Making Volcanoes and Lava

FRAMEWORK

I. Scientific and Engineering Practices 1, 2

II. Cross-Cutting Concepts 2, 4, 5,

III. Physical Sciences PS1, LS2, ESS2

SKILLS/OBJECTIVES

- To understand the significance of analogs in scientific learning
- To understand the physical concept of pressure
- To understand how volcanoes and lava work

MATERIALS

- 5 containers of Baking Soda
- 5 containers of Baking Powder
- 5 containers of Vinegar
- 1 box of Splenda
- 5 Bottles of Ketchup
- 4 containers of corn starch
- 2 "slope" models
- 5 bottles of Diet Coke
- 4 packs of Mentos
- 6 bottles of Karo Corn Syrup
- 4 20-oz soda bottles
- 4 containers of Kosher Salt
- Water
- 5 bottles of Seltzer
- 300 Dixie Cups
- Photos of Volcanoes
- Paper Towels
- Tarp
- Food Coloring

NOTES

Any concerns re: length of lesson or things to make sure are prepped in advance to streamline the lesson, time constraints, younger/older disparities, an indication if this is outside only or only for calm groups or whatever other specifications may come up.

BACKGROUND

- **Pressure= Force/Unit Area**
- **For Example: If you've ever walked on a trampoline, you know what pressure is. Pressure is the amount of weight you push down on over a certain area.**
- Volcanoes are created when the ***heat*** and ***pressure*** of the lava inside build up over many years, causing magma to erupt by pushing through the top.
- One of the most important events with **volcanoes** is the lava flow. This is a **physical process**, which involves the movement of lava down the sides of the volcano.

Activity #1	**Kinds of Volcanoes**
Materials	-Photos of Volcanoes
Worksheet	Y (at end)

- Have Wesleyan students hold up pictures of the different types of volcanoes. Ask kids what the pictures are of and what they see in each picture. ***NOTE: THE EXPLANATIONS BELOW ARE PRIMARILY FOR YOUR REFERENCE. FEEL FREE TO DESCRIBE EACH OF THESE VOLCANIC LANDFORMS IN YOUR OWN WORDS!***
- **(1) cinder cones=** pieces and blobs of lava spit out of one vent, making a cinder-shaped volcano with a dome at the top
- **(2) composite volcano=** steep, cone-shaped volcanoes that are made from layers of lava, ash, and cinders. These looks like mountains and are made when lava cracks out the sides of the volcanoes.
- **(3) shield volcano=** shield-like, flat volcano made from explosion of fluid-like flows from one vent
- **(4) lava domes=** really thick lava that can't travel far. The lava makes rough piles of lava and hills near the vent.

Activity #2	**Bottle Explosion**
Materials	-Bottle of Diet Coke -Pack of Mentos -Paper towels -Tarp (or do this outdoors)
Worksheet	N

- Begin with explanation of pressure.

- *Bottle Explosion Demonstration:* Take a bottle of Diet Coke, add in a full pack Mentos, and let the reaction go! Be sure to do this somewhere where the mess will not be too great, like outdoors or over a large tarp. Have paper towels on hand for clean up.

- Explain that a closed bottle of Diet Coke has "invisible" carbon dioxide gas on top of the soda. When you drop in the Mentos, it *dissolves*, or breaks down into small little pieces, where the gas bubbles can form. When the gas forms, there's more pressure coming up through the top until the bottle explodes!

Activity #3	**Kinds of Lava Flows**
Materials	-Photos of Lava Flows -Water -Corn Syrup -Aluminum foil slopes
Worksheet	Y (at end)

- Ask students how they think lava moves when it comes down a volcano--will it move fast or slow? Will it be thick or smooth?

- Show the different kind of lava flows using *Slopes Demonstration.*

Slopes Demonstration: Take the water and pour it down the **smooth** slope of aluminum foil. Next, take the corn syrup and pour it down the **rough** slope of aluminum foil. (*Note:* The water should flow down faster, and the corn syrup should flow down slower.)

- Ask students why they think the water flows faster and why the corn syrup flows slower.

