MOSA MACK SCIENCE

Water Cycle Lesson 1: *The Solve*

Educator's Resource Guide: Animated Mystery

The Solve contains two mini lessons: The live video lesson and the animation lesson. For the most comprehensive learning experience, conduct both. If you're short on time, choose one. Which lesson?

- For a more structured lesson, choose the animation (the lesson below).
- For a more inquiry-based lesson, choose the live video lesson and assign the animation for homework.

Objective

In *The Solve*, students will:

1. Solve a mystery that demonstrates how water cycles in the environment.
2. Create a Mind Map to explore relationships among complex Water Cycle vocabulary.
3. Communicate understanding that wastewater is a source of water that can be treated and recycled back into the environment for human use.

Time Required: 40-75 minutes

Materials Required	Safety Considerations	Science & Engineering Practices
• Student Guide (*includes student agenda and Mind Map)* • Water Cycle Mosa Mack Comic Mystery (printable or motion comic) • Scissors • Glue or tape	None	• Developing and using models • Constructing explanations or arguments from evidence

Episode Description

Splashy Land, the famous water park, has been forced to lock its gates. There's a drought in the area and water restrictions are affecting everyone.

Mosa and her crew are called to the scene to bring back summer fun. As she tries to find the source of the problem, she realizes that the water crisis is larger than she initially thought. After tracing the path of water, Mosa realizes that the water they use in the park and throughout the community is part of a larger cycle. She thinks up a creative way to re-open Splashy Land to beat the summer heat!

Inquiry Scale: Leveling Information

The Solve can be completed in various settings, including presentation-style, small groups, or individually. In the case of a flipped or blended classroom, it can be completed entirely at home.

Level 1: Most teacher-driven (*recommended for grades 4–5)*

View the animated mystery twice: once in full, and a second time along with the discussion questions, pausing the video as needed to answer the episode questions as a group. Project and complete the Mind Map as a class-wide activity. This can be done digitally or on paper. Have students informally quiz each other on the vocabulary until you feel they're familiar with the terms. Use the discussion questions at the bottom of the Mind Map to have a group discussion. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 2 (*recommended for grades 5–6)*

View the animated mystery in full. Afterwards, have students work through the episode questions to the best of their ability in small groups. Play the mystery a second time, pausing the video to discuss each question. Direct students to complete the Mind Map in small groups, either digitally or on paper. Come back as a class to review correct answers, as needed. Have students informally quiz each other on the vocabulary until you feel they're familiar with the terms. Use the discussion questions at the bottom of the Mind Map to have a group discussion. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 3 (*recommended for grades 6–7)*

Provide students with their student URL and have students view the animated mystery in small groups. Have students play the animated mystery once in full and then answer episode questions in their table groups to the best of their ability. Then, as a class, project the mystery, pausing, as needed, to discuss episode questions in a think-pair-share format. Have students complete the Mind Map in table groups, either digitally or on paper. Have students quiz each other on the vocabulary until you feel they're familiar with the terms. In table groups, have students go through the discussion questions on their own, and review answers as a class. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 4 *(recommended for grades 7–8)*

Provide students with their student URL and have students view the animated mystery and complete episode questions in pairs. Have students review their answers with a neighboring table group. Have students complete the Mind Map in pairs, either digitally or on paper. Have students quiz each other on the vocabulary until they feel they're familiar with the terms. Have these same pairs go through the discussion questions. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Agenda

I. Solve the Water Cycle Mosa Mack Mystery (20 minutes)

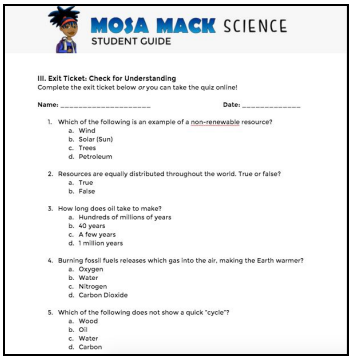
Differentiation Tip: The comic book and motion comic video can be read/watched as a class, in small groups, individually, or completed for homework. For additional support, students can read or watch the comic/episode twice: once before completing the questions, and once with teacher guidance, pausing to discuss each answer.

1. Read/watch the Mosa Mack Mystery on Water Cycle.

2. Students answer the questions in their Student Guide as they read/watch. Encourage students to cite the specific page numbers/time codes in the Comic Mystery to promote writing with supporting evidence. Answers can be found in the key below.

