Unit: Volcanoes
Lesson: What makes a volcano erupt?
This is for an eighth grade Earth Science class.
Length of Lesson: 50 minutes

Standards Met: E3.4C, E3.4d

Lesson Objectives:

1. Students will review the scientific method by completing a hypothesis, observations, and conclusions worksheet for the Elephant Toothpaste demonstration.
2. Students will relate the demonstration to a real volcanic eruption after completing a page of notes.
3. Students will be able to identify the four types of lava after completing their notes worksheet.

Procedures:

1. Student will pick up worksheet on their way into class.
2. Students will answer warm-up question from day before and then we will discuss the answer as a whole (5 min.).
3. We will begin our discussion of volcanoes: (5-7 min.)
   a. What do you already know about volcanoes and plate tectonics?
   b. What is their relationship?
   c. What do you want to learn about volcanoes?
4. On the worksheet, students will hypothesize about what causes volcanoes to erupt. (5 min)
5. Show Elephant toothpaste demo. See below. (10-15 min)
   a. Make sure students record observations.
      i. What did you see?
      ii. What caused this explosion?
      iii. What causes volcanoes to erupt?
   b. Fill out rest of worksheet
6. Notes will be taken on the different types of eruptions and lava flows, see notes worksheet and PowerPoint. (15 min.) For the drawing portions of the notes, selected students will come up to the board and recreate their drawings for the class.
7. What did we learn about volcanic eruptions? (5 min.)
   a. What causes the explosion?
   b. What kind of explosion is the biggest? Smallest?

Assignments: The students will turn in their demonstration worksheet at the end of the period

Materials and Equipment: For the demonstration, a tall, skinny, clear, container, hydrogen peroxide, active yeast, warm water, liquid dish soap and food coloring will be needed. For the lesson, a PowerPoint presentation, and a sample of both pumice and holey basalt will be needed.

Accommodations for Students with Special Needs:

For ESL students, the lesson contains many pictures and demonstration so that students can look at the images and be able to understand the material. They will also draw their own pictures of the material as well.
For students with learning disabilities, many different methods of teaching are included here so the students should be able to learn from one of the used methods.

Assessment: Checks for understanding will occur throughout the lesson through critical thinking questions. Also, the conclusions section of the demonstration worksheet will show for understanding as well.

Demonstration: Elephant Toothpaste

Supplies:
- An empty 20 oz soda bottle (or any tall skinny clear container)
- Hydrogen peroxide (you can get 3% at the grocery store, or 8% at a beauty supply store)
- Active yeast
- Warm water
- Liquid dish soap
- Food coloring - optional - but it does make a nice color!

Directions
1. Mix ~4 oz of hydrogen peroxide with ~2oz of liquid dish soap and a few drops of food coloring. Add this mixture to the soda bottle and place it in the sink.
2. In a separate container, mix one packet of active yeast with warm water, still and let sit for ~ 5 minutes.
3. When you are ready, pour the yeast mixture into the soda bottle (a funnel might be helpful) and watch the reaction!

Adapted from http://www.coolscience.org/CoolScience/KidScientists/h2o2.htm
Volcanic Eruption Notes

1. Nonexplosive Eruptions
   a. These are the most common type of _____________.
   b. Produce relatively _______ flows of lava
   c. Can release __________ _______________ of lava

Example:

2. Explosive Eruptions
   a. These are much more rare than ________________ eruptions
   b. The effects of explosive eruptions are more _________________.
   c. Produces hot debris, ash, and gas
   d. Instead of producing lava flow, ____________ eruptions cause molten rock to be blown into tiny ________________ that harden in the air

Example:

3. What causes volcanoes to erupt?
   a. A _____________ _____________ is a body of molten rock deep underground that feeds the volcano.
   b. Magma rises from the magma chamber through cracks in the Earth’s crust to openings called ____________.
   c. Once air pressure __________, the gas is released from the vents, bringing along the magma.

Draw a volcano and label the magma chamber and vents.
4. What is magma?
   a. Magma is molten or liquid rock ______________, it becomes ______ when it breaks through the earth's surface through vents or fissures (cracks) in the earth's crust. It contains water and gas.
   b. If the water content of the magma is ________, an explosive eruption is more likely.
      i. Water goes from liquid to gas, expands ____________, and causes an ______________ (like elephant toothpaste).
      ii. Some lava is so frothy with gas when it reaches the surface that its solid form, ____________, can float in water. (Similar to holey basalt.)
   c. If magma has low water and gas content, the magma will be ___________ and more fluid.

5. Types of Lava
   a. ______ lava pours out quickly and forms a brittle crust. The crust is torn into jagged pieces as molten lava continues to flow underneath.
   b. ________________ lava flows slowly, like wax dripping from a candle. Its glassy surface has rounded wrinkles.
   c. ____________ lava forms when lava erupts underwater. This lava forms rounded lumps that are in the shape of pillows.
   d. ____________ lava is cool, stiff lava that does not travel far from the erupting vent. Blocky lava usually oozes from a volcano and forms jumbled heaps of sharp-edged chunks.
Volcanic Eruption Notes Key

1. Nonexplosive Eruptions
   a. These are the most common type of eruption
   b. Produce relatively calm flows of lava
   c. Can release huge amounts of lava

   Example:

2. Explosive Eruptions
   a. These are much more rare than nonexplosive eruptions
   b. The effects of explosive eruptions are more destructive
   c. Produces hot debris, ash, and gas
   d. Instead of producing lava flow, explosive eruptions cause molten rock to be blown into tiny particles that harden in the air

   Example:

3. What causes volcanoes to erupt?
   a. A magma chamber is a body of molten rock deep underground that feeds the volcano.
   b. Magma rises from the magma chamber through cracks in the Earth’s crust to openings called vents.
   c. Once air pressure rises, the gas is released from the vents, bringing along the magma.

   Draw a volcano and label the magma chamber and vents.

4. What is magma?
   a. Magma is molten or liquid rock underground, it becomes lava when it breaks through the earth's surface through vents or fissures (cracks) in the earth's crust. It contains water and gas.
   b. If the water content of the magma is high, an explosive eruption is more likely.
      i. Water goes from liquid to gas, expands rapidly, and causes an explosion (like elephant toothpaste).
      ii. Some lava is so frothy with gas when it reaches the surface that its solid form, pumice, can float in water. (Similar to holey basalt.)
   c. If magma has low water and gas content, the magma will be runnier and more fluid.

5. Types of Lava
   a. Aa lava pours out quickly and forms a brittle crust. The crust is torn into jagged pieces as molten lava continues to flow underneath.
b. Pahoehoe lava flows slowly, like wax dripping from a candle. Its glassy surface has rounded wrinkles.

c. Pillow lava forms when lava erupts underwater. This lava forms rounded lumps that are in the shape of pillows.

d. Blocky lava is cool, stiff lava that does not travel far from the erupting vent. Blocky lava usually oozes from a volcano and forms jumbled heaps of sharp-edged chunks.
Exploding Volcano Demonstration

Hypothesis: Why do you think volcanoes erupt? What causes the eruption?

Observations: What do you see? What’s the texture? What color? Was the reaction quick or slow? Draw a picture if necessary.

Conclusion: Relate what you saw happen in the demonstration to a volcano? What happened in the demonstration that could cause a volcano to erupt?