

Volcanoes

Objectives

1. Students will learn about different types of volcanoes, how / why they erupt, and their role in land creation.
2. Students will explore shield volcanoes using a lava layering simulation, and how scientists use core sampling to figure out eruption history
3. Students will explore more explosive volcanoes (like Mt. Rainier) by modeling stratovolcano eruptions

Note: This lesson can be linked to the theory of plate tectonics (Week 2)

Introduction (~10 min):

Prompt students at the beginning:

- Review last week: talked about layers of the Earth and plate tectonics
- Who has heard of the ring of fire... Who can tell me what they think the ring of fire is?
- Who can tell me what a volcano is? [gather student ideas and write these on the board]
- You are all going to be volcanologists today - scientists who study volcanoes!

<http://studyjams.scholastic.com/studyjams/jams/science/rocks-minerals-landforms/volcanoes.htm>

Activity 1: Shield volcanoes (~45 min)

Reference:

Original: <https://www.jpl.nasa.gov/edu/teach/activity/lava-layering-making-and-mapping-a-volcano/>

Helpful Video: https://www.youtube.com/watch?v=_I8vvl7mQxg

Materials (per student)

- 1 aluminum pan (8x12)
- 4 colors of play-doh (3 oz jars)
- 4 tbsp. Baking soda
- 6 oz of vinegar
- 3 dixie cup
- Scissors (student provided)
- Plastic spoon
- Cardboard (~8x12)
- Graph paper
- 2 sheets of white paper
- Crayons
- 10 napkins
- Pencil (student provided)

Notes at the beginning:

- Make sure students know that they need to be resourceful with the playdoh! They will likely have some left over for the first few eruptions, but the last one will require a lot of playdoh, so they should try and stretch it out / flatten it as much as possible.
- Also, don't use too much vinegar

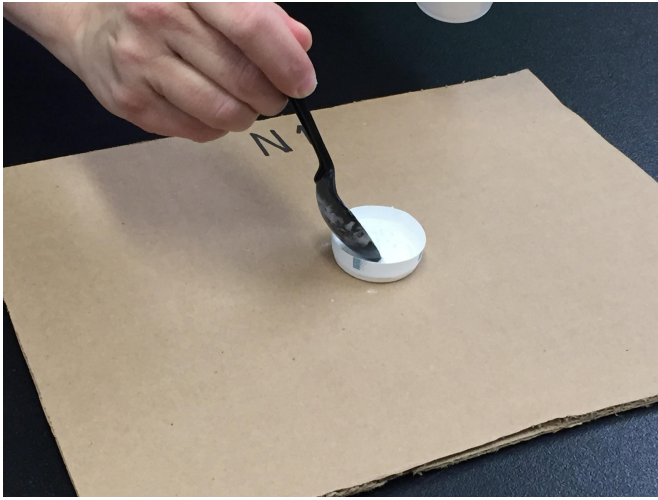
Prompt

1. Recall that the solid ground that we stand on is called the Earth's crust, and underneath the crust is a layer called the mantle, which is made up of liquid, or molten rock called magma. Volcanoes erupt when the magma escapes through the crust. Explain that when it is underground the molten rock is called **magma**, when it is above ground it is called **lava**. Reference the picture of a volcano and identify the parts of a typical volcano.
2. Explain that the Earth's plates are in motion – they float on top of the liquid mantle. Explain that on Earth, sometimes when the plates move, magma escapes from between the cracks, and causes a **volcanic eruption**.

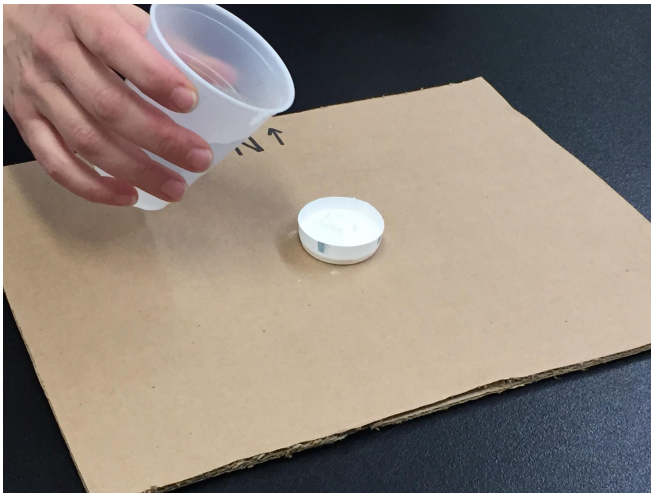
Instructions

1. Cut the top of the small paper cup so that the cup is ~2.5 cm high.
2. Place the small paper cup in the center of the cardboard cutout and trace around it with a pencil.
3. Place the small paper cup in the center of the graph paper and trace around it with a pencil.
4. This short cup is your eruption source (eventual caldera) and the cardboard is the original land surface.
5. Mark north, south, east, and west on the edges of the cardboard and the graph paper, orienting them similarly on the table.

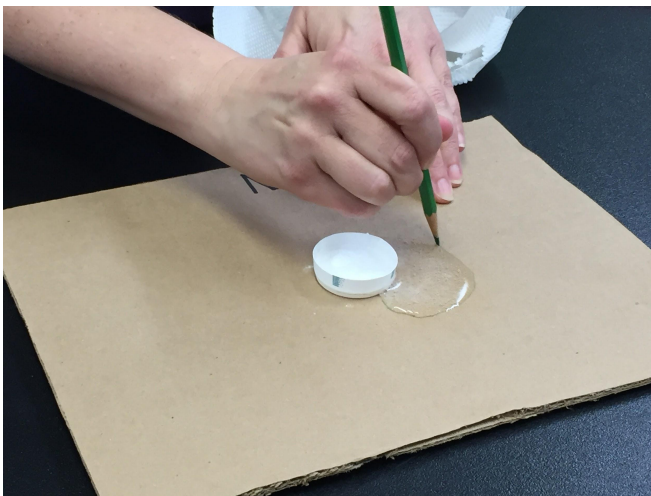
6. Place one heaping spoonful of baking soda in the short cup.



7. You are now ready to create an eruption. **Slowly pour a small amount** of vinegar into the small, source cup and watch the eruption of simulated lava.



8. When the lava stops, quickly draw around the flow edge with a pencil.



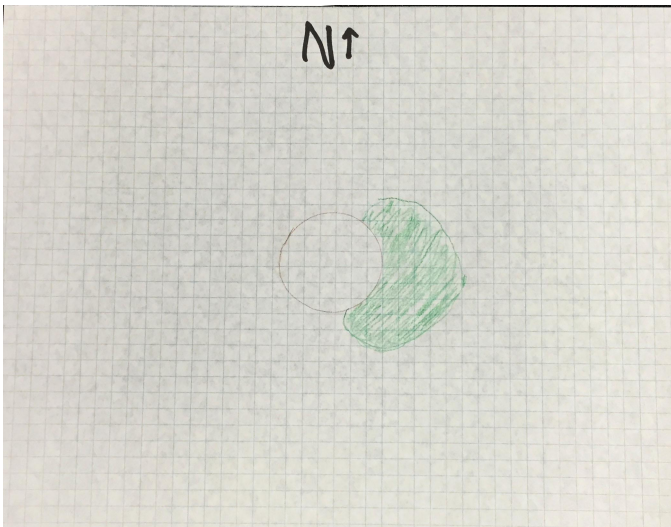
9. Dab up the fluid with paper towels.



10. As best you can, use a thin layer of play dough to cover the entire area where lava flowed.

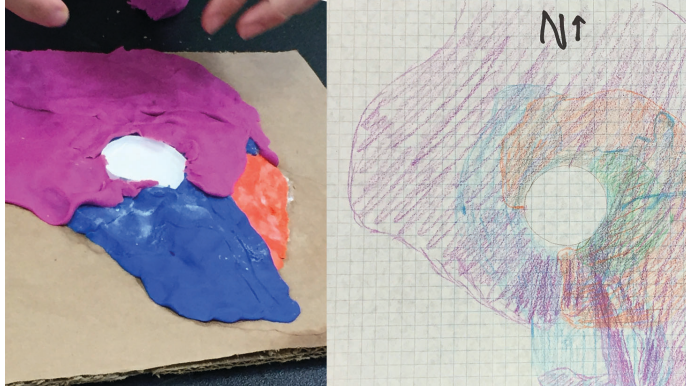


11. On one piece of graph paper, use a colored pencil that matches the play dough color to draw an outline representing the edge of the play dough, being sure to maintain the cardinal orientation (north, south, east, west) of the paper with the orientation of the volcano. Shade in this lava flow drawing. Make a note on the graph paper regarding the order of eruptions (which color came first)



12. Repeat steps 6 - 12 for each color of play dough available. Four to six flows show a good example of a shield volcano, but three flows will be adequate for a simple shield volcano model. Notes: The source cup may be cleaned out as needed. Be sure to mark the entire area of each lava flow – over previous

flows and on the cardboard. On subsequent flows, you will need to dig into the underlying play dough with your pencil to mark the flow area. The result will resemble a strange layer cake with new flows overlapping old ones.



Discussion questions

- After the very first lava flow, ask students what they observed.
- What do the bubbles represent? - (ash, lava, molten rock)
- What caused the “eruption”? - (build up of gases from a chemical reaction - vinegar (acid) + baking soda (base) = carbon dioxide gas)

Activity 2: Stratovolcanoes (~10 min)

Materials (per student) [all of which can come from whatever remained from activity 1]

- 1 aluminum pan (8x12)
- play-doh (3 oz jars)
- 4 tbsp. Baking soda
- 6 oz of vinegar
- 1 dixie cup

Instructions

1. Have students transfer vinegar from their water bottles into a fresh Dixie cup
2. Rinse the bottle with water and drain completely
3. Have the students pour in the rest of their baking soda into the clean water bottle
4. Have students use whatever remaining play-doh they have to cover their bottle volcanoes
5. Remove their shield volcanoes from the baking pan. Then, have students place their stratovolcano in the middle of the baking sheet.
6. Using the vinegar from the Dixie cup, slowly pour vinegar into the stratovolcano model

Discussion questions

- Ask students what they observed. What was different about this eruption?
- In what ways are these model volcanoes similar to real volcanoes?
- In what ways are these model volcanoes different from real volcanoes?

Activity 3: Core sampling (bonus if there is time)

Materials (per student)

- Shield volcano from activity 1
- Core sampler (made from plastic straws)

Instructions

1. Using the core sampler, have students extra 3-4 cores from around different parts of their volcano.
2. Have them indicate on their map where these cores are sampled from (using black crayon)
3. Have them share their core samples

Discussion questions

- How many flows can you see?

Concluding remarks / share your model volcanoes! (~5 min)