II. Vocabulary Mind Map Activity (15–45 minutes)

Differentiation Tip: The Mind Map can be done as a class, in small groups, individually, or completed for homework.


MOSA MACK SCIENCE
STUDENT GUIDE

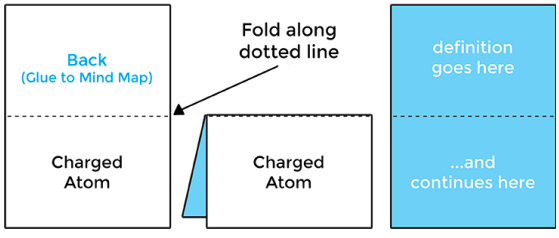
III. Exit Ticket: Check for Understanding
Complete the exit ticket below or you can take the quiz online!

Name: _____ Date: _____

1. Which of the following is an example of a non-renewable resource?
   a. Wind
   b. Solar (Sun)
   c. Trees
   d. Petroleum
2. Resources are equally distributed throughout the world. True or false?
   a. True
   b. False
3. How long does oil take to make?
   a. Hundreds of millions of years
   b. 40 years
   c. A few years
   d. 1 million years
4. Burning fossil fuels releases which gas into the air, making the Earth warmer?
   a. Oxygen
   b. Water
   c. Nitrogen
   d. Carbon Dioxide
5. Which of the following does not show a quick "cycle"?
   a. Wood
   b. Oil
   c. Water
   d. Carbon

1. Students may complete the Mind Map **digitally**. Follow directions below. (15 minutes)
   a. Go to https://mosamack.com/home/water-cycle
   b. Select **Lesson 1: *The Solve***.
   c. Select **Vocabulary** and complete **Part 1:** matching terms with definitions.
   d. Complete **Part 2:** matching terms and definitions with images on a diagram.

2. To complete the Mind Map **on paper**, follow the directions below (45 minutes).
   a. Print and pass out the Student Guide: Water Cycle Lesson 1: *The Solve*.
   b. Introduce the warm up task: students will be making a Mind Map of the vocabulary for this Water Cycle unit.
   c. Model the directions carefully, emphasizing the following. Students should:
      - **cut** out the vocabulary cards on the solid lines only
      - **fold** the cards at the dotted lines
      - write the definition of the term on the inside of the card using definitions provided



d. Students use the clues from the Mind Map images, definitions, and terms to place the cards in the correct location in the Mind Map.
e. Check that the students have matched their cards correctly before moving on.
f. Students use glue or double-sided tape to connect the back of the vocabulary card to the correct place on the Mind Map.
g. Students discuss the questions with their group or as a class when they have completed the Mind Map.

Teacher Tips:

- Since this is the first time many of the students will have seen these vocabulary terms, have students work together to use the images, definitions, and collaborative thinking to figure out where the terms go.
- Check in on student groups through this process. When you see a student or group who has placed a card in the correct place, ask a facilitating question such as, "Why do you think that term goes there?" or "What evidence leads you to believe that term goes there?" When students explain their thinking, this is a great opportunity to provide positive reinforcement. Then, encourage students to share their reasoning to the class or to other groups who may have trouble identifying the location of that specific term.
- If you do not have access to a color printer, provide students with black and white copies and project the colored version of the Mind Map at the front of the room so that students can reference both images.

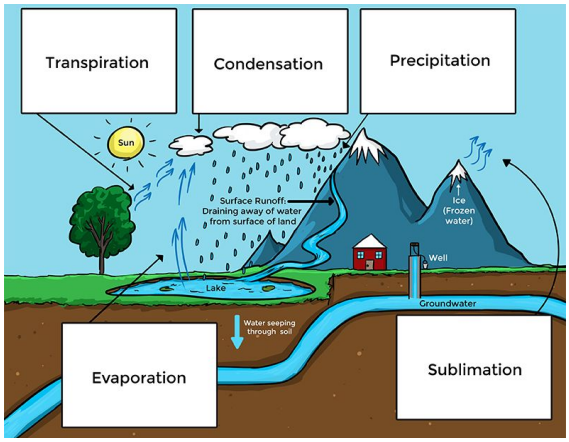
III. Exit Ticket: Check for Understanding (10–15 minutes)

Differentiation Tip: This can be done in groups, pairs, individually, or more formally as a quiz online.

1. Students complete the exit ticket to check for understanding. This can be done online by selecting the **Quiz** button in Lesson 1 or on paper in the Student Guide. Answers are in the key below.

