EarthComm: Chapter 1: Volcanoes and Your Community

Performance Task: The **Chapter Challenge** is for students to develop a screenplay or story, set within their community, which would help audiences understand volcanoes, volcanic hazards and the Earth system. As students move through the chapter, they inquire about the hazards and benefits of volcanism, the evidence for past volcanism in their community, the connections between volcanoes and Earth systems, and the flow of matter and energy in the geosphere. By the end of the chapter, students have uncovered how and why volcanoes affect all communities on Earth.

Activity	Description	Earth Science Principles	Durable Materials (class of 40 students)	Consumable Materials (class of 40 students)	Instructional Map
Getting Started, Scenario, Chapter Challenge and Assessment Criteria	Students answer an open-ended question about the effects of a volcanic eruption on their community. Students read a description of an eruption and then begin planning their Chapter Challenge tasks. Students develop the criteria for assessing their Chapter Challenge projects.		None needed		• 1 class period
Activity 1: **Where are the Volcanoes?**	Students begin the chapter by examining a map and searching for and describing patterns in the global distribution of volcanoes. They plot the latitude and longitude of the volcanoes closest to their community and make inferences about possible locations of future volcanic activity.	• Volcanism • Mid-ocean ridge • Hot-spot volcanism • Mercator projection	• 3 Maps, "This Dynamic Planet" • 10 Rulers (1 for each group of 4) • American Geological Institute website http://www.agiweb.org/earthcomm	• 40 copies of Blackline Master Volcanoes 1.1 Blank World Map • 10 sets colored pencils • 40 copes of Blackline Master Volcanoes 1.2 Cross Section Through a Mid-Ocean Ridge for "Check Your Understanding"	• 2-3 class periods • Think about It • Investigate –talk through step 1 • Students do steps 2-5 • Students read Digging Deeper • Preparing for Chapter Challenge

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Activity 2: **Volcanic Landforms**	Students construct models of volcanoes and contour maps of the models to learn how topographic maps depict elevations and features. Conceptual understanding of representations of the land surface is then connected to the relationship between magma composition and types of volcanic landform.	• Topography • Magma composition and properties • Volcanic landforms	• 10 Plastic Shoe Boxes • 10 clear plastic clip boards, or clear, flat plastic shoe box lids • 10 1 ft (30cm) rulers	• Transparent tape • 10 transparencies • 10 transparency markers • Sheets of paper • 10 copies of Blackline Master Volcanoes 2.1 Map of Mt. St. Helens • 10 Local Topo Maps used in or use Blackline Master Volcanoes 2.2 "Topographic Map of Mt. Rainier" •	• 2-3 class periods • Think about It • Investigate steps 1-7 • Digging deeper • Check your understanding • Preparing for Chapter Challenge
Activity 3: **Volcanic Hazards: Flows**	Using simple fluids and materials, students explore factors that affect volcanic flows (viscosity, slope, magma temperature, and channelization). They develop an understanding of the nature and hazards of lava flows, pyroclastic flows, and lahars. Students also explore the concept of a controlled experiment, and how knowledge of Earth science contributes to wise planning.	• Experimental control • Viscosity • Types of volcanic flows • Flow hazards	• 10 eyedroppers • Video: "Volcano: Nature's Inferno," National Geographic • 2 hot plates • 2 – 600mL beakers • 10 1 ft (30cm) rulers	• Liquid soap • Ice (~0.5L) • 10 transparency sheets • 10 copies of Blackline Master Volcanoes 3.1, Square Centimeter Graph Paper • paper towels	• 2 class periods • Think about It • Investigate Part A • Part B: Replace with National Geographic Video • *Volcano Nature's Inferno* for the modern/real world connection • Preparing for Chapter Challenge

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Activity 4: **Volcanic Hazards: Airborne Debris**	In this activity, students interpret maps and data tables to develop a concept of the varying scale of volcanic eruptions and determine that volcanic ash affects a larger area than lava. They connect magma composition to volcanic explosivity to better understand why volcanoes vary in size, eruptive style and potential hazard.	• Volcanic Explosivity Index • Volcanic particle types • Airborne hazards		• 40 copeies of Blackline Master Volcanoes 4.1 Graph Paper for Investigate #2.	• 1 class period • Think About It • Talk through the figures and graphs of VEI vs. plume height • Preparing for Chapter Challenge
Activity 5: **Volcanoes and the Atmosphere**	Students design an experiment to determine the volume of gas dissolved in a carbonated beverage. They learn about the common gases dissolved in magma and released during volcanism. This enables students to understand the connections between the geosphere, atmosphere, hydrosphere, and biosphere.	• Volcanic gases • Volcanoes and climate change • Experimental design	• 1 – 24in rubber tubing • 1 - 500 mL beaker • 1 – plastic dish pan • 1 hot plate • *If you want students to do the lab, you will need a class set of 10 setups.*	• Can of soda • Modeling clay	• 1 class period • Think About It • Investigate step 1 (students make predictions) • class discussion of steps 2-3 • teacher does step 4 as demonstration • Digging Deeper • Preparing for Chapter Challenge

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Activity 6: **Volcanic History in Your Community**	In this activity, students examine and classify rocks collected within their community and within volcanic regions. They also interpret local geologic maps to search for evidence of volcanism or past igneous activity. They learn about the nature and classification of igneous rocks, and how geologic maps provide evidence of past volcanism.	• Common igneous rocks • Intrusive vs. extrusive • Geologic maps • Map interpretation	• 10 sets of igneous rock samples • 10 hand lenses • 10 state geologic maps	• 40 copies of Blackline Master Volcanoes 6.1 Cross Section of a Composite Volcano for "Understanding and Applying What You Have Learned," #1.	• 2 class periods • Think About It • Investigate Part A (students refer to Digging Deeper as necessary) • Investigate Part B (students refer to Digging Deeper as necessary) • Preparing for Chapter Challenge
Activity 7: **Monitoring Active Volcanoes**	Interpreting an actual report from a volcano observatory provides the impetus for understanding the changes that volcanoes undergo prior to and during an eruption. Students apply their understanding by designing a monitoring instrument and preparing manuals that explain how the instrument is used.	• Volcano monitoring • Monitoring systems	• Students use materials from home	• Students use materials from home	• 1 class period • Think About It • Investigate • Preparing for Chapter Challenge
Chapter Challenge	Students prepare and present their Chapter Challenge projects.				• 2 Class Periods • Report Prep • Class Presentation