 25 min · Groups

Build and label a shoebox model driven by Sun and gravity.

YOU DO

1. Show Slide 9 Your task and a finished example with ocean, land, cotton clouds, and arrows.
2. Give out trays and remind teams to include one yellow Sun arrow for evaporation and brown down arrows for precipitation and runoff.
3. Circulate to check labels for evaporation, transpiration, condensation, precipitation, and runoff, the most important processes [12].
4. Stop at 20 minutes for 1-minute tours pointing to evaporation, condensation, precipitation, and runoff.

STUDENTS DO

1. Build ocean, land, and clouds and add sticky-note arrows for fluxes and pools.
2. Label evaporation, condensation, precipitation, runoff and add Sun and gravity arrows.
3. Give a 1-minute tour explaining how water returns to the start.

Say: Make an ocean with blue paper, hills with green paper, and clouds with cotton. Add arrows for movement and labels where water is stored [5]. You must show Sun energy driving water up and gravity driving rain and runoff down to the ocean.

Worked example: Teacher model tour: Sun heats ocean, water evaporates up. Vapor cools and condenses to cotton cloud. Gravity pulls drops down as precipitation. Runoff flows downhill on green paper back to blue ocean where the cycle restarts.

Ask: Where did you show the Sun driver and what does it do? (Yellow arrow on evaporation and transpiration; heat turns liquid to vapor that rises [4][7].) · Where did you show gravity and how does water get back to the ocean? (Down arrows on precipitation and runoff; rain falls and flows downhill to ocean [8].)

Check understanding: Checklist walk: each model has 4 labels plus Sun-up and gravity-down arrows. Add missing arrows before tours.

Support: Give pre-cut shapes and a sample layout, plus labels to stick on instead of writing all terms from memory. **Stretch:** Have students add houses and farms and explain how human activities affect where water is stored, how it moves, and how clean it is [5].

Use: Slide 9

50–60 min **Plenary** 10 min · Whole class

Connect ideas and check Sun and gravity understanding.

YOU DO

1. Show Slide 10 Connect the Cycle mindmap and have two teams link their model to each branch.
2. Show Slide 11 mystery: explain drops on a cold glass as vapor cooling and condensing [4].
3. Run Slide 12 Quick quiz orally for Sun and gravity drivers.
4. Hand out exit tickets and preview next lesson on freshwater limits.

STUDENTS DO

1. Link models to the mindmap and explain one Sun move and one gravity move.
2. Answer quiz questions and write exit ticket starting The Sun ___ and gravity ___.
3. Self-rate: point to success criteria and show 1-3 fingers.

Say: Water continuously moves between liquid, solid, and vapor states [3]. Tell how your model keeps water moving between oceans, atmosphere, and land [7]. The total amount stays almost the same, so water just changes place and state [12], but freshwater in one place can run short if used faster than restored [3].

Ask: What energy source drives evaporation? (Energy from the sun.) · What force pulls rain down and moves runoff downhill? (Gravity.) · Why does the total amount of water stay almost the same? (The total amount remains essentially constant; water just changes place and state [12].)

Check understanding: Collect exit tickets; if many miss gravity, re-model falling rain and downhill flow tomorrow.

Support: Allow copying the final class sort and sentence starters for the exit ticket. **Stretch:** Ask where condensation and infiltration fit when both cooling and falling are involved.

Use: Slides 10, 12

Common mistakes

Mistake	How to spot it	How to fix it
Thinking puddle water disappears and new water is made later.	Exit says water is gone or used up.	Remind that the total amount stays constant [12]; it changed to invisible vapor by evaporation [4].
Thinking clouds are vapor and rain comes without a driver.	Labels cloud as vapor or leaves out Sun and gravity arrows.	Model that vapor cools and condenses to liquid drops [4], then gravity pulls precipitation down [8].
Mixing up runoff and infiltration.	Labels soaking soil as runoff.	Act out: infiltration soaks into soil, runoff moves on the surface toward streams [8].

Support

- Give pre-cut shapes and a sample layout, plus labels to stick on instead of writing all terms from memory.
- Provide sentence starters, word bank, and Sun versus gravity color-coded arrows.
- Let students rehearse the 1-minute tour with a partner before sharing.

Stretch

- Have students add houses and farms and explain how human activities affect where water is stored, how it moves, and how clean it is [5].
- Have students compare shade versus sun evaporation and argue where condensation fits.

For the LSE or teaching assistant

Stay with target groups during build; help place Sun-up and gravity-down arrows and prompt tour sentences.

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Safety

- Show safe scissor use, carry scissors point-down, and clean up paper scraps to prevent slips.

Check for understanding

Question	Answer
What energy source drives evaporation and what does it change?	Energy from the sun; liquid water to vapor gas [4].
What force pulls rain down and moves runoff downhill?	Gravity pulls precipitation to the surface and runoff toward streams [8].
Name the four labeled moves in your model in order.	Evaporation, condensation, precipitation, runoff [12].

Homework

Draw your shoebox and write how the Sun and gravity would move water over the next day.

Sources

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