

To be explosive or not to be explosive, that is the question!

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Grade Levels: 9-12

Subjects: Earth Science/Advanced Geology

Project Summary: The Earth is a volatile place. It is always shaking and volcanoes are constantly erupting. Why? How does the composition of magma in the magma chamber determine a volcano's explosivity? Students will research and present the eruption history of volcanoes around the world, explaining why certain volcanoes are explosive and which are not.

Introduction:

Project Description: A volcano's explosivity is directly related to the viscosity of the magma, due to the magma's silica/quartz content. Volcanoes with a low viscosity will be non-explosive in nature and have a low silica/quartz content while volcanoes with a high viscosity are explosive and have a high silica content. Using this knowledge and their knowledge of the temperatures at which minerals crystallize out, students will use the internet to research volcanic eruptions that have occurred around the world throughout the history and present their findings to their colleagues with PowerPoint presentations. Students will create a 2-dimensional cross-sectional poster or a 3-dimensional model of their volcano which will be shared during their presentation.

Student Impact:

The major goal of this unit is for students to be able to understand the process of volcanism and to predict the explosive nature of the different types of volcanoes. To understand this, students need to understand how volcanoes are distributed around the world, what their chemical composition tells us about their explosivity and what types of geological features and hazards are associated with them. Students will also be able to explain why 500 million people live in harms way of volcanoes around the world.

Assessment:

Students will be graded in a variety of different ways. They will do book work, laboratory write-ups, crossword puzzles, PowerPoint Presentations (see attached rubric), study guides and a performance exam (the volcano model). By assessing students in different ways all students can be successful in this unit. Students learn in different ways and should be able to show they understand concepts in different ways. All of these assessment tools are attached. I have included in this packet a copy of all assignments, tests and quizzes.

Standards:

ES 3b. Students know the principal structures that form at the three different types of plate boundaries.

ES 3c. Students know how to explain the properties of rocks based on the physical and chemical conditions in which they formed, including plate tectonic processes.

ES 3e. Students know there are two kinds of volcanoes: One kind with violent eruptions producing steep slopes and the other kind with voluminous lava flows producing gentle slopes.

ES 3f. Students know the explanation for the location and properties of volcanoes that are due to hot spots and the explanation for those that are due to subduction.

Materials/Budget:

LCP Projector

PowerPoint Software

Computers

Internet access

Video: Dante's Peak (~\$5.00)

Lesson Plans:

***See attachments for detailed lesson plans**

Lesson 1: Notes: Igneous rocks & their textures

- Mini-Lab: Sort through igneous rocks. Separate these by 1) type of magma (basic, intermediate, or acidic) and then 2) texture (phaneritic, porphyritic, or aphanitic)

Lesson 2: Notes: Bowens Reaction Series & Magmatic Differentiation (Explaining how mineral in a magma crystallize and form based on composition). Lab: Bowens Reaction Series

Lesson 3: Igneous rock crossword puzzle

Lesson 4: Super Quiz: Igneous rocks

Lesson 5: Volcanism Project: Research and presentation project using actual volcanoes

Lesson 6: Volcano Exam Review – Table + volcano crossword puzzle

Lesson 7: Volcano matching exam

Lesson 8: Video: Dante's Peal + paper guidelines