
NYC Companion Lesson



Reading “What Makes Water Move?”

Overview

Students have investigated condensation and evaporation, two of the eight processes in the water cycle. The article “What Makes Water Move?” helps students place those processes in the context of a complete explanation of the water cycle. Following the Active Reading approach, students first read and annotate the article on their own, then they discuss their annotations with a partner. To deepen their understanding, students reread to gather expertise on several water cycle processes. Students then share their particular expertise in groups of three, so each student gets information about all eight processes and can create a diagram of the entire water cycle. The purpose of this lesson is for students to develop an understanding of how water cycles among Earth’s land, ocean, and atmosphere.

Recommended Placement: *Weather Patterns*, after Lesson 1.3

Suggested Time Frame: 60 minutes (first and second reads can be spread across two class periods)

Note: A version of the “What Makes Water Move?” article is assigned for homework in Lesson 1.3. However, this companion lesson requires the NYC-specific version of the “What Makes Water Move?” article found in the Student Edition or on the New York City Resources webpage.

- NYC teachers should not assign the homework found in Lesson 1.3.
- For this companion lesson, do *not* use the version of the “What Makes Water Move?” article that is assigned for homework in Lesson 1.3.

NYS P–12 Science Learning Standards

Performance Expectations

- **MS-ESS2-4:** Develop a model to describe the cycling of water through Earth’s systems driven by energy from the Sun and the force of gravity.



**Disciplinary
Core Ideas**

- **ESS2.C: The Roles of Water in Earth’s Surface Processes:**
 - (NYSED) Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation, sublimation, deposition, precipitation, infiltration, and runoff. (MS-ESS2-4)

**Science and
Engineering
Practices**

- **Practice 1:** Asking Questions
- **Practice 8:** Obtaining, Evaluating, and Communicating Information

**Crosscutting
Concepts**

- Cause and Effect
- Energy and Matter
- Stability and Change

Vocabulary

- | | | | |
|----------------|----------------|-----------------|-----------------|
| • condensation | • evaporation | • precipitation | • sublimation |
| • deposition | • infiltration | • runoff | • transpiration |

Materials & Preparation

Materials

For the Class

- | | |
|---|--|
| <ul style="list-style-type: none"> • Reading “What Makes Water Move?” copymaster • Annotation Tracker | <ul style="list-style-type: none"> • student sheets* • Reading “What Makes Water Move?” • Second Read of “What Makes Water Move?” |
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For Each Student

- Student Edition: “What Makes Water Move?” article

*teacher provided



Preparation

- 1. Print Reading “What Makes Water Move?” copymaster.** Locate the Reading “What Makes Water Move?” copymaster on the New York City Resources webpage: www.amplify.com/amplify-science-new-york-city-resources. Make one copy of all pages for each student.
- 2. Prepare for Active Reading.** Before class, preview the “What Makes Water Move?” article. Review the first few sentences carefully as you prepare to model Active Reading. For a full description of preparing for an Active Reading day, see *Weather Patterns* Lesson 1.4, Lesson Brief, Preparation. It is highly recommended to have students annotate the Student Editions directly with sticky notes in order to achieve the full benefits of this approach.
- 3. Print one copy of the Annotation Tracker for each class.** A blank copy is available in your digital teacher’s guide in *Weather Patterns* Lesson 1.4, Lesson Brief, Digital Resources. If you plan to use the Annotation Summary Sheet to track students’ annotations or wish to review the Annotation Tracker Instructions, these are also available in Lesson 1.4, Digital Resources.
- 4. Make sure the Active Reading Guidelines are clearly visible.** If they are not posted on your classroom wall, write them on the board before class. (See Active Reading Guidelines on the Reading “What Makes Water Move?” student sheet.)
- 5. Plan to model Active Reading.** To model the Active Reading approach, you will need to have students follow along as you read aloud the first few sentences of the article. If you have a document camera in your classroom, consider projecting and annotating the article as you read aloud. Alternatively, you can project the article from the PDF available on the New York City Resources webpage.
- 6. Prepare for On-the-Fly Assessment.** The second read section of this lesson provides an opportunity to informally assess students’ understanding of how water cycles among Earth’s land, ocean, and atmosphere. Refer to the On-the-Fly Assessment in the Assessment section of this lesson for details about what to look for and how you can use the information to maximize learning by all students.



7. Immediately before the lesson, have on hand the following materials:

- “What Makes Water Move?” article
- student sheets
- Annotation Trackers

Science Background

The water cycle consists of many different processes that cause water to be transported and transformed on Earth. Students may already be familiar with some of these processes—evaporation, condensation, and precipitation. Water is also moved and/or transformed through sublimation, deposition, infiltration, runoff, and transpiration.

Sublimation is the process by which a solid changes directly into a gas. Sublimation can occur when the climate has very low relative humidity and at high altitudes where the pressure is lower. Deposition is the process by which a gas changes directly to a solid. Deposition can occur at below-freezing temperatures. Another scientific meaning for the word *deposition* refers to the geologic process by which sediment is laid down and added to land masses.