- Explain that the corn syrup is thick and dense, making it move a lot slower. This is a *viscous (thick) lava flow*. Explain that the water is thinner and less dense, letting it move a lot quicker an easier. This is a *fluid* (thinner, like water) *lava flow.*

- Show photos of different lava flows

Explain that *viscous flow* makes rhyolitic (lighter-colored, smoother) rocks. It moves really slow to make a lot of little domes. In the picture, the flows are *obsidian* (very glassy), and the little domes are make up *calderas*.

Explain that *fluid flow* makes basaltic (hard, black) rocks. It can move really far and cools to make smooth sheets of rock that make up a dome-like slope that makes up the *shield volcano*.

Activity #4	**Creative Project**
Materials	-Dixie Cups -Salt -Baking Soda -Baking Powder -Sugar -Corn Starch -Water -Ketchup -Vinegar -Corn Syrup -Seltzer -Food Coloring
Worksheet	Y (at end)

- Hand out worksheets and one cup to each student, explaining to them that they are now going to make their *own* volcanoes for Wesleyan!

- Explain that the students are going to do three trials of making a volcano. Each child will pick different ingredients and draw what happens. Distribute the following to each student as needed:

    - A pinch of salt for each kid
    - 1 tablespoon baking soda for each kid
    - 1 teaspoon baking powder for each kid
    - A pinch of sugar for each kid
    - A pinch of corn starch for each kid
    - ¼ cup water for each kid
    - ¼ cup ketchup for each kid
    - ¼ cup vinegar for each kid
    - 1 teaspoon of corn syrup for each kid
    - 1/8 cup seltzer for each kid
- Add one drop of food coloring to each kid's cup after one trial.

- Ask students what they think is happening to cause 'fizzing' (which compound/gas?)

    - Explain to the students that the baking soda and vinegar react to make carbon dioxide in solution, making the "volcano" fizz, build up pressure, and explode.

CONCLUSIONS

-Volcanoes are created when heat and pressure of the lava inside has built up so much that it erupts out through the top of the Earth's crust.

-How lava flows down the volcano depends on the terrain and the viscosity of the lava .

