Veronica Lindahl
Grade: 3
Unit of Study: Social Studies: Landforms
Time Frame: This is one lesson in a six week unit. This lesson will take about four days of one hour periods to complete.

First day: Engage and first explore activity.
Second Day: Second explore activity and explain section of 5-E model
Third Day: Extension section fo 5-E model.
Fourth Day: Evaluation and reflection.

Objectives:

- Students will graph and interpret data on volcanoes
- Students will analyze their maps for patterns in their data and draw conclusions on the relationships between plate tectonics and volcanoes
- Students will compare advancements technology and data used by scientists to predict when volcanoes will erupt
- Students will analyze a variety of resources, including, videos to explain phenomenon

Standards:

Standard: New York State K-12 Social Studies Standards
Third Grade Geographic Reasoning

- Ask geographic questions about where places are located and why they are located there, using location terms and geographic representations, such as maps, photographs, satellite images, and models. Describe where places are in relation to each other and describe connections between places.

- Describe how human activities affect the environment of a world community; describe how the environment of a specific world community affects the human activities in that community

Next Generation Science Standards:
ESS2.D: Weather and Climate

- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1)
- Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2)

ESS3.B: Natural Hazards

- A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1) *(Note: This Disciplinary Core Idea is also addressed by 4-ESS3-2.)*

4-ESS2.B.1

- The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. See More 4-ESS2.B.1 Resources

Science and Engineering Practices

Analyzing and Interpreting Data

- Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.
  - Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. (3-ESS2-1)

Obtaining, Evaluating, and Communicating Information

- Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.
  - Obtain and combine information from books and other reliable media to explain phenomena.

Crosscutting Concepts:

Patterns

- Patterns of change can be used to make predictions. (3-ESS2-1),(3-ESS2-2)

Cause and Effect

- Cause and effect relationships are routinely identified, tested, and used to explain change. (3-ESS3-1)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones). (3-ESS3-1)

Connections to Nature of Science

Science is a Human Endeavor

- Science affects everyday life.

Mathematical Practices

- CCSS.MATH.PRACTICE.MP4 Model with mathematics.
- CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically.
- CCSS.MATH.PRACTICE.MP6 Attend to precision.

Materials:

- **Video clip of Kilauea Volcano footage for "hook"**
- Global Volcanism Program: Smithsonian Institution
- Recording Sheet for Asia Map: Volcano List
- Recording Sheet for Australia and Nearby Islands Map: Volcano List
- Recording Sheet For North America Map: Volcano List
- Recording Sheet for South America Map: Volcano List
- Volcano Mapping Sheets
- Medium-cooked eggs. These eggs should be boiled for approximately 5 – 8 minutes, and cooled before distributing to students.
- Pencils
- Website of plate tectonics and volcanoes
- What is a Volcano? Article
- Comprehensive monitoring provides timely warnings of volcano reawakening..
- VR Goggles
- Google Expedition
- Ipods
- Explorer Question for Evaluation
- Rubric for Summative Assessment

Justification:

The unit my grade partners and I currently implement to teach geography and map reading skills, includes lots of experiential learning and our students are very engaged. Historically, my students are drawn to the lessons on volcanoes. Using the Next Generation Science Standards, I wanted to extend this unit to include more lessons that had students analyze the placement of volcanoes, and their impact on world communities and the environment. I felt

this would further enrich our current social studies unit as well as integrate what students will be learning in their science class.

This lesson integrates science standards and technology into social studies standards, further enriching my students geographical reasoning and analyzing skills. One of the core ideas for the third grade standards of Weather and Climate is "ESS3.B: Natural Hazards. A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1)." By first being able to understand how volcanoes are created, students will then be looking at how humans have been affected by volcanoes. This lesson directly supports this core idea as well as the cross-cutting concepts connected to this standard. Students will observe the cause-and-effect relationship between plate tectonics and volcanoes.

This lesson also supports the cross-cutting concept that science affects our everyday lives and is a human endeavor with a goal to learn as much as possible about volcano activity, in order to help predict future eruptions and hopefully save future lives. This lesson also supports many of the science practices. Students will be evaluating and communicating information obtained from their new knowledge based on their analysis of the data. This lesson also hits upon many mathematical practices including using appropriate tools strategically, as well as reinforcing skill development such as constructing viable arguments and critiquing the reasoning of others.

Engage:

- A video will be shown to pique student interest and engage them in the lesson. The following video clip of Kilauea volcano footage taken between July 24 and July 31, 2016 from the United States Geological Survey Website will be used. **Video clip of Kilauea Volcano footage for "hook**." This is a long video. I suggest just showing the first 4-5 minutes.
- Next, explain to students that they will be exploring the following two questions:
    - *How are Tectonic Plate Boundaries and Volcanoes connected?*
    - *How do volcanic eruptions change the Earth's surface?*

Explore: The explore section will be broken apart into two one hour class periods. The first day the students will do the mapping and analyzing. During the next period they will do the egg simulation.

- Break the class apart into four groups. For example if you have 24 students then each group will have six students.
- Give each group one of the Volcano Mapping Worksheets (link is under materials). One entire group will get the Asia Map, another group will get the

Australia & Nearby Islands Map, the third groups will get the South America Map, and the final group will get the North America Map. Students should work in partner pairs within their groups, and share a map.

