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BASIS Lesson Plan

Lesson Name: All About Volcanoes!

Grade Level Connection(s)

NGSS Standards: Grade 2, Earth Science
FOSS CA Edition: Kindergarten, Earth Science

**Note to teachers: Detailed standards connections can be found at the end of this lesson plan.*

Teaser/Overview

How does a volcano grow? This question has a fascinating explanation and students will investigate this and other questions about volcanoes during this hands-on lesson! Through two hands-on activities students will explore what's inside volcanoes, what makes a volcano active or dormant, and the properties of rocks that are produced by volcanoes. The lesson will end with an explosive demonstration to prompt student thinking about types of volcanic eruptions and their effects on humans and other living things.

Lesson Objectives

- Students will learn how volcanoes form and grow. They will discover that not every mountain is a volcano.
- Students will be able to identify igneous rocks and to separate them into two groups: from magma (inside the earth, slow cooling) or from lava (outside the earth, fast cooling) according to rock characteristics.
- Students will discover the difference between red (effusive eruptions) and gray (explosive eruptions) volcanoes and how this relates to volcanic hazards.

Vocabulary Words

- **Volcano**: a landform created when magma escapes through an opening in the earth's surface and flows out.
- **Magma**: melted rock inside the earth.

- **Lava**: melted rock outside the earth.
- **Model**: a representation or an example of something; pretending
- **Igneous rock**: a rock formed from lava or magma.

Materials

Scientist Volunteers will bring:
Laminated images of volcanoes
Laminated images of volcano eruption game
Play-Doh (8 different colors each divided into 3 containers, enough for 3 stations)
Dice
Floss (to make cross-section of Play-Doh model volcano)
Igneous rock samples (1 sample/student)
Wash bins (2)
Volcano model
Vinegar
Baking soda
Coke
Mentos candy

Materials teachers should provide:
If possible, we would like to ask students to draw a volcano before the visit.
We will need access to a sink for clean-up.

Classroom Set-Up

Students should be seated at the central classroom carpet for the introduction to the lesson. Students should then be divided into three groups and each group will participate in two hands-on activities at these stations. The students should then go back to the carpeted area (or a central area where a small spill is easily cleaned) and we will demonstrate different volcano eruption types using wash bins and small amounts of vinegar, baking soda, Mentos, and coke. We will need access to a sink for clean-up.

Classroom Visit

1. Introduction (10 minutes)

Role Model Introduction:
Being a role model for students is an important part of being a BASIS volunteer. Begin your lesson by introducing yourselves! Every team member should take a moment to explain who they are and what they study/do as a scientist. A bonus will be to tell your "story," as if giving an elevator pitch to 8-year-olds: Why did you become a scientist? What made you interested in your topic? Why should students relate to you, or be interested in you? And remember, you can also weave your story throughout your lesson through examples from your own life, and/or return to it with Q&A at the end.

Topic Introduction:
After you introduce yourselves as role models, take some time to introduce the topic of this lesson: *Volcanoes and their characteristics.* It may be helpful to keep the suggested take-away in the back of your mind throughout the lesson: **Volcanoes are dynamic and diverse landforms that can grow and change.**

Your topic introduction should follow the outline below. As much as possible, try to frame this information as questions posed to the class, rather than as a lecture. This helps activate students' prior knowledge and facilitates student-guided discussion.

- Today we are going to learn about volcanoes!
- Who can tell me what a volcano is? [gather student ideas and write these on the board] Create a Know, Wonder, Learn (KWL) chart of what students Know about volcanoes and what they Wonder about volcanoes. You can then return to this on the board at the end of the lesson to review what students Learned about volcanoes.
- Engage students in a discussion about volcanoes. [Define **volcano**, **lava, and magma**]
- Do you think that all volcanoes are the same? Why or why not?
- We want to show you some pictures of volcanoes. This first one is a volcano called Cuexcomate and it is located in Mexico. Does anyone know where Mexico is? Cuexcomate is the world's smallest volcano! The second picture is a volcano named Mauna Kea and it is located in Hawaii. Does anyone know where Hawaii is? Mauna Kea is the tallest volcano on Earth!
- So why are these volcanoes so different? We're going to figure it with some fun activities! You are all going to be volcanologists today – scientists who study volcanoes!