When water reaches Earth’s surface, infiltration can occur. Infiltration is the process by which water sinks into the ground. It can sink below Earth’s surface into soil or rock. The relationship between groundwater (especially shallow groundwater) and surface water is dynamic. Though groundwater is recharged by surface water percolating into the ground, the flow of water from groundwater to the surface is a major source of water that feeds rivers and lakes. Runoff is liquid water from rain or melting snow that flows over the surface of Earth. This liquid water may come directly from rain or melting snow, or it may come from groundwater that has become oversaturated beneath Earth’s surface.


In addition to the evaporation of surface water, water can move into the atmosphere through transpiration. Transpiration is the process by which water travels through a plant or other organism and evaporates. In plants, water is absorbed by the roots, travels within the plant, and then evaporates out of pores on the outside surface. Water travels upward within a plant against the force of gravity by capillary action or from the loss of water molecules due to transpiration. When water molecules leave the plant through its pores, additional water molecules move up to fill the space. Water can also transpire through the skin of animals, including humans, but that is outside the scope of this lesson.




Instructional Guide

First Read of “What Makes Water Move?”

1. Introduce the article and make a connection to students’ background knowledge.

 You have been investigating what makes rain happen. Today, you will build on what you already know about rainfall and the water cycle by reading an article called “What Makes Water Move?”

 You may have some ideas so far about what makes water move between different areas of Earth’s surface and the atmosphere, but in a moment you will read to find out more.

2. Model Active Reading. Read the first few sentences of the article aloud. Ask questions and make connections as you model the Active Reading process.

3. Review Active Reading Guidelines. Before students begin reading, point out the Active Reading Guidelines on the classroom wall.

4. Distribute the Reading “What Makes Water Move?” student sheets.

5. Prompt students to read and annotate independently. Direct students to the “What Makes Water Move?” article in their Student Editions. Circulate as students read, providing support as needed.

6. Review the process for discussing annotations. When most students have finished reading and annotating, explain that students will choose one or two annotations to share with a partner. They should select questions or connections that they find interesting or those that will help them better understand what they read.

7. Provide a moment for students to select the annotations that they will share with their partners.

8. Prompt partners to discuss annotations. Circulate as pairs discuss, using the Annotation Tracker and listening for questions and connections that you would like to invite students to share during the class discussion.

9. Prompt partners to prepare for class discussion. Ask them to choose an interesting or unanswered question or connection that they would like to share with the class. Explain that they can discuss the same annotations that they shared with their partners if the questions are still unresolved.

10. Facilitate a brief class discussion about annotations. Invite students to share their questions and connections. Encourage students to respond to one another and to look back at the article in order to answer their peers’ questions.



- 11. Highlight exemplary or noteworthy annotations.** Refer to your Annotation Tracker and invite students to share those annotations that you noted. Provide specific, positive feedback as students share and noting when annotations show evidence of Active Reading. Examples might include annotations that make a connection to science ideas, use vocabulary from the unit, or instances in which students were able to answer their own questions.

Second Read of “What Makes Water Move?”

- 12. Set purpose for rereading “What Makes Water Move?”** Point out that many different processes are responsible for cycling water among the land, ocean, and atmosphere. Each process tells one small part of the water cycle story. Explain that students will reread different paragraphs to become experts on several water cycle processes. They will first work with a partner to understand their assigned water cycle processes, then they will share their expertise with a group of students who read about different processes. Each student will create a complete diagram of the water cycle.
- 13. Assign water cycle processes.** Have students form groups of three. Each group member should read about one set of processes. Later, groups will work together to understand the role each process plays in the water cycle. Remind students that they already have some experience with evaporation and condensation from the Sim and the hands-on investigation in the previous lesson.
 - **Set A:** transpiration, evaporation, and sublimation (reread paragraphs 2–4)
 - **Set B:** condensation, deposition, and precipitation (reread paragraphs 5–6)
 - **Set C:** infiltration and runoff (reread paragraphs 7–8)
- 14. Have students relocate to sit with a partner who was assigned to the same set of water cycle processes.** Working in pairs will allow students to support each other as they prepare to share expertise with their original groups.
- 15. Distribute the Second Read of “What Makes Water Move?” student sheets and direct partners to complete Part 1.** Partners should identify and discuss the information that helps them understand how their assigned processes move water from place to place.
- 16. Prompt pairs to discuss information from the article.** Ask students to talk to their partners about the information they highlighted and annotated. Remind them that this partner discussion will help them prepare to share their expertise with group members who read about different processes.



17. Have students reconvene with their original groups and complete Part 2. Students should take turns explaining how the processes they read about move water from place to place. When they are finished, they should use their shared knowledge to create a diagram of the water cycle. Diagrams should be labeled and include all eight processes, but students can decide how to best represent each process. Inform students that discussions and planning can happen as a group, but each group member should make their own diagram.

18. On-the-Fly Assessment: Students’ Understanding of How Water Cycles Among Land, Ocean, and Atmosphere. For further suggestions on how to support students’ understanding of how water cycles among land, ocean, and atmosphere, refer to the On-the-Fly Assessment in the Assessment section of this lesson.

