

Earthquakes and Volcanoes Lesson 1: “The Solve” Educator’s Resource Guide

Objective:

In The Solve, students will:

1. Solve a mystery that demonstrates the common geological causes of earthquakes and volcanoes.
2. Create a mind map to explore relationships among complex Earthquakes and Volcanoes vocabulary.
3. Communicate understanding that earthquakes and volcanoes are caused by a gradual build-up of pressure between tectonic plates.

Time Required: 40-75 minutes

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

Episode Description:

A sudden and unexpected Earthquake rumbles through Cake County and their Cake Contest is ruined! Yet baker Leonardo’s cake is mysteriously intact. When he uses this as evidence that there *was* no earthquake and his competitors are just poor losers, Mosa is called to the scene.

Mosa travels around Cake County to explore the effects on the town and the geography of the region to try to get a better understanding of what actually happened. On this journey, Mosa meets a Volcanologist 100 miles away who may have some useful clues for her.



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 Earthquakes and Volcanoes 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 Earthquakes and Volcanoes.
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.

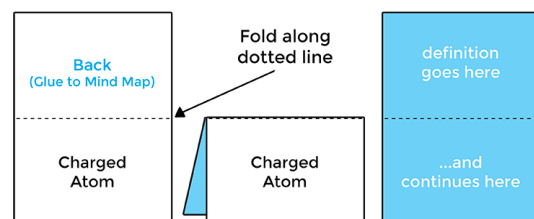
1. Students may complete the Mind Map **digitally**. Follow directions below. (15 minutes)
 - a. Go to <https://mosamack.com/home/earthquakes-volcanoes>
 - b. Select **Lesson 1: The Solve**.
 - c. Select **Vocabulary** and complete **Part 1**: matching terms with definitions.
 - d. Complete **Part 2**: 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: Earthquakes and Volcanoes Lesson 1: *The Solve*.
 - b. Introduce the warm up task: students will be making a Mind Map of the vocabulary for this Earthquakes and Volcanoes 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.

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STUDENT GUIDE

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

Name: _____ Date: _____

1. Which of the following is an example of a nonrenewable 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. Wind
 - b. Oil
 - c. Water
 - d. Carbon



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- 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

Episode Questions Answers

1. According to most bakers, what ruined all of the cakes in the contest? Describe what happened. (Page 4)

An earthquake caused the cakes to crumble. The earth rumbled and shook causing their cakes to fall apart.

2. What does Leonardo claim and why? (Page 5)

Leonardo claims that there was no earthquake because his cake did not fall apart.

3. When Mosa investigates the geography of Cake County, what evidence does she find? (Page 6)

Cracks in the sidewalk that opened up overnight and bumps in the road.

4. What does the Volcanologist say the “crack” is? What does this have to do with volcanoes? (Page 7)

It is called a fault line, and fault lines are any cracks in the Earth’s crust. A fault line also refers to the boundary between two tectonic plates. This is where most volcanoes occur.

5. What causes a volcanic eruption? (Page 8-9)

Magma below the Earth’s crust moves the tectonic plates and pressure builds up over thousands of years until an eruption suddenly occurs!

6. What do volcanoes have in common with earthquakes ? (Page 11-13)

There are long periods where nothing is happening, but pressure is building between the plates at the fault line, and then there is a sudden seismic event that changes the geography.

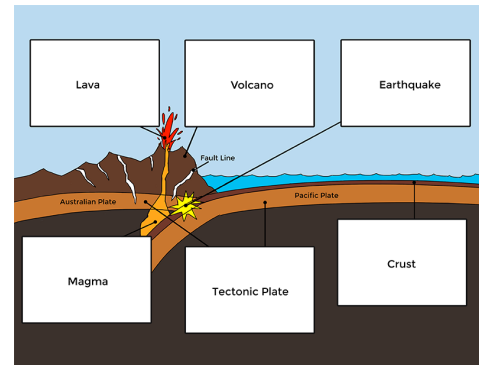
7. Mosa proposes that the Earthquake started in one place and spread outward from there. How can this be related to volcanoes? (Hint: look at the list of volcano characteristics). (Page 14)

Volcanoes occur at a central location and cause lava to move outward.

8. What did Mosa figure out? How did she know the location of Leonardo’s house? (Answer Comic)

The Earthquake began at the town center and the shockwave rippled out across the town. Just like lava cools as it gets farther from the volcano’s center, the strength of shockwaves from Earthquakes get weaker as they move away from the Earthquake’s center. Since Leonardo didn’t feel it, he must have lived farther from the Earthquake’s center.

Mind Map:



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Quiz:

1. Which of the following is not evidence of an earthquake?
 - a. Cracks in the sidewalk
 - b. Bumps in the road
 - c. Rumbles and shakes
 - d. Rain**
2. Mosa observes a crack in the sidewalk that opened up overnight, which the Volcanologist could be a boundary between two tectonic plates. What is this called?
 - a. Volcano
 - b. Earthquake
 - c. Fault Line**
 - d. Tectonic Line
3. Below the Earth's crust, magma moves the tectonic plates and pressure builds up over thousands of years. What can this cause?
 - a. A volcanic eruption
 - b. An earthquake
 - c. Lava flow
 - d. All of the above**
4. Between earthquakes, there are long periods of time when it appears nothing is happening. True or false?
 - a. True**
 - b. False
5. An earthquake originates at the:
 - a. Volcano
 - b. Fault Line**
 - c. Tectonic Plate
 - d. Magma
6. Why didn't Leonardo feel the earthquake?
 - a. He was asleep and didn't wake up
 - b. His home is farther from the town center, where the Earthquake originated**
 - c. He is lying; he did feel the earthquake
 - d. He lives at the top of a high-rise building