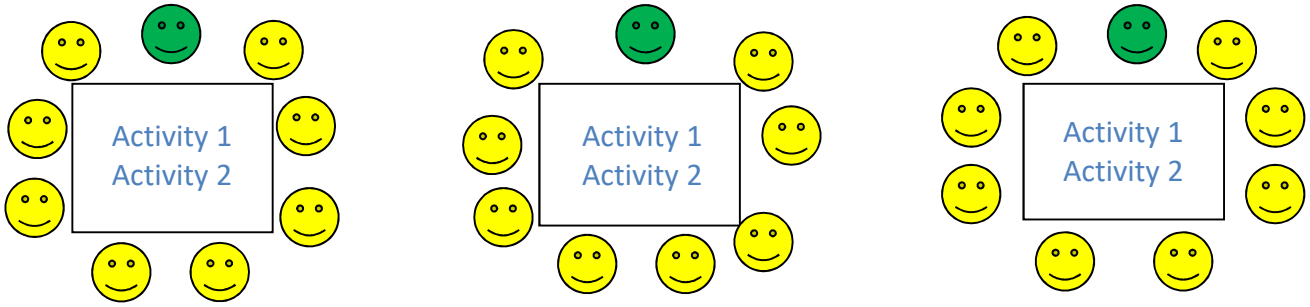
Teaching Tip: Say, Write, Show

- Bring in photos and props to illustrate the topic intro
- Write new vocabulary words, key terms, and brainstorm lists on the board
- Refer back to the board to engage visual learners and English Language Learners

2. Learning Experience (30 minutes)

Students will be split into three groups. Each group will sit at one of three stations set up around the room and participate in two activities at the station. At the station, a BASIS volunteer will lead the students through two activities that explore properties of volcanoes. Remember that all activities are designed to address the take-away in a particular way: **Volcanoes are dynamic and diverse landforms that can grow and change.**

Classroom set-up:



Activity 1: How Do Volcanoes Grow?

1. Engage students in a conversation about volcanoes
    a. Show students the pictures of volcanoes again. "We established that not all volcanoes are the same size or shape. So how do volcanoes grow?"
    b. Introduce the idea that volcanoes erupt. When they erupt **magma** [define this for students again] flows out. When that melted rock is outside the Earth, what do we call it? [**Lava** – define for students again].
2. Do the Volcano Modeling activity
    a. Today we're going to use a volcano **model**. Sometimes in science when something is too big, too small, or too complicated to understand, we use something called a **model**. The model helps scientists understand how the world works.
    b. Build a small **model** volcano out of Play-Doh.
    c. Explain the rules of the volcano eruption game. Each student will have a turn to roll the die and if there is an eruption, each student will add a bit of the same color Play-Doh to the volcano.
    d. Hand out a small piece of Play-Doh that is the same color to each student.
    e. Play the volcano eruption game. Each student has a turn to roll the die. Have students add a layer onto the volcano model if an eruption occurs. Distribute another small piece of Play-Doh in a different color and repeat the activity several times. Once the

game has ended take a piece of floss to make a cross-section of the volcano model so that you can see and discuss the layers and how this relates to the growth of a volcano.

3. Connect the activity to the big picture
    a. Invite students to reflect on the importance of eruptions and how these contribute to the growth of volcanoes. What happens when a volcano is young? What happens when a volcano is old?
    b. Emphasize the overall take-away of the lesson: **Volcanoes are dynamic and diverse landforms that can grow and change.**

Activity 2: Igneous rock sorting

1. Engage students in a conversation about rocks formed from volcanoes.
    a. Prompt students with some guiding questions: "We just talked about eruptions and how volcanos are growing. What happens to the lava once it cools?"
    b. Introduce the idea that volcanoes are composed of two different types of rock.
2. Do the igneous rock sorting activity
    a. Present students with a challenge: "There are two different types of rocks formed by volcanoes. I'm going to give each of you a rock and we're going to figure out what characteristics of those rocks are useful in putting them into two categories. We're going to figure it out together!"
    b. Give each student an igneous rock. Prompt the students to use some words to describe characteristics of their rock.
    c. Have students match their rocks with other students that have similar rocks.
    d. What were the important different **characteristics** of these two rocks?
3. Connect the activity to the big picture
    a. Invite students to reflect on the similarities and differences between igneous rocks formed from lava and those formed from magma.
    b. Show the pumice floating activity – based on what you just learned, do you think these igneous rocks were formed from **lava** or from **magma**?
    c. Emphasize the overall takeaway of the lesson: **Volcanoes are dynamic and diverse landforms that can grow and change.**

Student table groups will now all gather together and rejoin on the central carpet area for the final activity on Eruptive Styles.

Activity 3: Eruptive Styles

1. Engage students in a conversation about volcanic eruptions.
    a. Prompt students with some guiding questions: "What happens when a volcano erupts?"

   b. Introduce the idea that volcanoes have two different types of eruptions. A grey eruption (explosive eruption) and a red eruption (effusive eruption). Grey eruptions have more ash and less lava while red eruptions have less ash, but more red hot lava.
   c. Guide students to make a prediction about which eruption type is most dangerous. [Many may say red eruption because there is more lava.]
2. Do the volcano eruption simulations
   a. Set up a red eruption using baking soda and vinegar within a wash tub.
   b. Guide students to watch what is happening to the "village" around the volcano. Would the people living in this village be harmed by this eruption?
   c. Set up a grey eruption using Mentos and coke within a wash tub.
   d. Guide students to watch what is happening to the "village" around the volcano. Would the people living in this village be harmed by this eruption?
3. Connect the activity to the big picture
   a. Invite students to reflect on their initial predictions about which type of eruption is more harmful. Have they revised their thinking? Why or why not?
   b. What will happen to the lava from these eruptions once it cools?
   c. Emphasize the overall takeaway of the lesson: **Volcanoes are dynamic and diverse landforms that can grow and change.**

3. Wrap Up: Review and Discuss the Learning Experience (5 minutes)

Prompt students to engage in a wrap-up discussion.

- What are volcanoes? What is magma? What is lava? Review of vocabulary words.
- What did we learn about how volcanoes grow?
- What did we learn about volcanic rocks? What are they called? [Igneous rocks]
- What are the two types of eruptions? [red and grey] Which type is the most dangerous? Why?

Prompt students to think about what other questions they have about volcanoes.

4. Connections & Close (5 minutes)

Connections to the real world around students:
There are different volcanoes all around the world and even volcanoes in California! (Example: Long Valley caldera, Lassen volcano). There is even a volcano in the Oakland hills! This local volcano is in a place called Sibley Volcanic Regional Preserve. But don't worry – it hasn't had an explosion for over 10 million years! If you get the chance to visit, make sure you look around for igneous rocks!

If possible, tie lesson back into your research or role model story.

Close:

- Reiterate for students that science helps us learn about volcanoes
- Ask students if they have any questions about science or being a scientist
- Close with a good bye and a thank you, and encourage the kids to keep thinking about the earth and volcanoes!
- Don't forget to help clean up!

Follow Up: After the Presentation

Teachers who wish to extend the impact of this lesson may find the following CRS web pages useful:

- http://www.crscience.org/educators/helpfulreports
- http://www.crscience.org/educators/treasuretrove
- http://primaryhomeworkhelp.co.uk/mountains/volcanoes.htm (volcanoes)
- http://www.ebparks.org/parks/sibley (Sibley Volcanic Regional Preserve)
- https://education.usgs.gov/docs/USGSEducResources.pdf (Education resources from USGS)

Standards Connections

NGSS:

- Connections by topic
  - Earth Science: 2. Earth's Systems: Processes that Shape the Earth
- Connections by disciplinary core ideas
  - Earth Science: 2-ESS1. Earth's Place in the Universe
  - Earth Science: 2-ESS1. Earth's Systems
- Connections by scientific & engineering practices
  - 2. Developing and using models
  - 6. Constructing explanations and designing solutions
- Connections by crosscutting concepts
  - 2. Cause and Effect: Mechanism and explanation
  - 6. Structure and Function: Determine properties of things
- Connections by performance expectation
  - 2-ESS1-1. Make observations from media to construct an evidence-based account that Earth events can occur quickly or slowly.
  - 2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.

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