Answer Key

Mind Map



Mind Map Discussion Questions:

a. What do the processes of evaporation and transpiration have in common? *In both evaporation and transpiration, liquid water escapes into the atmosphere in the form of water vapor (a gas). The sun can stimulate both processes.*
b. Name the forms of precipitation shown in this Mind Map illustration. *Precipitation is shown as rain in the Mind Map illustration.*
c. How is runoff important to the Water Cycle process? *Runoff (the draining away of water from a surface) is important to help replenish water in rivers, lakes, streams, and groundwater.*

Episode Questions

1. Why was Splashy Land closed? (page 1) (0:15 - 0:25) *Splashy Land was closed due to water restrictions caused from a drought.*

2. What does the hydrologist blame for the "missing" water? (page 2)(0:54) *The hydrologist blames everybody in the community for using the water, including big farms, new suburbs, etc.*

3. What does Billy find once he climbs down into the well? (page 3) (1:45) *Billy finds just a trickle of water inside of the aquifer once he is lowered into the well.*

4. Where does the water in the aquifer come from? (page 3) (2:10 - 2:23) *Water in the aquifer comes from rainwater seeping down through the ground and from rivers on the surface above.*

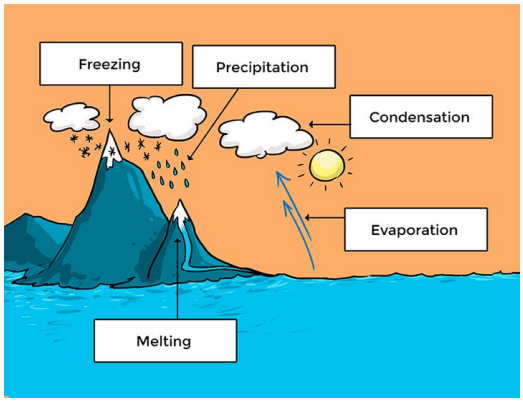
5. What did Mosa and her crew discover in the air on their plane ride? (pages 5-6) (4:30 - 4:45) *Mosa and her crew discovered that water is not a liquid when it is in the sky but instead exists as a gas. When the air gets cooler, the water vapor gases can condense and become a liquid once again. Due to gravity, the liquid water drops to the ground again as rain.*

6. Describe the problems with using ocean water to solve the water crisis. (page 8) (6:30 - 7:00) *We cannot use saltwater for drinking or watering plants because the salt in the water can dehydrate plants and people. In order to safely use saltwater, salt need to be removed. Getting salt out of the water and pumping it from the ocean takes a lot of energy and can be very costly.*

7. Explain what happens to wastewater after it falls down the sewer drain. (pages 10-11) (8:45 - 9:15) *Wastewater is carried to a wastewater treatment plant where it is filtered and purified in order to remove all of the human waste and bacteria. The purified water is then released back into the river, where it mixes with other water.*

8. What water is Mosa going to use to re-open Splashy Land? (Answer Comic) *After learning about the purification of wastewater, Mosa plans to recycle purified wastewater for Splashy Land.*

9. Create a picture in the box below to show your understanding of how the following words connect together in the water cycle: Evaporation, Condensation, Precipitation, Freezing, Melting. *Answers may vary but an example drawing could look like the following shown to the right.*



Quiz:

1. An aquifer is best described as:
    - **a. An underground river**
    - b. A pool of ocean water
    - c. Rain, sleet, and snow
    - d. A drinking fountain found at Splashy Land

2. Most of the water in an aquifer comes from:
    - a. Splashy Land Water Park
    - **b. Water seeping down through the ground from rain and rivers on the surface above**
    - c. The clouds in the sky
    - d. Snowpack found on the top of the mountains

3. Snowpack is formed from layers of snow, which is a form of:
    - a. Transpiration
    - b. Condensation
    - **c. Precipitation**
    - d. Evaporation

4. Condensation occurs when:
    - a. Liquid water is heated and escapes into the air
    - **b. Water vapor cools into liquid droplets**
    - c. Water seeps through the ground
    - d. Rainwater freezes into ice

5. Heat causes liquid to become vapor and enter the air. This is how water from the ocean enters the air. This process is known as:
    - a. Runoff
    - b. Condensation
    - c. Precipitation
    - **d. Evaporation**
6. 97% of all the water on Earth is located in:
    - a. Snowpack
    - b. Lakes
    - c. Aquifers
    - **d. Oceans**

7. True or False: Water from sewer drains can be cleaned and recycled back into rivers and streams.
    - **a. True**
    - b. False