- Explain to students that within their pairs, they will need to decide who will be the "Mapper" and who will be the "Announcer." The "Mapper" will be recording the plots on the map, while the "Announcer" reads the information. Both partners will be doing the research together.
- Next, give each team a "Recording Sheet" that matches their assigned map. For example, if a pair has the Asia Map, then they will receive the "Recording Sheet for the Asia Map: Volcano List."
- Explain to students that they will be using the following website: Global Volcanism Program: Smithsonian Institution to research their data. They will need to find the following information for each of their volcanoes on their recording sheet: country, last eruption, type of volcano and elevation
- Once students have gathered all of their information, the "Announcer" will announce each location to their partner, while the "Mapper" plots the data on the map.
- When all groups are done, bring together one map from each group, to create a world map.
- In groups, students will look for and record patterns in their data in their Landform Journals.
- Teacher will then pull up the following website: http://d3tt741pwxqwm0.cloudfront.net/WGBH/conv16/conv16-int-tectonic/index.html. Teacher will click on "plate tectonics" and "volcanoes." Students will analyze their maps against this website. Students will analyze the data and hypothesize the correlation between tectonic plate boundaries and volcano locations.
- Teacher will ask students what patterns they notice by looking at their maps and website and record observations and answers on a class chart. Teacher will also record the class' hypothesis on the correlation between tectonic plate boundaries and volcano locations
- Next, give each group a boiled egg
- First they will roll it gently on a paper towel, allowing the shell to crack but not break off. Ask them what they think this represents on the Earth? (Earth's crust broken up into plates)
- Next, each group will lightly squeeze the egg allowing some of the shells to move. Ask the students what this simulation represents? (Elicit that the Earth's plates are in motion and float on top of the mantle.)

- Finally, the students will squeeze the egg harder, and see the yolk oozing out. (this represents magma escaping when the plates move)
- Teacher will then explain that on the Earth when tectonic plates move, magma escapes from between the cracks, which can cause a volcanic eruption.

Explain:

- Students will learn about the relationship between tectonic plates and volcanoes through reading the following article taken from NewsELA: https://newsela.com/read/lib-Nasa-volcano/id/23119/
- Next, take the students on a Google Expedition to further learn about volcanoes and plate tectonics: They will use the slides "What Causes Volcanoes?" and "Ring of Fire" from "Volcanoes" Expedition. You will need VR goggles and Ipods for this.
- Teacher will elicit from students "key findings" from the article and google Expedition and record the "key findings." Together students and teacher will go back to their notes from the mapping exercise and revise students' findings, in light of their new knowledge. Together Students will also record these this new knowledge in their social studies notebooks..

Extend/Elaborate:

Students will extend their knowledge by exploring how volcanoes can change the way the Earth looks and how scientists are using data and technology to provide warnings to volcanoes reawakening.

- Students will explore how volcanoes change the way the Earth looks by watching a video clip of how lava has affected Hawaii. https://cptv.pbslearningmedia.org/resource/bf10.sci.ps.earth.lavaland/lava-landscapes/
- Teacher will explain that when the hot lava stops flowing and cools, it can create rocks or new land that looks very different from the original landscape.
- Next, read the following article together: Comprehensive monitoring provides timely warnings of volcano reawakening.. Discuss and chart what scientists are doing to warn people of volcanoes reawakening.

Evaluate

Throughout the unit there are opportunities for formative assessments. While students are working in their partnerships, looking up data on volcanoes and plotting the locations, teachers can observe how students are collecting data, and the conversations they are having around volcanoes. During the class discussion, the teacher can record observations of what students notice in the patterns of their data, and what conclusions they are drawing on the relationship between volcanoes and plate tectonics. During the class discussion, teacher can also document which students are sharing ideas with supporting evidence from their research and data

collection. The teacher will also collect all worksheets at the end of the unit. The summative component for evaluation is the teacher will hand out the following worksheet: Explorer Question for Evaluation. Students will need to synthesize all of their knowledge from the unit and lesson to answer the question with supporting evidence: "How could you explain to an explorer how to find volcanoes?" There is a rubric linked under materials to assess this response.

References

Could a volcano pop up in your backyard? (n.d.). Retrieved from https://mysteryscience.com/rocks/mystery-1/volcanoes-rock-cycle-earth-s-surface/53

Global Volcanism Program. (2013). Retrieved November, 2018, from https://volcano.si.edu/search_volcano.cfm

NASA.gov. (2016, December 1). What is a volcano? Retrieved from https://newsela.com/read/lib-Nasa-volcano/id/23119/

US Geological Survey. Comprehensive monitoring provides timely warnings of volcano reawakening. Retrieved November, 2018, from https://volcanoes.usgs.gov/vhp/monitoring.html

US Geological Survey (2016, July) Kīlauea Volcano, Halemaʻumaʻu Crater, Summit Vent Lava Lake (4K). Retrieved October, 2018, from https://www.usgs.gov/media/videos/k-lauea-volcano-halema-uma-u-crater-summit-vent-lava-lake-4k

WGBH. (Ed.). (2018). Tectonic Plates, Earthquakes, and Volcanoes. Retrieved October, 2018, from https://cptv.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.tectonic/tectonic-plates-earthquakes-and-volcanoes/

Vibrant Volcanoes. (n.d.). Retrieved from https://cptv.pbslearningmedia.org/resource/bf10.sci.ps.earth.lpvibvolc/vibrant-volcanoes/