



Volcano e-Lab
Pre-mission Lesson Plan (45-50 minutes)

I. Introduction

The material contained within this lesson plan is meant to be used as preparation for the Volcano e-Lab. As part of this pre-lab lesson, students will understand:

- A. A volcano is a circular or linear opening in the Earth's surface through which lava, rock fragments, ash, and gases erupt.
- B. Volcanoes are windows into how the Earth works. They occur because the Earth's rigid outer shell, the crust and upper mantle, is broken into a mosaic of plates that are in constant motion.
- C. More than half of the volcanoes that are exposed on land form a chain along the converging plates that encircle the Pacific Ocean. This chain is called the "Ring of Fire."

II. Objective:

Students will be introduced to the Ring of Fire, and will identify and locate various volcanoes along the Ring of Fire on a map. Students will be able to explain that the Ring of Fire is an area of frequent volcanic activity associated with the movement of plates at crustal boundaries.

III. Key Vocabulary:

- **Asthenosphere**: plastic like layer of the upper mantle on which the lithospheric plates move.
- **Crater**: The circular depression containing a volcanic vent.
- **Calderas**: large volcanic depressions formed by the collapse of the summit of a volcano into underlying magma chambers emptied by removal of magma by large explosive eruptions or the effusion of large volumes of lava flows.
- **Cinder cone**: A steep-sided volcano formed by the explosive eruption of cinders that pile up around a vent. Cinders are lava fragments a few centimeters in diameter.
- **Hot spot**: An area in the middle of a lithospheric plate where magma rises from the mantle and erupts at the Earth's surface. Hot spot volcanoes are not associated with plate boundaries.
- **Lava**: The term used for magma once it has erupted onto the Earth's surface.
- **Lithosphere**: The Earth's hard, outermost shell. It comprises the crust and the upper part of the mantle and is divided into a mosaic of 16 major slabs, or plates. These plates float on top of the asthenosphere, a more plastic layer in the Earth's mantle.
- **Magma**: Molten rock containing liquids, crystals, and dissolved gases that forms within the upper part of the Earth's mantle and crust. When erupted onto the Earth's surface, it is called lava.
- **Mantle**: A zone in the Earth's interior between the crust and the core that is 2,900 kilometers (1,740 miles) thick. (The lithosphere is composed of the topmost 65-70 kilometers (39-42 miles) of the mantle and the crust.)

- **Shield volcano**: A volcano that resembles an inverted warrior's shield. It has long gentle slopes produced by multiple eruptions of fluid lava flows.
- **Stratovolcano**: A steep-sided volcano built by inter-layered lava flows and tephra deposits. (Also called composite volcano.)
- **Subduction zone**: The place where two lithospheric plates come together, one moving down under the other. Most volcanoes on land occur parallel to and inland from the boundary between the two plates.
- **Tephra**: Solid material of all sizes explosively ejected from a volcano into the atmosphere.
- **Vent**: The opening at the Earth's surface through which volcanic materials (lava, tephra, and gases) erupt. Vents can be at a volcano's summit or on its slopes; they can be circular (craters) or linear (fissures).
- **Viscosity**: Measure of the fluidity of a substance. Taffy and molasses are viscous; water has low viscosity.
- **Volcano**: A vent (opening) in the Earth's surface through which magma and its gases erupt; it is also the landform that is constructed by the eruptive material.

IV. Materials:

- [All About Volcanoes Reading and Comprehension worksheets](#) for each student
- [Map of the World](#) (color if possible) for front of classroom (or this can be projected on Smartboard)
- [Copies of Volcanoes Prelab Lesson Student Worksheet](#) (chart and map) for each student
- Computers with internet access
- Stickpins (if not using Smartboard)

Safety: Remind students that the stickpins are to only be used on the map. Pick them up from the teacher when your team is ready to place them on the map.

V. Lesson Sequence:

A. Engage.

1. Read the "All About Volcanoes" reading handout together with students. Discuss with students what volcanoes look like, what causes them, and where they are found. Do not have students answer the Comprehension Questions until they have completed the next section (B. Explore and Explain).

B. Explore and Explain

2. Place the color map up in front of the classroom, or project it to the Smartboard.
3. This part of the activity can be completed in groups or individually. Give each student or group of students a copy of the Volcanoes Prelab Lesson Student Worksheet (chart and map). Give each student or group the names and longitude and latitude coordinates of a volcano(es).

4. Have the students use the coordinates given to them and their Student Volcano Map to plot their assigned volcano. Using the internet, have students look up the coordinates to determine the name of their volcano and characteristics about it. Have them record their information in the Student Volcano Chart.
5. Once students have figured out the location of the volcanoes they have been given and their names, and have plotted them on their own map, they must locate them on the class map and mark them with a stickpin or, if projected, mark them using the Smartboard software.

C. Elaborate

6. Using the finished class map ask students to identify any patterns they may see. (Students should say that they notice the location of the volcanoes form a ring, curve, and /or along plate boundaries).
7. Explain to students that volcanic activity occurs on coastal areas/ borders of crustal plates. We refer to this area as the Ring of Fire (show area).

D. Evaluate

8. Have students answer the "All about Volcanoes" Comprehension Questions.

Volcano Lesson Rubric:

Skill	5 Points	3 Points	1 Point	0 Points
Mapping	Plotted volcanoes correctly			No volcanoes plotted correctly
Question #1	Explained causes for volcanic activity at plate boundaries	Partially explained (few errors) causes for volcanic activity at plate boundaries	Partially explained (major errors) causes for volcanic activity at plate boundaries	Inaccurate causes for volcanic activity at plate boundaries or no attempt
Question #2	Complete description of the Ring of Fire and volcanic events	Partial description of the Ring of Fire and volcanic events (few errors)	Partial description of the Ring of Fire and volcanic events (major errors)	Inaccurate description of Ring of Fire or no attempt
Question #3	Uses all 5-6 terms correctly in explanation of volcanic activity along Ring of Fire	Uses at least 3-4 terms correctly in the explanation of volcanic activity along Ring of Fire	Uses at least 1-2 terms correctly in the explanation of volcanic activity along Ring of Fire	Lack correct use of terms in the explanation of volcanic activity along Ring of Fire