

Climate Change 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. Gather evidence to help solve Mosa Mack's mystery of why sea levels are rising.
2. Complete a Vocabulary Mind Map.
3. Complete an exit ticket to communicate findings.

Time Required: 70 minutes

Materials Required	Safety Considerations	Science & Engineering Practices
<ul style="list-style-type: none">● Student Guide (<i>includes student agenda and Mind Map</i>)● Climate Change Animated Mystery● Computer with speakers● Scissors● Glue or tape	None	<ul style="list-style-type: none">● Developing and Using Models● Constructing Explanations or Arguments From Evidence

Inquiry Scale

The Solve can be completed in various settings, including presentation-style, small groups, or individually. Alternatively, 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.

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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 Climate Change Mosa Mack Mystery (20 minutes)

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

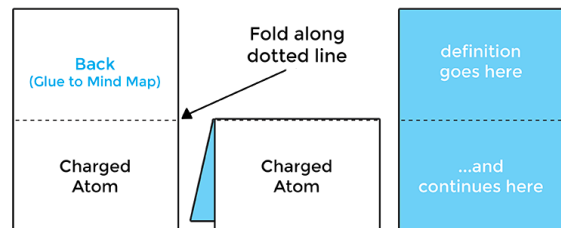
1. Read/watch the Mosa Mack Mystery on Climate Change.
2. Students answer the questions in their Student Guide as they view. Encourage students to cite the specific time codes in the mystery to promote writing with supporting evidence. Answers can be found in the key below.

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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.

- Students may complete the Mind Map **digitally**. Follow directions below. (15 minutes)
 - Go to <https://mosamack.com/home/climate-change-ecological-footprint>
 - Select **Lesson 1: *The Solve***.
 - Select **Vocabulary** and complete **Part 1**: matching terms with definitions.
 - Complete **Part 2**: matching terms and definitions with images on a diagram.
- To complete the Mind Map **on paper**, follow the directions below (45 minutes).
 - Print and pass out the Student Guide: Climate Change Lesson 1: *The Solve*.
 - Introduce the warm up task: students will be making a Mind Map of the vocabulary for this Climate Change unit.
 - 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
 - Students use the clues from the Mind Map images, definitions, and terms to place the cards in the correct location in the Mind Map.
 - Check that the students have matched their cards correctly before moving on.
 - Students use glue or double-sided tape to connect the back of the vocabulary card to the correct place on the Mind Map.
 - 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.

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- 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.

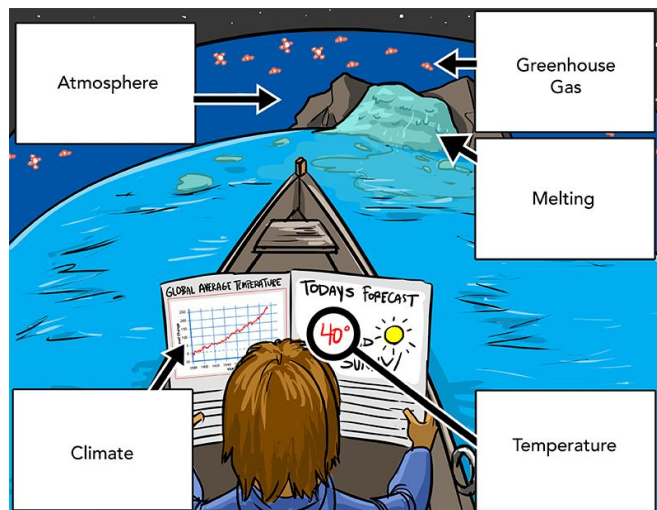
1. Students complete the exit ticket to check for understanding. This can be done online by selecting the **Quiz** button in Lesson 1 or on paper in the Student Guide. Answers are in the key below.

Answer Key

Episode Questions

1. **At the beginning of the mystery, why was Mosa Mack getting calls from around the world?** *Mosa Mack was getting calls from around the world because people (and animals) had too much water in their environment, and it was causing problems such as flooding, food destruction, dying turtle eggs, and habitat loss. (Page 1)*
2. **What did Mosa Mack and her team learn at the National Weather Service about sea levels?** *They learned that sea levels have been pretty stable for 2,000 years. But around the turn of the twentieth century, sea levels started to rise. They also learned that in 2000, sea levels rose 3.2 millimeters, and sea levels have risen 75 millimeters in the past 25 years. (Pages 2–3)*
3. **What did Mosa Mack learn while looking at the glacier in Alaska? How does that impact sea levels?** *She learned that over the past ten years, glaciers have been melting. Melting glacial ice means an increase in ocean water. (Page 4)*
4. **The scientist in Alaska told Mosa that in addition to the melting glaciers, there were other factors responsible for causing the sea levels to rise. What experiment did the scientist do for Mosa Mack and what did it show?** *The scientist filled a flask with water and marked the water level. When she heated the water, the water rose. This showed that when water is heated, it expands. Warming ocean temperatures are another cause of sea levels rising. (Pages 4–5)*

Mind Map



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- 5. In about 100 years, the average temperature rose a little less than one degree. An increase of one degree didn't sound like much to Dullis, the sloth, but the scientist was more concerned about this. Why?** *One degree may not sound like a lot, but one degree is very significant. To put it in context, the Ice Age, when the entire Northeast United States was covered in ice more than 3,000 feet thick, was only about five degrees colder than it is now. (Page 6)*
- 6. Methane, nitrous oxide, and carbon dioxide are examples of what types of gas?** *Greenhouse gas. (Page 7)*
- 7. How do greenhouse gases work?** *When the sun's heat hits the Earth, some of it bounces back into the atmosphere. Greenhouse gases trap that heat and hold the heat close to the Earth. (Page 8)*
- 8. Mosa notices that since the turn of the twentieth century, the amount of greenhouse gases in the atmosphere have been rising because of an increase in industry, agriculture, transportation, and electricity. She noticed they all use fossil fuels. How do fossil fuels affect greenhouse gases?** *When fossil fuels burn, they create carbon dioxide, the most common greenhouse gas. (Pages 9–10)*
- 9. What did Mosa Mack figure out at the end of the mystery? Why was the atmosphere warming?** *The atmosphere was warming because of the increase in the amount of greenhouse gases that humans and human activities were releasing into the atmosphere. (Page 10)*

Quiz: Check for Understanding

- Since 1880, the average global temperature has risen by how many degrees?
 - 10 degrees Celsius
 - Almost 1 degree Celsius**
 - 5 degrees Celsius
 - 0 degrees Celsius
- The atmosphere is becoming overcrowded with which molecules? Choose all that apply.
 - Methane**
 - Oxygen
 - Carbon dioxide**
 - Nitrogen
- Where do greenhouse gases come from?
 - Exhausts from burning fossil fuel**
 - Trees
 - Plants
- When the sun's heat heats the Earth, some of it bounces back. What traps the heat in the Earth's atmosphere?
 - Greenhouse gases**
 - A blanket
 - The sun
 - Dust

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5. What would happen if there were absolutely no greenhouse gases in the atmosphere?
 - a. The temperature would not change from what it is now
 - b. Humans and animals on Earth would all be more likely to survive
 - c. The Earth would freeze**
 - d. The temperature would rise dramatically

6. What did Mosa conclude about the change in the overall climate? What is causing the sea level to rise?
 - a. The sun is getting hotter, raising the temperature and causing the ice to melt
 - b. The Earth is getting closer to the sun, raising the temperature and causing the ice to melt
 - c. Humans are producing greenhouse gases that trap heat, raising the temperature and causing the ice to melt**
 - d. The Arctic is tilting closer to the sun, raising the temperature and causing the ice to melt