19. Lead a brief discussion of Part 2. Invite groups to share their diagrams. As students share, highlight each water cycle process and write it on the board. You can refer to the following definitions as you support students’ explanations:

- **transpiration:** the process by which water travels through a plant or other organism and evaporates
- **sublimation:** the process by which a solid changes directly into a gas
- **evaporation:** the process by which a liquid changes into a gas
- **condensation:** the process by which a gas changes into a liquid
- **deposition:** the process by which a gas changes directly into a solid
- **precipitation:** snow, rain, sleet, or hail that falls from clouds onto the ground
- **infiltration:** the process by which water sinks into the ground
- **runoff:** liquid water from rain or melting snow that flows over Earth’s surface

Note that students can also find these definitions in the glossary at the back of their Student Editions.

20. Make a connection to the unit. Remind students that they have been trying to figure out why some rainstorms have more rain than others. Clarify that rain, like snow, hail, and sleet, is precipitation. Since precipitation is connected to the processes in the water cycle, understanding these processes will help students figure out what causes some rainstorms to have more rain than others.



On-the-Fly Assessment: Students’ Understanding of How Water Cycles Among Land, Ocean, and Atmosphere

Look for:

Students should be building the understanding that water continually cycles among the land, ocean, and atmosphere. During discussions of the Second Read of “What Makes Water Move?”, listen as students share about each process in their set and summarize how each process moves or changes the phase of water. As students create their diagrams, look for students to show through illustrations, arrows, and labels how each process contributes to the movement of water. The following are examples of what could be in students’ diagrams:

- **Transpiration:** Draw or label water moving up through plants and moving to the atmosphere.
- **Sublimation:** Draw or label water moving from ice on the surface to the atmosphere.
- **Evaporation:** Draw or label water moving from liquid water at the surface to the atmosphere, i.e., from plant leaves, bodies of water, or from the ground.
- **Condensation:** Draw or label water vapor becoming liquid water in the atmosphere, i.e., in the form of clouds.
- **Deposition:** Draw or label water vapor becoming ice, i.e., forming snowflakes.
- **Precipitation:** Draw or label water falling from the atmosphere toward Earth as rain or snow.
- **Infiltration:** Draw or label water moving from the surface into the ground.
- **Runoff:** Draw or label water moving downhill over the surface.

(Assessment continues on the next page.)



On-the-Fly Assessment: Students’ Understanding of How Water Cycles Among Land, Ocean, and Atmosphere

(continued)

Now what?

If students aren’t showing an understanding of the different processes that cycle water among the land, ocean, and atmosphere, work with a small group or lead a whole class discussion and draw a diagram together. Go through each process and prompt students with the following questions:

- What happens during the process?
- Is the water a solid, liquid, or gas (vapor)?
- Does the water change during the process? If it changes, what does it become?
- Where is the water at the beginning of the process? Where does it end up?

As needed, project the article for the class and reread parts of the article. As students answer the questions above, ask students to provide suggestions on how to draw the process, and draw what they are describing on the board.



Reading “What Makes Water Move?”

1. Read and annotate the “What Makes Water Move?” article.
2. Choose and mark annotations to discuss with your partner. Once you have discussed these annotations, mark them as discussed.
3. Now, choose and mark a question or connection, either one you already discussed or a different one that you would like to discuss with the class.
4. Answer the reflection question below.

Rate how successful you were at using Active Reading skills by responding to the following statement:

As I read, I paid attention to my own understanding and recorded my thoughts and questions.

- Never
- Almost never
- Sometimes
- Frequently/often
- All the time

Active Reading Guidelines

1. Think carefully about what you read. Pay attention to your own understanding.
2. As you read, annotate the text to make a record of your thinking. Highlight challenging words and add notes to record questions and make connections to your own experience.
3. Examine all visual representations carefully. Consider how they go together with the text.
4. After you read, discuss what you have read with others to help you better understand the text.



Second Read of “What Makes Water Move?”

Part 1

Check the set of water cycle processes that you and your partner will focus on.

- Set A:** transpiration, evaporation, and sublimation (reread paragraphs 2–4)
- Set B:** condensation, deposition, and precipitation (reread paragraphs 5–6)
- Set C:** infiltration and runoff (reread paragraphs 7–8)

Reread the paragraphs to find information about the processes in your assigned set.

- As you read, highlight and annotate information that helps you explain how your set of water cycle processes moves water from place to place.
- Be ready to share your expertise with your water cycle group in Part 2.



Second Read of "What Makes Water Move?" (continued)

Part 2

1. Each group member will take a turn and explain the processes they read about. As group members share, they should explain how these processes help move water from place to place.
2. After sharing, use the space below to draw and label a diagram of the water cycle. Include labels for all eight processes in the article: *transpiration*, *sublimation*, *evaporation*, *condensation*, *deposition*, *precipitation*, *infiltration*, and *runoff*. You might want to include things like land, air, and water in your diagram. You can plan your diagram as a group, but each group member should draw their own diagram.

Water Cycle Diagram

Diagrams will vary. Example:

