

Subject area/course: Science/Earth Science

Grade level/band: 9-10

Task source: Virtual Learning Academy Charter School (VLACS) in collaboration with the Center for Collaborative Education; Author: Betsy Stacey

Your Earthquake and Volcano Risk

TEACHER'S GUIDE

A. Task overview:

In this task, students will play the role of a risk assessor for the Federal Emergency Management Agency (FEMA). Their job is to figure out if their local region is at risk of a devastating earthquake or volcano and to write a risk assessment document for their locality. In order to understand the risks, students need to understand plate tectonics and where their state sits in relation to plate boundaries, and how those plate boundaries affect earthquakes and volcanoes. Students will then research another region of the world that they feel has a very different risk factor of volcanoes and/or earthquakes and write a risk assessment document for that region as well.

The task will be completed in three parts:

- Part 1: Research Earthquake and Volcano Hazards
- Part 2: Drafts of Risk Assessments – Earthquakes
- Part 3: Drafts of Risk Assessments – Volcanoes

B. Aligned standards:

1. Common Core State Standards

[CCSS.ELA-Literacy.RST.9-10.2](#) Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

[CCSS.ELA-Literacy.RST.9-10.7](#) Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

[CCSS.ELA-Literacy.RST.9-10.9](#) Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

2. Critical abilities

Communication in Many Forms: Use oral and written communication skills to learn, evaluate, and express ideas for a range of tasks, purposes, and audiences. Develop and strengthen writing as needed by planning, revising, editing, and rewriting while considering the audience.

Analysis of Information: Integrate and synthesize multiple sources of information (e.g., texts, experiments, simulations) presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to address a question, make informed decisions,



understand a process, phenomenon, or concept, and solve problems while evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

3. Next Generation Science Standards

[HS-ESS3-1](#). Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

4. Other standards

New Hampshire ELA Competency 4: Explanatory Writing Competency: Students will demonstrate the ability to effectively write informative texts to examine and convey complex ideas for a variety of purposes and audiences.

New Hampshire S:ESS1:11:5.1 Explain that the Earth is composed of interactive layers, which have distinct compositions, physical properties and processes.

New Hampshire S:ESS1:11:5.2 Relate plate movement to earthquakes and volcanic activity, and explain how it results in tectonic uplift and mountain building.

C. Time/schedule requirements:

Depending on class hours available, this work could be split over 3 weeks with other class work being completed as well. The instructor may make changes to the time as needed.

D. Materials/resources:

Materials for students:

- Risk Assessment Table
http://www.ready.gov/sites/default/files/documents/files/RiskAssessment_Table_0.pdf
- The following links may be helpful as you move through the unit. A select few were included in the student instructions.

Dynamic Earth- great summary of plate tectonics, earthquakes, and volcanoes

http://www.mnh.si.edu/earth/text/4_0_0.html

PBS NOVA- earthquake info

<http://www.pbs.org/wgbh/nova/earth/vernon-earthquakes.html>

Earthquake detection- <http://www.pbs.org/wgbh/nova/earth/earthquake-detection.html>

National Geographic Special- Down to the Earth's Core

<http://www.youtube.com/watch?v=LwTzzgHaC2I>

Khan Academy - Compositional and Mechanical layers of the earth-

<http://www.youtube.com/watch?v=hHteUIS00FY>

Khan Academy - How do we know about the earth's core?

<http://www.youtube.com/watch?v=KL0i1RSnpfl>

<http://www.fema.gov/determine-your-risk>

<http://www.fema.gov/earthquake/your-earthquake-risk>

<http://www.ready.gov/earthquakes>



<http://www.ready.gov/volcanoes>

<http://training.fema.gov/EMIWeb/edu/docs/fmc/Chapter%204%20-%20Flood%20Risk%20Assessment.pdf>

Great summary of regional earthquakes and geologic forces

https://www2.bc.edu/~kafka/Why_Quakes/why_quakes.html

http://www.ehow.com/list_7636595_natural-disaster-risk-assessment-tools.html

http://www.tulane.edu/~sanelson/Natural_Disasters/introduction.htm

E. Prior knowledge:

Students should be able to do research about the earthquake and volcano risks. As needed, students should be able to organize this information to meet the criteria of this task.

Students should know: All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future.

F. Connection to curriculum:

Due to the nature of Virtual Learning Academy Charter School (VLACS), this task was built to be used as an independent study task, but can be modified and embedded naturally into a unit of study or course. Below are the instructions for how the task was originally laid out to be administered.

G. Teacher instructions:

Below is the sample learning plan used by VLACS.

Prior to Beginning the Task

As you introduce the task, you may wish to discuss with students FEMA's role in assessing and managing emergency situations.

Part	Approximate # of Weeks	What will be done
1	1 week	Research Earthquake and Volcano Hazards
2	2 weeks	Drafts of Risk Assessments- Earthquakes and Volcanoes

Part 1: Research Earthquake and Volcano Hazards

Spend some time preparing the students with the background information they need to understand how different regions of the world differ in terms of earthquake and volcano risk. Students may do this independently by researching the information themselves or you may decide to design lesson plans that support students with learning this information.

Below are sample questions that you may choose to use in your planning.

- What causes an earthquake?
- What causes a volcano?
- Why do earthquakes happen in some regions more than others?
- How do earthquakes relate to tectonic plates?
- How are the tectonic plates able to move over time?
- Describe the type of damage that earthquakes cause.
- Find localized information about your region in terms of earthquake risk, then find a specific region of the world that is very different than your own in terms of effects of plate tectonics and get a sense of the different risks.

If students are working independently, it is recommended that you have a check in conversation with the student and collect and give feedback on the following items:

- Notes of findings
- Choice of regions to be studied

Part 2: Drafts of Risk Assessments- Earthquakes and Volcanoes

Below are some suggested guidelines for the risk assessments. As you support students with their drafts, you may wish to emphasize these points.

- General description of region including underlying plate tectonics
- Description of damage that earthquakes and/or volcanoes do to a region
- Explanation of why you would expect a high rate of earthquakes and/or volcanoes or not
- General safety guidelines for dealing with an earthquake or volcanic eruption.

NOTE: At Virtual Learning Academy, every Performance Assessment culminates with a Discussion Based Assessment (DBA). A DBA is an individual conversation between the student and teacher where the teacher asks questions about the content and the product the student created. The following sample DBA questions and prompts might be helpful in planning instruction:

- In your own words, describe the theory of plate tectonics.
- What do the terms fault, focus and epicenter describe?
- List the layers of the earth and their attributes; from inner core through crust. Explain why certain parts of the Earth are more prone to earthquakes or volcanoes.
- Assess whether your region has a high risk of earthquakes and explain why or why not given your knowledge of plate tectonics, volcanoes and earthquakes.

H. Student support:

Possible accommodations for specific students should be discussed in advance with SPED and/or ELL teachers, and could include:

- Extended time- the hours listed above are suggestions, but could be modified
- Provide outline supports for article
- Websites accessible in other languages
- Support with translation of website language

I. Extensions or variations:

A similar task could be done with other natural disasters.

J. Scoring instructions:

Student work can be scored using the SCALE Earthquake and Volcano Risk rubric.

