

Plate Tectonics Lesson 1: “The Solve”

Educator’s Resource Guide

Objective:

In the Solve, students will:

1. Solve a mystery that demonstrates the understanding of the theory of plate tectonics and how the movement and interaction of plates is caused by the cycling of hot magma beneath the Earth’s surface.
2. Create a mind map to explore relationships among complex plate tectonics vocabulary

Time Required: 45-80 minutes

Materials Required	Safety Considerations	Science & Engineering Practices
<ul style="list-style-type: none">● Student Guide (<i>includes student agenda and vocabulary handout</i>)● Plate Tectonics Episode● Computer with speakers● Scissors● Glue or Tape	None	<ul style="list-style-type: none">● Developing and Using Models● Constructing Explanations or Arguments From Evidence

Episode Description:

“The reports are all lies!” The bones of Lystrosaurus have been found on three separate continents, but the guide at Triassic Park is calling their bluff. How can the fossil of a creature from one place be distributed on so many continents? Mosa and her team time-travel under the ocean and over vast areas of the Earth’s surface to figure out just how these fossils may have separated.



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.

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Agenda

I. Solve the Plate Tectonics Video 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. Play the animated Mosa Mack Mystery on Plate Tectonics.
2. Students answer questions either digitally on the Mosa Mack platform or on paper in the Student Guide as they watch. Encourage students to cite the specific time codes in the episode to promote writing with supporting evidence. Answers can be found in the key below.
3. View the answer video to confirm student understanding.

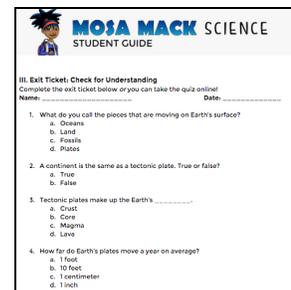
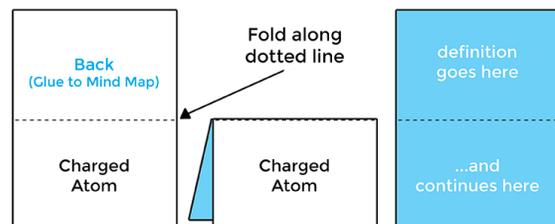


II. Vocabulary Mind Map Activity (15–45 minutes)

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

1. Students may complete the Mind Map **digitally**. Follow the directions below. (15 minutes)
 - a. Go to <https://mosamack.com/home/plate-tectonics>
 - 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: Plate Tectonics Lesson 1: *The Solve*.
 - b. Introduce the warm up task: students will be making a Mind Map of the vocabulary for this Plate Tectonics 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



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- 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 throughout this process. When you see students or groups who have placed their 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 them 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 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 Answer Key section below.

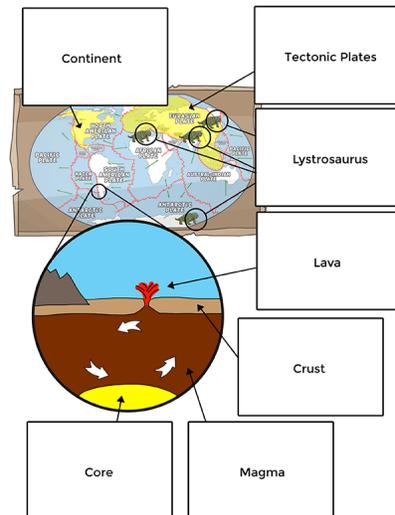
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Answer Key

Discussion Questions

1. What is the difference between a **tectonic plate** and a **continent**?
A continent is land that sits on top of the tectonic plate. For example, The North American Plate is a tectonic plate. It contains North America, part of Asia, and parts of the Arctic Ocean and the Atlantic Ocean. The Pacific Plate has no continents at all.
2. How is **magma** different from **lava**?
Lava is magma that reaches the Earth's surface, through a volcanic vent.
3. Why do you think the "super-hot" Earth's core is important in this whole process?
It is the source of the heat that creates the cyclic flow of Magma, which leads to tectonic plate movement.
4. What do you already know about the Earth's plates and their motion?
Student answers will vary.

MindMap



Episode Questions

1. What does Mosa notice about the bones in Asia and Antarctica? Are they fakes? (1:33 - 1:50)
They are all real bones AND they are all the same species as the ones in South Africa.
2. Mosa and her team find out that all the receivers in North America have moved west about an inch. What does this prove? (2:25 - 2:50)
It proves the continents are really moving!
3. What is making the floaty toys move in the bathtub if the bubbles aren't on? (4:00 - 4:50)
Heat is rising from the bottom of the water to the top, cooling a bit, then moving down again. This cycle or flow of water moves the floaty toys along with it along the surface.
4. After seeing the lava spill out of an underwater volcano, what does Mosa discover is underneath the plates that is causing them to move? (5:50 - 6:30)
Magma is flowing underneath the plates and is moving the plates as it flows.
5. Mosa and her team go back in time 200 million years and try to adjust their map to show what continent they are on. Why is Mosa not able to tell Billy and Dullis exactly where they are? (6:45 - 7:09)
Every time she re-draws the plates, she realizes that the plates don't quite look the same and have moved.
6. What did Mosa figure out? How did the fossils separate? (7:15 - 8:02)
They were once all on the same continent, known as Pangaea, but were split apart by tectonic plate movement.

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Quiz:

1. What do you call the pieces that are moving on Earth's surface?
 - a. Oceans
 - b. Land
 - c. Fossils
 - d. Plates**
2. A continent is the same as a tectonic plate. True or false?
 - a. True
 - b. False**
3. Tectonic plates make up the Earth's _____.
 - a. Crust**
 - b. Core
 - c. Magma
 - d. Lava
4. About how far do Earth's plates move a year on average?
 - a. 1 foot
 - b. 10 feet
 - c. 1 centimeter
 - d. 1 inch**
5. Why are Earth's plates moving?
 - a. There are vibrations coming from the Earth's core causing them to move.
 - b. The Earth's plates are floating on a liquid called magma, which is moving because of heat.**
 - c. The plates have tiny hair-like legs that move them side to side.
 - d. There is a magnetic pull on all the plates towards the North Pole.