

## ***Best Lesson-Volcanoes & Earth's Layers***

**Grade Level:** 5<sup>th</sup> Grade

**Title of Lesson:** Volcanoes & Earth's Layers

**Unit Title:** Earth Science- Landforms of Georgia

**Georgia Performance Standard:**

**S5E1:** Students will identify surface features of the Earth caused by constructive and destructive processes.

**S5CS4:** Students will use ideas of system, model, change, and scale in exploring scientific and technological matters.

**S5CS5:** Students will communicate scientific ideas and activities clearly.

**Essential Question:** How do movements of the crust change landforms?

**Objectives:**

- Students will learn about the layers of the Earth and where the plates are located.
- Students will learn about how tectonic plate movement can affect Earth's surface.
- Students will learn about the different types of volcanoes, how they are made, and their components.

**Key Words and Terms:**

*Plate, crust, mantle, outer core, inner core, magma, lava, volcano, vent, hot spot, shield volcano, cinder cone volcano, composite volcano, ash*

**Learning Activity:**

**Abstract:** This lesson teaches students about the types of volcanoes and how they relate to plate movement.

**Materials:**

- One family size package of Oreos
- One 20oz. bottle of diet coke
- One pack of Mentos
- One bottle of Ketchup
- One box of baking soda (will use 2 tablespoons for each volcano)
- One bottle of vinegar

- One bottle of dish detergent
  - One packet of notebook paper
  - 2 ½ cups of warm water
  - Two 20oz. empty bottles (any brand)
  - Red food coloring
  - Three 6-packs of Play-doh or modeling clay
  - 3 large baking dishes or baking pans
  - 3-4 pairs of safety glasses/goggles
- No materials need to be prepared before lesson.
  - The materials for the volcanic eruptions should be prepared while students work on creating their volcanoes in groups as outlined in the procedure section below.

### **Safety Concerns:**

All three experiments are non-toxic, but students should be monitored and told not to consume any of the baking soda, food coloring, dish detergent, or vinegar which may cause stomach irritation and sickness. If students take part in creating the eruptions, they should have proper safety glasses to protect their eyes.

### **Procedures to facilitate lesson:**

1. Opener:
  - a. Ask students if they have ever seen a volcano on television before.
  - b. Make a list of what they look like and how they work based on their television observations.
2. Mini-Lesson:
  - a. Discuss Earth's layers and where tectonic plates are located.
    - i. Earth's tectonic plates are located on the mantle.
    - ii. Earth's Layers: *inner core, outer core, mantle, plates, crust, and mantle.*
    - iii. Use an Oreo as a demonstration.
      1. Have students break apart Oreo gently so that one cookie has the cream and the other one is creamless
      2. Have students break the creamless cookie in half
      3. The whole cookie represents the inner and outer core, the cream represents the mantle (which is soft), and the broken cookie represents the tectonic plates.
      4. Show how landforms are made when the plates (broken cookie) move across the mantle (cream).

- a. Moving them apart creates trenches, faults, and earthquakes.
    - b. Moving them together can create mountains, volcanoes, and earthquakes.
    - c. Sliding them along each other can cause earthquakes.
  - b. Talk about how plate movement creates volcanoes.
    - i. Volcanoes are created when liquid magma from the mantle moves through the plates and cools. The process repeats until a mountain like structure forms.
  - c. Discuss many different examples of volcanoes.
    - i. Hawaiian Islands are shield volcanoes (flat and extend for miles) and ooze out lava.
    - ii. Composite volcanoes are made up of everything (dirt, dust, ash, lava, etc), have wide steep slopes, and an example is Mount St. Helens in Washington.
    - iii. Cinder cone volcanoes are very steep and produce only ash. They are found in Mexico.
  - d. Introduce terms: *lava, magma, vent, volcano, shield volcano, composite volcano, and cinder cone volcano* (note: reading the section and vocabulary can be learned at a different time).
3. Experiment:
  - a. Place students in three groups and assign each group a certain type of volcano (Composite, Cinder-Cone, or Shield).
  - b. Give groups a picture of their volcano, a bottle, one 6-pack container of play-doh or clay, 20-30 sheets of notebook paper, and a large baking tray/dish
    - i. The cinder cone group will have the 20oz. diet coke bottle as the center of their experiment
    - ii. The shield volcano will have the shortest bottle.
    - iii. The composite volcano will have the taller empty bottle.
  - c. Have students, in their groups, work together to build their volcano around on the baking dish using the play-doh and paper. They will have 15-20mins to build their volcanoes.
  - d. **While students construct their volcanoes the teacher needs to perform the following task:**
    - i. Mix ½ cup of warm water (heated in the microwave), ½ cup of vinegar, and 2-3 drops of food coloring together and add to the composite volcano when students are done.
    - ii. Mix ½ cup of warm water and ½-1 cup of ketchup (depends on how thick you want your lava) together and add to the shield volcano when students are done.

- iii. Set up station either outside (preferably) or with newspaper and a tub if inside so that you can perform your eruptions.
- iv. Have box of baking soda, packet of Mentos, and spoon ready for eruptions.
- e. **For the eruptions the teacher needs to take the following steps:**
  - i. Have each group explain their volcano.
  - ii. Starting with the composite volcano, put on safety goggles and discuss why eye safety is important for this experiment.
    - 1. Discuss what type of eruption might occur (violent eruptions with lava)
    - 2. Add 1-2 spoonful of baking soda quickly into your vinegar and water mixture and observe the eruption
  - iii. Moving onto the shield volcano discuss which type of eruption might occur (slowly oozing lava).
    - 1. Add 1-2 spoonful of baking soda and mix thoroughly. Observe eruption and how it is different from the first eruption.
  - iv. Lastly do the Cinder cone volcano.
    - 1. Add 10-12 Mentos as fast as possible (use a funnel) and observe eruption
- 4. Conclusion:
  - a. Have students draw and describe each different volcano in their journals.
  - b. Have students describe how volcanoes are formed and their components in 2-3 sentences in their journals.

**Notes/Tips:**

- I would try to plan this experiment for a day where you can go outside.
- You can add a few drops of dish detergent to the Composite and shield volcanoes for a bubbly eruptions.
- It may also be beneficial to explain what reactions are taking place
  - Acid/Base reactions=between the acetic acid in vinegar and tomatoes and basic baking soda
  - Chemical reaction caused by CO<sub>2</sub> gas rapidly accumulating from the Mentos when added to the diet coke.
- The warmer the water at the time of the eruptions (not hot though) the better the eruptions.
- Do to time constraints and cost of supplies, a single volcanic eruption of your choosing may be sufficient for this lesson.
  - If a single volcano is decided upon, use a 2 liter bottle of diet coke and Mentos to produce the best explosion.

**References:**

<http://www.focus.uga.edu/fifthgrade/documents/5-PS-Volcanoes.pdf>

<http://video.about.com/chemistry/Erupting-Volcano.htm>

<http://chemistry.about.com/od/chemicalvolcanoes/a/ketchupvolcano.htm>

Fifth Grade Science Curriculum.

<https://www.georgiastandards.org/Standards/Georgia%20Performance%20Standards/FifthGradeApproved7-12-2004.pdf>