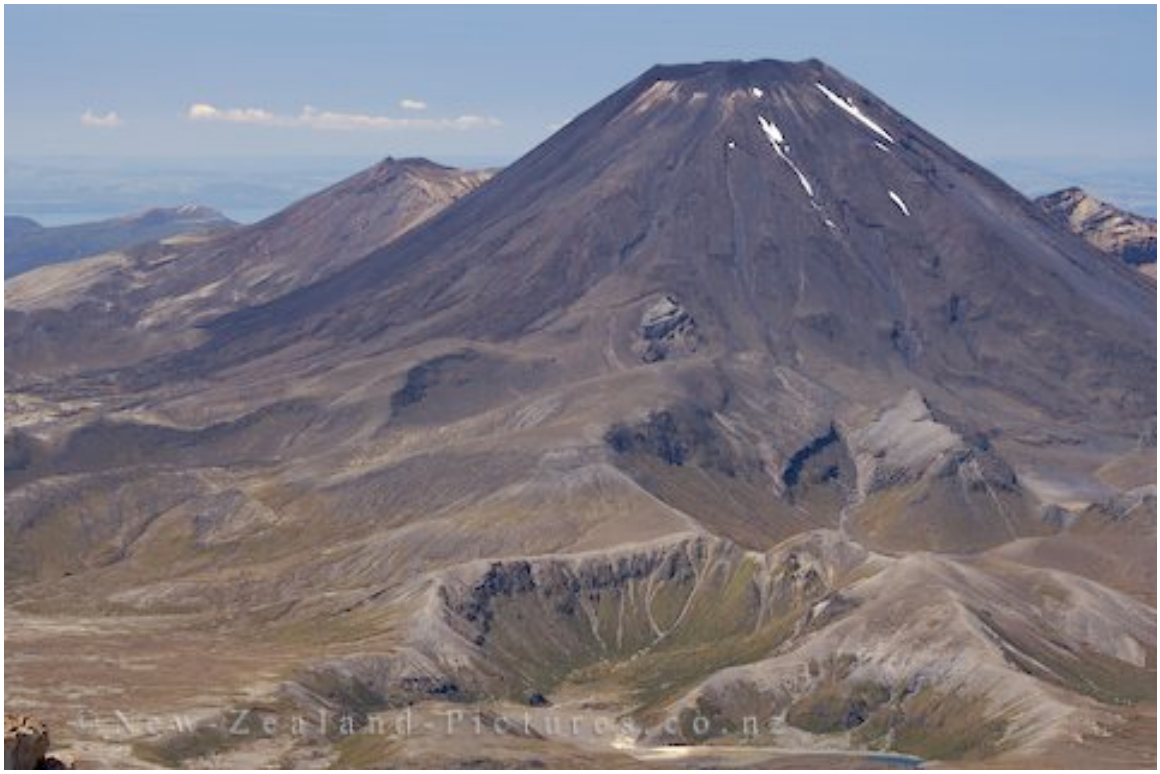
TYPES OF VOLCANOES

(1) cinder cones= pieces and blobs of lava spit out of one vent, making a cinder-shaped volcano with a dome at the top

Sunset Crater, Arizona

TYPES OF VOLCANOES

(2) composite volcano= steep, cone-shaped volcanoes that are made from layers of lava, ash, and cinders. These looks like mountains and are made when lava cracks out the sides of the volcanoes.



Mt. Ruapehu, Tongariro National Park, NZ

TYPES OF VOLCANOES

(3) shield volcano= shield-like, flat volcano made from explosion of fluid-like flows from one vent

Mauna Loa, Hawaii

TYPES OF VOLCANOES

(4) lava domes= really thick lava that can't travel far. The lava makes rough piles of lava and hills near the vent.

Mount St. Helen's, Skamania County Washington

TYPES OF LAVA FLOWS

1. ***Viscous flow:*** **Show caldera from Long Valley, California.**

-Explain that *viscous flow* makes rhyolitic (lighter-colored, smoother) rocks. It moves really slow to make a lot of little domes. In the picture, the flows are *obsidian* (very glassy), and the little domes are make up *calderas*.

TYPES OF LAVA FLOWS

2. ***Fluid flow:*** **Show shield volcano from Belknap, Oregon.**

-Explain that *fluid flow* makes basaltic (hard, black) rocks. It can move really far and cools to make smooth sheets of rock that make up a dome-like slope that makes up the *shield volcano*.

Name: _____

Volcanoes!

You've learned that **volcanoes** happen because lava is less **dense** than rock. So, lava floats. Because the lava's **pressure** (how much **force** hits an **area**) is more than the rock's **pressure** that holds down the lava, the lava breaks the **crust** and BOOM! Lava goes everywhere!

You've also learned that lava flows can be pretty **thick** (**viscous)** and **thin (fluid**).

Make Your Own Volcano!!!

Now, Wesleyan wants you to make your own volcano! Here's a list of materials you can use:

Trial 1		Trial 2		Trial 3	
☐	Salt	☐	Salt	☐	Salt
☐	Baking Soda	☐	Baking Soda	☐	Baking Soda
☐	Baking Powder	☐	Baking Powder	☐	Baking Powder
☐	Splenda (sugar)	☐	Splenda (sugar)	☐	Splenda (sugar)
☐	Corn Starch	☐	Corn Starch	☐	Corn Starch
☐	Water	☐	Water	☐	Water
☐	Ketchup	☐	Ketchup	☐	Ketchup
☐	Vinegar	☐	Vinegar	☐	Vinegar
☐	Corn Syrup	☐	Corn Syrup	☐	Corn Syrup
☐	Seltzer	☐	Seltzer	☐	Seltzer

1. Check off what you use to make a volcano in each trial.
2. Write and draw what you see on the next page. Good luck, scientists!

Trial 1: Did this work? Yes No

What happened?

_____

_____

Draw what you saw:

<u>Trial 2</u>: Did this work? Yes No

What happened?

_____

_____

Draw what you saw:

<u>Trial 3</u>: Did this work? Yes No

What happened?

_____

_____

Draw what you saw: