

Prepared in cooperation with the National Park Service

Living with a Volcano in Your Backyard

An Educator's Guide with Emphasis on Mount Rainier

General Information Product 19
Version 2.0, December 2014

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Coordinated by Carolyn Driedger, Anne Doherty, Cheryl Dixon, and Lisa Faust

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**U.S. Department of the Interior
U.S. Geological Survey**

U.S. Department of the Interior
GALE A. NORTON, Secretary

U.S. Geological Survey
P. Patrick Leahy, Acting Director

U.S. Geological Survey, Reston, Virginia
First release: 2005, online
Revised: December 2014 (ver. 2.0), online

For product and ordering information: World Wide Web: <http://www.usgs.gov/pubprod>
Telephone: 1-888-ASK-USGS

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Suggested citation:

Driedger, C., Doherty, A., Dixon, C., and Faust, L., coordinators, 2005, Living with a volcano in your backyard—An edu-
cator's guide with emphasis on Mount Rainier (ver. 2.0, December 2014): U.S. Geological Survey General Information
Product 19, 716 p., <http://dx.doi.org/10.3133/gip19>.

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Living with a Volcano in Your Backyard— An Educator’s Guide with Emphasis on Mount Rainier

Coordinated by: Carolyn Driedger¹, Anne Doherty², Cheryl Dixon², and Lisa Faust¹

INTRODUCTION

Today’s residents, as well as residents of centuries past consider Mount Rainier “the spiritual and cultural icon of the Pacific Northwest.” As a backdrop for many of the State’s residents, Mount Rainier offers beauty, solace, inspiration, and challenge. The mountain sets the daily mood for thousands of people who gaze at and respect it. There is no mistaking this object of admiration when people smile and remark that, “the mountain is out!”

Yet, the origin of Mount Rainier, formed by volcanic processes and now heavily laden with snow and ice, remains an enigma to many admirers. During the 1980s, volcanologists from around the world voted Mount Rainier as one of 17 volcanoes most worthy of additional study because of the hazard potential to large population centers nearby. Subsequent research indicates that Mount Rainier, though quiet since the nineteenth century, is very much an “active volcano” with potential to erupt again and disrupt the life of Pacific Northwest residents. Following days to months or more of warning, Mount Rainier could erupt lava and ash and melt snow and ice to form lahars (volcanic mudflows). Or, Mount Rainier could simply warm up briefly, jolt us from our apathy, and then return to slumber for many more years.

Until such time, the mountain is ours to explore. **Living with a Volcano in Your Backyard—An Educator’s Guide with Emphasis on Mount Rainier** invites educators and their students to learn what scientists are discovering about Mount Rainier’s past; to explore its slopes during this period of quiescence; and to plan future responses to volcanic unrest.

Mount Rainier National Park is a unique classroom, rich in resources for observing geologic change. The park staff encourages safe and knowledgeable use by educators and students and their families.

¹ U.S. Geological Survey; ² National Park Service

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The National Park Service and the U.S. Geological Survey’s Volcano Hazards Program (USGS-VHP) support development and publication of this educator’s guide as part of their mission to educate the public about volcanoes. The USGS-VHP studies the dynamics of volcanoes, investigates eruption histories, develops hazard assessments, monitors volcano-related activity, and collaborates with local officials to lower the risk of disruption when volcanoes become restless.

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Carolyn Driedger, Anne Doherty, Cheryl Dixon, and Lisa Faust

The National Park Service and U.S. Geological Survey wish to acknowledge the insights, contributions, and dedication of all of the teachers, emergency managers, and scientists who developed and supported this educator’s guide.

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ACKNOWLEDGMENTS

The Mount Rainier Volcano Hazards Work Group is a coalition of emergency and land-use managers, educators, public officials, community leaders, and scientists dedicated to mitigating the effects of volcanic activity at Mount Rainier. Since 1996, the work group has met regularly to plan responses to future volcanic unrest at Mount Rainier. These measures include developing a Volcano Response Plan that defines the role of each contributing agency during volcanic unrest, practicing the plan, training emergency management staff about volcano matters, and supporting development of a lahar detection system and accompanying notification system. Member agencies provide grass roots community outreach regarding volcanic hazards. Their effort encouraged the writing of **Living with a**

HOW TO USE THIS GUIDE

Living with a Volcano in Your Backyard—An Educator’s Guide with Emphasis on Mount Rainier is a three-unit guide that provides science content and inquiry-based activities about volcanoes of the Cascade Range, with emphasis placed on Mount Rainier. Activities are designed for middle school students. Adaptations and extensions offer opportunities for students in higher and lower grade levels. Background sections provide more in-depth information. This guide includes more than 30 activities, a field guide to geological sites of interest in Mount Rainier National Park, glossary, list of Internet resources, and supplementary information.

The principal purpose of this guide is to familiarize students with the geologic and hydrologic processes that shaped Mount Rainier. The authors wish to show how present populations can enjoy the mountain safely and responsibly while recognizing these natural processes as hazards. Materials in the guide enable broad instruction about volcanoes of the Cascade Range, and focused instruction about Mount Rainier volcano. Science content and activities are usable alone or as augmentation for other curricula.

KEY CONCEPTS

Many Volcanoes of the Cascade Range are Historically and Presently Active

- ◆ Mount Rainier is one of thousands of volcanoes located in a circum-Pacific zone of volcanism known as the Ring of Fire
- ◆ Volcanoes of the Cascade Range erupted recently in geologic time; local inhabitants reported eruptions or signs of unrest at seven volcanoes since around A.D. 1700
- ◆ Layers of lava and volcanic ash remain as evidence of a volcano's eruptive history
- ◆ People of the Pacific Northwest witnessed volcanic eruptions repeatedly after entering the region approximately 9,000 years ago; people recorded their observations in oral and written stories
- ◆ Each Cascade volcano possesses a unique history and eruption style
- ◆ Plate tectonics processes that produced the Cascade volcanoes remain unchanged. Future eruptions will occur

Diverse and Dynamic Processes Shaped Volcanoes of the Cascade Range

- ◆ The Cascadia Subduction Zone is the foundation for volcanoes of the Cascade Range
- ◆ Water plays a principal role in the development of eruptions; first, it lowers the melting point of mantle rock enough to transform solid rock to magma, and later it expands and propels magma up the conduit causing a volcanic eruption
- ◆ Water also plays a principal role in destruction of a volcano because it reduces rock stability; stream water and glacial ice erode the volcano; water mobilizes loose volcanic rock and forms debris flows and lahars (volcanic mudflows)
- ◆ When ice-age glaciers enveloped Mount Rainier, they influenced the movement of lava flows and thus, the location of today's ridges and valleys
- ◆ Lava flows and domes, volcanic ash, pyroclastic flows and lahars built the existing landscapes at volcanoes of the Cascade Range
- ◆ Mount Rainier consists of overlapping layers of lava flows and rock rubble
- ◆ Volcanic ash, tiny fragments of erupted magma, are blown by the wind and distributed thousands of miles distant
- ◆ Landslides and lahars have covered valley floors for tens of kilometers (miles) distant from some Cascade volcanoes
- ◆ Chemical composition and cooling conditions determine the appearance of volcanic rocks
- ◆ The geologic processes that built Cascade volcanoes pose hazards for the future

Studying a Volcano's Past and Present Behavior Provides Important Clues about Future Eruptions

- ◆ Geologists examine rock layers at each volcano to determine past eruptive behavior and thus the most likely type of volcanic activity to happen in the future
- ◆ Scientists consider Mount Rainier “active” (although it is not currently erupting) because of recurring earthquake activity, the presence of geothermal heat and gas release and the volcano's location in an active tectonic setting
- ◆ Volcanologists are on continual watch for changes that could indicate the onset of volcanic unrest; they watch for variations in earthquake activity, gas release and slope stability
- ◆ Magma, rising in the Earth, causes rock breakage and earthquakes that precede an eruption
- ◆ Earthquakes are a reliable tool for volcano forecasting because they occur weeks to months or more in advance of an eruption
- ◆ Lahars (volcanic mudflows) are the most significant hazard to people who live in the vicinity of Mount Rainier because they are known to have traveled more than 100 kilometers (60 miles) or more distant
- ◆ While most lahars form by snow and ice-melt during an eruption, landslides can also initiate lahars during non-eruptive times with little or no warning

We Can Prepare for the Next Eruption of Mount Rainier

- ◆ Mount Rainier has the potential to erupt during our lifetime
- ◆ Reviewing Mount Rainier's history can help us identify the lowland communities that could be adversely impacted by the mountain's power
- ◆ When people understand the risks presented by volcanic eruptions, they can take steps to prevent disasters
- ◆ Preparing and understanding hazard maps help us prepare for future volcanic activity
- ◆ Reducing volcano risk requires societal debate, tough choices, and the ability to view issues from a variety of perspectives
- ◆ Multiple career opportunities exist in the monitoring, planning, and preparation for the next eruption of Mount Rainier
- ◆ Observing and learning about Mount Rainier will help you be ready for renewed volcanic activity and associated hazards

Mount Rainier is Culturally Significant

- ◆ Mount Rainier is a principal cultural icon of the Pacific Northwest
- ◆ Volcanoes can be community assets, bringing aesthetic and economic benefit
- ◆ Interest in volcanoes is nearly universal and unites people globally as they address volcanic risk
- ◆ Mount Rainier inspires artistic and cultural traditions
- ◆ Mount Rainier offers a fascinating opportunity to learn about volcanoes and local ecology

ACTIVITY OVERVIEW

Chapter 1. What the Past Tells Us

This chapter provides a general overview of the volcanoes of the Cascade Range. The chapter begins with a preassessment activity entitled "Eruption!" and then addresses the plate tectonics responsible for Cascades volcanism. It ends with activities regarding how volcanoes work.

Overview

Blast from the Past

- ◆ **Eruption!** — In this preassessment activity, students describe their perceptions of a volcanic eruption in a personal journal entry. Then they read an actual eyewitness account of the A.D. 79 eruption of Mount Vesuvius in Italy and compare those events to the eruption events depicted in their journal entries.
- ◆ **Fire, Flood, and Fury** — Native American oral traditions chronicle geologic events in the history of Mount Rainier. These stories are read, interpreted, and illustrated by students with the use of storyboards.
- ◆ **Nineteenth-Century News** — Read nineteenth-century newspaper accounts of recent eruptions at Mount Rainier. The minor eruptive activity at Mount Rainier illustrates that not all eruptions are large or destructive.
- ◆ **Cascade Volcano Timeline** — Cascade volcanoes are young in relation to the geologic events that have shaped the Earth. A timeline illustrates the high incidence of Cascade volcano activity in comparison to geologic and human events since the signing of the Declaration of Independence. A hypothetical genealogy of one family's history illustrates the collective and individual activity of the Cascade volcanoes.
- ◆ **A String of Volcanoes** — Students research information about Cascade volcanoes and write the information on cards used to construct a mobile.
- ◆ **Volcano Hall of Fame** — This is a game where students use fun facts to try to identify a specific Cascade volcano.

Forces Responsible for Cascade Volcanism

- ◆ **Surrounded by Volcanoes** — Explore geographical information to learn about tectonic boundaries, origin of the "Ring of Fire," and volcanoes in the Pacific Northwest. Identify and label Cascade volcanoes on a satellite image.
- ◆ **Magma Mash** — Students take on the role of minerals cooling at different rates in an exploration of magma behavior, and then examine samples of rocks cooled at different rates.

- ◆ **Riding the Magma Elevator** — Examine the process of magma formation from mantle melting in the subduction zone, rising to the magma chamber, and erupting from the magma conduit. During this activity, the class will ride an imaginary elevator from the subduction zone and out the volcano crater.
- ◆ **Soda Bottle Volcano** — Examine how gases energize explosive volcanic eruptions by making comparisons to gases in a soda bottle and performing a carefully controlled “eruption” of baking soda and (or) vinegar or soda water.

Chapter 2. Today’s Discoveries Unlock the Past

Volcanic processes are the principal focus of Chapter 2 and are the natural progression from the Chapter 1 overview about how volcanoes work. Activities invite inquiry about volcanic processes at Cascade volcanoes and about how researchers conduct their research.

Overview

Lava, Rock Rubble, and Mud, Oh My!

- ◆ **Understanding Volcanic Hazards Video/DVD** — Introduces students to the vocabulary and character of volcanic processes and how volcano hazards impact people living near and far from a volcano. This video/DVD is intended for older students only.
- ◆ **Volcanic Processes** — This activity is an alternative to the **Understanding Volcanic Hazards video**. Students view graphics of volcanic processes, then answer questions on a worksheet. As an optional activity, they can prepare a booklet or computer presentation about each process with an emphasis on the interaction of these processes during a volcanic eruption.
- ◆ **Tephra Popcorn** — Students study physical characteristics of tephra using samples and make mass and volume measurements of popcorn to understand the role gases play in tephra formation.
- ◆ **Lava Building Blocks of Mount Rainier** — Students explore the nature and motion of lava flows and learn their importance as the building blocks of Mount Rainier. Students learn how the composition and texture of lava differs between volcanoes and affects the ultimate shape of a volcano.
- ◆ **Rock Stars** — Using photos and rock samples, students identify the characteristics that tell a story about where and how each rock was formed.
- ◆ **Fire and Ice** — Students conduct or observe an experiment simulating glacier/lava flow interactions, then answer questions about how glacier and lava interactions shaped specific features on Mount Rainier.
- ◆ **Lahar in a Jar** — Using experimental and scientific methods, explore how loose rock is mobilized by small amounts of water to form lahars.

- ◆ **Rock Rubble Review** — This is a physically active game that tests the students’ knowledge of volcano terminology, processes, and impacts on communities.

Interpreting Volcanic History

- ◆ **Earth Blocks** — Learn about the “Law of Superposition” and how to interpret rock and sediment layers by reading a short story and arranging “Earth Blocks.”
- ◆ **Volcano Fan Club** — Students learn that tephra layers at Mount Rainier originated from several volcanoes by looking at tephra dispersal patterns and thickness contours on maps.
- ◆ **Tephra Explorer** — Students view distributions of tephra layers found around Mount Rainier and discover the source.
- ◆ **Shoobox Geologist** — Make a model of layers emplaced by processes of deposition and erosion in a volcanically active landscape. Students interpret geologic events from layers in a classmate’s model using stratigraphic columns and the Law of Superposition.
- ◆ **Perilous Beauty video** — The “Perilous Beauty” video introduces students to the types of hazards common to Mount Rainier, specifically mudflows and the types of mechanisms that produce them.

Chapter 3. Don’t be Scared—Be Prepared!

Chapter 3 contains information about volcanic hazards and suggestions for preparedness. Several activities suggest how students can appreciate the benefits of living near a Cascade volcano, and can enjoy them, most often from their own communities.

Overview

Mapping Your Way to Mount Rainier

- ◆ **Play-Dough Topo** — Students make a clay model volcano, complete with glacial and fluvial valleys and then create a topographic map of their volcano.
- ◆ **Topographic Maps and Mount Rainier** — Students explore how lines on a topographic map represent the real landscape by comparing features on photographs and topographic maps. Later, students analyze and answer questions about a Mount Rainier National Park map.
- ◆ **Planning Your Trip to Mount Rainier National Park** — Students will plan a trip to Mount Rainier National Park using topographic, highway, and official park maps.

Living with a Volcano in Your Backyard

- ◆ **The Next Eruption of Mount Rainier** — Through a series of activities, students will examine the hazards associated with Mount Rainier by making a timeline of Mount Rainier events, interpreting hazard maps, investigating the potential effects of volcanic events on their community, and becoming acquainted with how scientists watch for signs of volcanic unrest.
- ◆ **Reducing Volcanic Risk video/DVD** — Familiarizes students with the steps they can take to reduce volcanic risk.

Home and Community Preparedness Plans

- ◆ **Don’t be Scared—Be Prepared!** — Students learn simple steps to preparedness by conducting basic preparedness tasks with their class and family.
- ◆ **A Volcano Tussle—How Much Do We Risk?** — Students play the roles of persons with interest in maintaining visitation facilities at Mount Rainier National Park while faced with the prospect of geologic hazards. They write position papers and later defend them within in group.
- ◆ **Living Well with a Volcano in Your Backyard!—Prepare, Then Enjoy It!** — This activity provides a variety of options for students to explore and appreciate the many ways that volcanoes are beneficial to their community. It includes the Mount Rainier paper model. Students color, cut, fold and paste a simple cone-shaped volcano, and in the process become familiar with many geographic features within Mount Rainier National Park.

Appendixes.

The appendixes provide reference materials and enhance understanding of geologic concepts. Appendixes 2 and 3 provide information specific to Mount Rainier and are useful for interpreting features located within Mount Rainier National Park.

- ◆ **Appendix 1. Volcanism in a Plate Tectonics Perspective** — To understand how volcanoes form, it is necessary to know something about the inner structure and dynamics of the Earth. This appendix describes plate tectonics, formation of magma, and creation of volcanoes, with an emphasis on volcano and mountain building in the Pacific Northwest.
- ◆ **Appendix 2. A Short History of Mount Rainier** — The edifice of modern Mount Rainier is assembled from many individual lava flows and layers of rock rubble that accumulated during eruptions that span half a million years. The volcano has been altered episodically by renewed eruptions, magma intrusions, and lahars, and more continuously by glacial erosion, rock fall, and debris flows. This appendix briefly describes the conditions of the landscape just prior to the onset of the volcano’s construction, and presents a timeline of significant geologic events.

- ◆ **Appendix 3. Journey Back in Time—A Mount Rainier Geological Field Trip Guide for Teachers** — This appendix provides background information, suggested activities and itinerary for geology-oriented field trips to the southwest side of Mount Rainier National Park and the Paradise area. The guide can be used in conjunction with the classroom activities described above.
- ◆ **Appendix 4. Internet Resources** — This list provides guidance for additional resources that pertain to the subjects in this educator guide.
- ◆ **Appendix 5. Glossary** — Definitions are provided for the vocabulary words shown with *bold italics* in each activity.

NOTE: Teachers should consult “Recommended Activity Sequencing” to determine the most appropriate activities based on time and teaching goals.

EXPLANATION OF ACTIVITY FORMAT AND FONTS

- **Overview:** The overview provides a summary of concepts and general procedures addressed in the activity
- **Grade Level:** Authors based grade designation upon the level that best fit Skills and Benchmark activity
- **Learner Objectives:** Students should meet the listed objectives of each activity
- **Setting:** Authors chose the most practical location for completion of an activity
- **Timeframe:** Authors used classroom reviews to determine time frame required for completion of each activity
- **Materials:** A list of materials required for each section of the activity
- **Skills:** Skills are based on criteria established for Washington State teaching standards
- **Benchmarks:** See benchmarks for each activity in the Introduction.
- **Vocabulary:** First usage of a vocabulary word in an activity is designated in *bold italics*, and is included in the **Glossary**
- **Teacher Tips:** Teacher Tips highlight additional information and specific recommendations to increase added value to the activity
- **Teacher Background:** Provides the teacher with the content information required to complete the activity
- **Procedures:** Recommends course of action for conducting the activity
 - ◆ **Assessment**
 - ◆ **References**
 - ◆ **Credits**

- **Adaptations:** Alternate procedures for this activity
- **Extensions:** Ideas for expanding the study of concepts in this activity
- **Assessments:** Recommendations for student assessment
- **References:** Suggested references for additional information
- **Student and Teacher Pages:** Activity pages designed for student and teacher use

FONT KEY

- References to section titles within an activity are indicated by “*bold italics.*”
- References to other activities and units within the educator guide are indicated by “**Scrawlin.**”

RECOMMENDED ACTIVITY SEQUENCING

One week of classes (50 minutes each)

- **Eruption! or Fire, Flood and Fury, or Nineteenth Century News** (1 class)
- **Cascade Volcano Timeline** (2 classes)
- **Eruption!** (1 class)
- **Soda Bottle Volcano** (1 class)
- **Understanding Volcanic Hazards video/DVD or Volcanic Processes** (1 class)
- **Lahar in a Jar** (1 class)
- **The Next Eruption of Mount Rainier** (1 class)

Two weeks of classes (50 minutes each)

- Use all of the recommendations above, and add one additional activity from Chapter 2 or 3

Three weeks of classes (50 minutes each)

- Conduct the above two weeks and add the following three activities
 - ◆ **Earth Blocks** (1 class)
 - ◆ **Tephra Explorer** (2 classes)
 - ◆ **Shoebox Geologist** (2 classes)

Six weeks of classes (50 minutes each)

- Conduct all of Chapter 1 and Chapter 2 activities in order
- **Play-Dough Topo** (1 class)
- **Topo Scavenger Hunt** (1 class)
- **Planning Your Trip to Mount Rainier National Park**, or other Chapter 3 activities (2 classes)

Schools located in any volcano hazard zone

- **Eruption!** (1 class)
- **Perilous Beauty Video** (1 class)
- **The Next Eruption of Mount Rainier** (1 class)
- **Don't be Scared—Be Prepared** (1 class)
- **A Volcano Tussle** (1 class)
- **Living Well with a Volcano in Your Backyard** (1 class)

Schools in a lahar hazard zone

- **Lahar in a Jar** (1 class)
- **Understanding Volcanic Hazards Video/DVD** [older students only] (1 class)
- **Perilous Beauty video** (1 class)
- **Reducing Volcanic Risk Video/DVD** (1 class)
- **Don't Be Scared—Be Prepared!** (1 class)
- **The Next Eruption of Mount Rainier** (1 class)
- **A Volcano Tussle** (1 class)
- **Living Well with a Volcano in Your Backyard—Prepare, Then Enjoy It!** (1 class)

Schools in vicinity of volcanoes of the Cascade Range, but not in a hazard zone

- All of Chapter 1
- All of Chapter 2

Teachers with plans for class field trip to Mount Rainier National Park

- **Surrounded by Volcanoes** (2 classes)
- **Volcanic Processes** or **Understanding Volcanic Hazards Video/DVD** (1 class)
- **Play-Dough Topo** (1 class)
- **Topographic Maps and Mount Rainier** (2 classes)
- **Planning Your Trip to Mount Rainier National Park** (1 class)

Community and school safety

- **Perilous Beauty video** (1 class)
- **Reducing Volcanic Risk Video/DVD** (class 1)
- **Don't Be Scared—Be Prepared!** (1 class)
- **Living Well with a Volcano in Your Backyard—Prepare, Then Enjoy It!** (1 class)

Social studies and English

- **Eruption!** (1 class)
- **Fire, Flood and Fury** (1 class)
- **Nineteenth Century News** (1 class)

Note to teachers downloading files: In addition to downloading activity files, teachers are encouraged to download the chapter overviews, Glossary, and Internet Resources.

CONVERSION FACTORS

SI to Inch/Pound

For readers who wish to convert measurements from the metric system of units to the inch-pound system, the conversion factors are listed below.

Multiply	By	To obtain
Length		
kilometer (km)	0.6214	mile (mi)
meter (m)	3.281	foot (ft)
millimeter (mm)	0.039	inch (in)
Area		
hectacre (ha)	2.471	acre
square meter (m ²)	10.76	square foot (ft ²)
Volume		
cubic kilometers (km ³)	0.2399	cubic mile (mi ³)
milliliter (ml)	0.061	cubic inch (in ³)
Pressure		
kilopascal (kPa)	0.145	pounds/square inch (psi)
Flow rate		
liter per second (L/s)	15.85	gallon per minute (gal/min)
metric ton (t)	1.102	short ton (2,000 pounds)
metric ton (t)	0.9842	long ton (2,240 pounds)
kilogram per second (kg/s)	27.273	pound per minute (lb/s)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows: °F = (1.8 x °C) + 32

EDUCATOR STANDARDS MATRIX

Washington State and National Education Standards

In the matrix, this interdisciplinary curriculum is aligned with the middle school level Washington State 2009 K-12 Science Learning Standards.

SCIENCE

Educator Standards Matrix Chapter One SCIENCE

	19 th Century News	Fire, Flood, and Fury	Eruptoni!	A Cascade Volcano Timeline	Volcano Hall of Fame	Surrounded by Volcanoes	Magma Mash	Riding the Magma Elevator	Soda Bottle Volcano
EALR 3: Application									
Big Idea: Application (APP); Core Content: Science, Technology and Problem Solving									
6-8 APPA People use technology to solve problems									
6-8 APPB Science and Technology Careers									
6-8 APPC Interdependence of science and technology									
6-8 APPD Technological design									
6-8 APPE Generating solutions to a problem									
6-8 APPF Designing and testing solutions									
6-8 APPG Benefits of science and technology									
6-8 APPH People contribute to society through science and technology									
EALR 4: Domains of Science: Physical Science									
Big Idea: Force and Motion (PS1); Core Content: Balanced and Unbalanced Forces									
6-8 PS1A Average speed									
6-8 PS1B Friction is a force									
6-8 PS1C Unbalanced forces will cause change in speed or direction of motion									
6-8 PS1D Unbalanced forces and motion changes of objects with more or less mass									
Big Idea: Matter Properties and Change (PS2); Core Content: Atoms and Molecules									
6-8 PS2A Properties of substances									
6-8 PS2B Properties of mixtures and compounds									
6-8 PS2C Matter, elements, and atoms									
6-8 PS2D Compounds, molecules and atoms									
6-8 PS2E Solids, liquids and gases									
6-8 PS2F Conservation of mass									

SCIENCE

Educator Standards Matrix Chapter One SCIENCE

	Erupioni!	Fire, Flood, and Fury	19 th Century News	Cascade Volcano Timeline	A String of Volcanoes	Volcano Hall of Fame	Surrounded by Volcanoes	Magma Mash	Riding the Magma Elevator	Soda Bottle Volcano
Big Idea: Energy Transfer, Transformation and Conservation (PS3); Core Content: Interactions of Energy and Matter										
6-8 PS3A Forms of energy, transformations and transfers										
6-8 PS3B Transferring of heat energy										
6-8 PS3C Heat, vibration of atoms and thermal insulators										
6-8 PS3D Visible light										
6-8 PS3E Energy transformations into electricity										
6-8 PS3F Energy transference via waves; wave properties										
EALR 4: Domains of Science: Earth and Space Science										
Big Idea: Earth in Space (ES1); Core Content: The Solar System										
6-8 ES1A The Moon; its motion and properties										
6-8 ES1B Composition of the Solar System										
6-8 ES1C Motion of objects in Solar System										
6-8 ES1D Gravity										
6-8 ES1E Relationship of earth, sun, Milky Way galaxy, other galaxies										
Big Idea: Earth Systems, Structures and Processes (ES2); Core Content: Cycles in Earth Systems										
6-8 ES2A Atmosphere, stratosphere and troposphere										
6-8 ES2B Sun as the energy source for phenomena on Earth's surface										
6-8 ES2C Water cycle										
6-8 ES2D Water is a solvent										
6-8 ES2E Layers of earth: crust, mantle and core										
6-8 ES2F Crust structure and plate movement										
6-8 ES2G Landforms; processes that build them up and break them down										
6-8 ES2H Rock cycle: igneous, metamorphic and sedimentary rocks										

Educator Standards Matrix
 Chapter One
 SCIENCE

	Erupzioni!	Fire, Flood, and Fury	19 th Century News	Cascade Volcano Timeline	A String of Volcanoes	Volcano Hall of Fame	Surrounded by Volcanoes	Magma Mash	Riding the Magma Elevator	Soda Bottle Volcano
Big Idea: Earth History (ES3); Evidence of Change										
6-8 ES3A Earth history and processes										
6-8 ES3B Sedimentary rocks and fossils as evidence of earth's history and age										
6-8 ES3C Sedimentary rocks and formations as evidence of geologic events										
6-8 ES3D Processes that shaped the earth										
6-8 ES3E Living organisms play roles in shaping landforms										
EALR 4: Domains of Science: Life Science										
Big Idea: Structure and Function of Organisms (LS1); Core Content: From Cells to Organisms										
6-8 LS1A Cells as the fundamental unit of life										
6-8 LS1B One-celled organisms										
6-8 LS1C Multicellular organisms										
6-8 LS1D Plant and animals cells; their similarities and differences										
6-8 LS1E Classifying organisms										
6-8 LS1F Lifestyle choices and environments affect organisms										
Big Idea: Ecosystems (LS2); Core Content: Flow of Energy Through Ecosystems										
6-8 LS2A Populations and nonliving factors comprise all ecosystems										
6-8 LS2B Relationships between producers, consumers and decomposers										
6-8 LS2C Ecosystem processes: energy and photosynthesis										
6-8 LS2D Ecosystem processes: factors affecting populations										

SCIENCE

Educator Standards Matrix
 Chapter One
 SCIENCE

Activity	Big Idea: Biological Evolution (LS3): Core Content: Inheritance, Variation, and Adaptation	6-8.LS3.A Theories of Evolution	6-8.LS3.B Genes, chromosomes and genetic information	6-8.LS3.C Reproduction	6-8.LS3.D Sexual and asexual reproduction	6-8.LS3.E Adaptations	6-8.LS3.F Extinction	6-8.LS3.G Evidence for evolution
Empyrot								
Fire, Flood, and Fury								
19 th Century News								
Cascade Volcano Timeline								
A String of Volcanoes								
Volcano Hall of Fame								
Surrounded by Fame								
Magma Mash								
Riding the Magma Elevator								
Soda Bottle Volcano								

Educator Standards Matrix
 Chapter One
 SOCIAL STUDIES

SOCIAL STUDIES	SOCIAL STUDIES									
	Erupion!	Fire, Flood, and Fury	19 th Century News	Cascade Volcano Timeline	A String of Volcanoes	Volcano Hall of Fame	Surrounded by Fame	Magma Mash	Riding the Magma Elevator	Soda Bottle Volcano
Social Studies										
EALR 3 Geography										
3.1 Physical & cultural characteristics										
3.1.1 Maps and Geographic Tools										
3.1.2 Char & Spatial Org of Places/Regions										
3.2 Human Interaction with Environment										
3.2.1 Human-Environmental Interaction										
3.2.2 Culture										
3.2.3 Human Migration										
3.3 Geographic Context of Global Issues										
3.3.1 Geographic Context of Global Issues										
EALR 4 History										
4.1 Understands Historical Chronology										
4.1.1 Chronology										
4.1.2 Chronological Eras										
4.2 Causal Factors that Shaped History										
4.2.1 Individuals and Movements										
4.2.2 Cultures and Cultural Groups										
4.2.3 Ideas and Technology										
4.3 Multiple Perspectives/Interp. Of History										
4.3.1 Historical Interpretation										
4.3.2 Multiple Causation										
4.4 Understand Present/Plan for Future										
4.4.1 Historical Antecedents										
EALR 5 Social Studies Skills										
5.2 Inquiry-based Research										
5.2.1 Formis Questions										

Educator Standards Matrix
 Chapter One
 MATHEMATICS

MATHEMATICS		MATHEMATICS																				
		Empty!	Fire, Flood, and Fury	19 th Century News	Cascade Volcano Timeline	A String of Volcanoes	Volcano Hall of Fame	Surrounded by Volcanoes	Magma Mash	Riding the Magma Elevator	Soda Bottle Volcano											
Mathematics																						
EA LR 1 Concepts/Procedures																						
Number and Numeration																						
1.1 Number Sense																						
1.1.1 Concept & Symbolic Representation																						
1.1.2 Relative Values																						
1.1.3 Properties of Addition/Multiplication																						
1.1.4 Ratio, Percent, Direct Proportion																						
Computation																						
1.1.5 Meanings																						
1.1.6 Computational Procedures																						
1.1.7 Apply Strategies/Uses Tools																						
Estimation																						
1.1.8 Estimation Strategies																						
Probability and Statistics																						
1.4 Probability and Statistics																						
1.4.5 Data in Diagrams, Plots, and Graphs																						

Educator Standards Matrix
 Chapter One
 MATHEMATICS

MATHEMATICS	Erupt!	Fire, Flood, and Fury	19 th Century News	Cascade Volcano Timeline	A String of Volcanoes	Volcano Hall of Fame	Surrounded by Fame	Magma Mash	Riding the Magma Elevator	Soda Bottle Volcano
EALR 2 Define and Solve Problems										
2.2 Construct Solutions										
2.2.4 Determine Viability/Correct Answers										
EALR 3 Mathematical Reasoning										
Analyze Information										
3.1 Analyze Information										
3.1.1 Analyze Mathematical info. or Results										
Conclude										
3.2 Conclude										
3.2.1 Draw and Support Conclusions										
Verify Results										
3.3 Verify Results										
3.3.1 Justify Results Using Evidence										
EALR 4 Communicates Knowledge										
Organize, Represent, and Share Info.										
4.2 Organize, Represent, and Share Info.										
4.2.2 Represent Info. in Graphs/Other Forms										

Educator Standards Matrix
 Chapter One
 READING

READING	Exhilaration!	Fire, Flood, and Fury	19 th Century News	Cascade Volcano Timeline	A String of Volcanoes	Volcano Hall of Fame	Surrounded by Volcanoes	Magma Mash	Riding the Magma Elevator	Soda Bottle Volcano
Reading										
EA LR 1 Skills and Strategies to Read										
1.2 Vocabulary Strategies										
1.2.1 Use Resources/Reference Skills										
1.2.2 Vocabulary Strategies										
1.3 Build Vocabulary Through Wide Reading										
1.3.1 Understand/Apply New Vocabulary										
1.3.2 Content/Academic Vocabulary										
1.4 Word Recognition/Read Fluently										
1.4.2 Fluency to Enhance Comprehension										
1.4.3 Different Reading Rates										
EA LR 2 Understand Meaning										
2.1 Evidence of Reading Comprehension										
2.1.3 Comprehension During and After Reading										
2.1.4 Use Prior Knowledge										
2.1.5 Predict and Infer										
2.1.6 Generate and Answer Questions										
2.1.7 Determine Importance/Summarize Text										
2.2 Text Components to Comprehend Text										
2.2.1 Time, Order, and/or Sequence										
2.2.2 Printed/Electronic Text Features										
2.2.3 Understand/Analyze Story Elements										
2.2.4 Text Organizational Structures										
2.3 Analyzing, Interpreting, Synthesizing										
2.3.1 Similarities/Differences and Cause/Effect										

Educator Standards Matrix
 Chapter One
 READING

	19 th Century News	Cascade Volcano Timeline	A String of Volcanoes	Volcano Hall of Fame	Magma Mash	Riding the Magma Elevator	Soda Bottle Volcano
READING							
2.3.2 Information for Specific Topic or Purpose							
2.3.3 Literary Devices							
2.3.4 Information from Variety of Sources							
2.4 Use of language, style, Purpose&Persp.							
2.4.1 Draw Conclusions and Develop Insights							
2.4.2 Style of Writing for Purpose/Influence							
2.4.3 Verify Validity and Accuracy							
2.4.4 Tone and Use of Persuasive Devices							
2.4.5 Generalize/Express insight Beyond Text							
2.4.6 Ideas/Concepts in Multiple Texts							
2.4.7 Author's Perspective/Beliefs/Assumptions							
EALR 3 Different Materials/Purposes							
3.1 Read to Learn New Information							
3.1.1 Appropriate resources							
3.2 Read to Perform a Task							
3.2.2 Functional Documents							
3.4 Literary/Narrative Experience							
3.4.2 Variety of Literary Genres							
3.4.3 Recurring Themes							

Educator Standards Matrix

Chapter One

WRITING

WRITING	Erupcion!	Fire, Flood, and Fury	19 th Century News	Cascade Volcano Timeline	A String of Volcanoes	Volcano Hall of Fame	Surrounded by Farms	Magma Mash	Riding the Magma Elevator	Soda Bottle Volcano
Writing										
EALR 1 Understand/Use a Writing Process										
1.1 Prewrites to Generate Ideas										
1.1.1 Generates Ideas/Plans Writing										
1.5 Publishes Text to Share										
1.5.1 Appropriate for audience/purpose										
EALR 2 Variety of Forms/Audiences										
2.1 Adapts Writing for Variety of Audiences										
2.1.1 Multiple and Various Audiences										
2.2 Writes for Different Purposes										
2.2.1 Different Purposes for Writing										
2.3 Writes Variety of Forms/Genres										
2.3.1 Uses a Variety of Forms/Genres										

Educator Standards Matrix
 Chapter One
 WRITING

	Explosion!	Fire, Flood, and Fury	19 th Century News	Cascade Volcano Timeline	A String of Volcanoes	Surrounded by Fame	Volcano Mash	Magma Mash	Riding the Magma Elevator	Soda Bottle Volcano
WRITING										
EA LR 3 Write Clearly and Effectively										
3.1 Develops Ideas and Organizes Writing										
3.1.1 Selects topic/use relevant details										
3.1.2 Effective Organizational Structure										
3.2 Uses Appropriate Style										
3.2.1 Different audience affect writer's voice										
3.2.2 Language, audience/purpose appropriate										
3.2.3 Uses a Variety of Sentences										
3.3 Knows/Applies Writing Conventions										
3.3.1 Uses Legible Handwriting										
3.3.2 Spells Accurately in Final Draft										
3.3.3 Applies Capitalization Rules										
3.3.4 Applies Punctuation Rules										
3.3.5 Applies Usage Rules										
3.3.6 Uses Complete Sentences in Writing										
3.3.7 Applies Paragraph Conventions										
EA LR 4 Effectiveness of Written Work										
4.1 Analyzes/Evaluates Others/Own writing										
4.1.1 Analyzes/Evaluates Using Est. Criteria										
4.1.2 Analyzes/Evaluates Own Writing										

Educator Standards Matrix
 Chapter One
 COMMUNICATION

COMMUNICATION	Eruption!	Fire, Flood, and Fury	19 th Century News	Cascade Volcano Timeline	A String of Volcanoes	Volcano Hall of Fame	Surrounded by Volcanoes	Magma Mash	Riding the Magma Elevator	Soda Bottle Volcano
Communication										
EARL 1 Listening/Observation Skills										
1.1 Listening/Observation Skills										
1.1.1 Listening Strategies										
1.1.2 Skills/Strategies to Interpret Info.										
1.2 Synthesize info from variety of sources										
1.2.1 Relationships bt. Visual/Auditory Info.										
1.2.2 Mass Media Bias/Persuasive Tech.										
EARL 2 Interact/Work Effectively w Others										
2.1 Interact Effectively in Multicultural Context										
2.1.1 Needs of Audience/Adjust Language										
2.2 Work Collaboratively, Solve Problems										
2.2.1 Skills that Demonstrate Respect										
2.2.2 Contribute Responsibility in Group Setting										
2.3 Communicate Interculturally										
2.3.1 Cultural/Individual Perspectives										
2.3.2 Intercultural Communication Strategies										
EARL 3 Effectively Present Ideas										
3.1 Topic/Theme, Audience, Purpose to Plan										
3.1.1 Plan/Organize Presentation										
3.2 Uses Media to Support Presentations										
3.2.1 Uses resources to enhance presentation										
3.3 Uses Effective Delivery										
3.3.1 Effective Oral Comm./Presentations										

Educator Standards Matrix
 Chapter One
 COMMUNICATION

	Erption!	Fire, Flood, and Fury	19 th Century News	Cascade Volcano Timeline	A String of Volcanoes	Volcano Hall of Fame	Magma Mash	Riding the Magma Elevator	Soda Bottle Volcano
COMMUNICATION									
EALR 4 Evaluates Effectiveness of Comm.									
4.1 Assesses Own/Others' Communication									
4.1.1 Evaluates Own Strengths/Weaknesses									
4.1.2 Evaluates Others' Strengths/Weaknesses									
Arts									
EALR 1 Arts Knowledge and Skills									
1.2 Develop Arts Skills and Techniques									
EALR 2 Using Artistic Processes									
2.1 Creative Process in the Arts									
EALR 3 Communicate Through the Arts									
3.1 Express and Present Ideas and Feelings									
EALR 4 Connections to Other Disciplines									
4.2 Connection Between Arts/Other Areas									

Educator Standards Matrix
 Chapter Two
 SCIENCE

	Understanding Volcanic Hazards	Volcanic Processes	Tephra Popcorn	Lava Building Blocks	Rock Stars	Fire and Ice	Labar in a Jar!	Rock, Rubble, Review	Earth Blocks	Volcano Fan Club	Tephra Explorer	Shoebx Geologist	Perilous Beauty Video
EALR 3: Application													
Big Idea: Application (APP); Core Content: Science, Technology and Problem Solving													
6-8 APPA People use technology to solve problems													
6-8 APPB Science and Technology Careers													
6-8 APPC Interdependence of science and technology													
6-8 APPD Technological design													
6-8 APPE Generating solutions to a problem													
6-8 APPF Designing and testing solutions													
6-8 APPG Benefits of science and technology													
6-8 APPH People contribute to society through science and technology													
EALR 4: Domains of Science: Physical Science													
Big Idea: Force and Motion (PS1); Core Content: Balanced and Unbalanced Forces													
6-8 PS1A Average speed													
6-8 PS1B Friction is a force													
6-8 PS1C Unbalanced forces will cause change in speed or direction of motion													
6-8 PS1D Unbalanced forces and motion changes of objects with more or less mass													
Big Idea: Matter Properties and Change (PS2); Core Content: Atoms and Molecules													
6-8 PS2A Properties of substances													
6-8 PS2B Properties of mixtures and compounds													
6-8 PS2C Matter, elements, and atoms													
6-8 PS2D Compounds, molecules and atoms													
6-8 PS2E Solids, liquids and gases													
6-8 PS2F Conservation of mass													

SCIENCE

Educator Standards Matrix
 Chapter Two
 SCIENCE

	Understanding Volcanic Hazards	Tephra Processes	Volcanic Processes	Tephra Popcorn	Lava Building Blocks	Rock Stars	Fire and Ice	Lahar in a Jar!	Rock, Rubble, Review	Earth Blocks	Volcano Fan Club	Tephra Explorer	Shoebox Geologist	Perilous Beauty Video
EALR 3: Application														
Big Idea: Application (APP); Core Content: Science, Technology and Problem Solving														
6-8 APPA People use technology to solve problems														
6-8 APPB Science and Technology Careers														
6-8 APPC Interdependence of science and technology														
6-8 APPD Technological design														
6-8 APPE Generating solutions to a problem														
6-8 APPF Designing and testing solutions														
6-8 APPG Benefits of science and technology														
6-8 APPH People contribute to society through science and technology														
EALR 4: Domains of Science: Physical Science														
Big Idea: Force and Motion (PS1); Core Content: Balanced and Unbalanced Forces														
6-8 PS1A Average speed														
6-8 PS1B Friction is a force														
6-8 PS1C Unbalanced forces will cause change in speed or direction of motion														
6-8 PS1D Unbalanced forces and motion changes of objects with more or less mass														
Big Idea: Matter Properties and Change (PS2); Core Content: Atoms and Molecules														
6-8 PS2A Properties of substances														
6-8 PS2B Properties of mixtures and compounds														
6-8 PS2C Matter, elements, and atoms														
6-8 PS2D Compounds, molecules and atoms														
6-8 PS2E Solids, liquids and gases														

SCIENCE

Educator Standards Matrix

Chapter Two

SCIENCE

	Understanding Volcanic Hazards	Volcanic Processes	Lava Building Blocks	Tephra Popcorn	Rock Stars	Fire and Ice	Labour in a Jar!	Rock, Rubble, Review	Earth Blocks	Volcano Fan Club	Tephra Explorer	Shoobox Geologists	Perilous Beauty Video
SCIENCE													
Big Idea: Energy Transfer, Transformation and Conservation (PS3); Core Content: Interactions of Energy and Matter													
6-8 PS3A Forms of energy, transformations and transfers													
6-8 PS3B Transforming of heat energy													
6-8 PS3C Heat, vibration of atoms and thermal insulators													
6-8 PS3D Visible light													
6-8 PS3E Energy transformations into electricity													
6-8 PS3F Energy transformation via waves, wave properties													
EALR 4: Domains of Science: Earth and Space Science													
Big Idea: Earth in Space (ES1); Core Content: The Solar System													
6-8 ES1A The Moon, its motion and properties													
6-8 ES1B Composition of the Solar System													
6-8 ES1C Motion of objects in Solar System													
6-8 ES1D Gravity													
6-8 ES1E Relationship of earth, sun, Milky Way galaxy, other galaxies													
Big Idea: Earth Systems, Structures and Processes (ES2); Core Content: Cycles in Earth Systems													
6-8 ES2A Atmosphere, stratosphere and troposphere													
6-8 ES2B Sun as the energy source for phenomena on Earth's surface													
6-8 ES2C Water cycle													
6-8 ES2D Water is a solvent													
6-8 ES2E Layers of earth: crust, mantle and core													
6-8 ES2F Crust structure and plate movement													
6-8 ES2G Landforms; processes that build them up and break them down													
6-8 ES2H Rock cycle, igneous, metamorphic and sedimentary rocks													

Educator Standards Matrix
 Chapter Two
 SCIENCE

	Understanding Volcanic Hazards	Volcanic Processes	Tephra Popcorn	Lava Building Blocks	Rock Stars	Fire and Ice	Lahar in a Jar!	Rock, Rubble, Review	Earth Blocks	Volcano Fan Club	Tephra Explorer	Shoebox Geologist	Perilous Beauty Video
Big Idea: Earth Systems, Structures and Processes (ES2); Core Content: Cycles in Earth Systems													
6-8 ES2A Atmosphere, stratosphere and troposphere													
6-8 ES2B Sun as the energy source for phenomena on Earth's surface													
6-8 ES2C Water cycle													
6-8 ES2D Water is a solvent													
6-8 ES2E Layers of earth: crust, mantle and core													
6-8 ES2F Crust structure and plate movement													
6-8 ES2G Landforms; processes that build them up and break them down													
6-8 ES2H Rock cycle; igneous, metamorphic and sedimentary rocks													
Big Idea: Earth History (ES3); Evidence of Change													
6-8 ES3A Earth history and processes													
6-8 ES3B Sedimentary rocks and fossils as evidence of earth's history and age													
6-8 ES3C Sedimentary rocks and formations as evidence of geologic events													
6-8 ES3D Processes that shaped the earth													
6-8 ES3E Living organisms play roles in shaping landforms													
EALR 4: Domains of Science: Life Science													
Big Idea: Structure and Function of Organisms (LS1); Core Content: From Cells to Organisms													
6-8 LS1A Cells as the fundamental unit of life													
6-8 LS1B One-celled organisms													
6-8 LS1C Multicellular organisms													
6-8 LS1D Plant and animals cells; their similarities and differences													
6-8 LS1E Classifying organisms													
6-8 LS1F Lifestyle choices and environments affect organisms													

SCIENCE

Educator Standards Matrix

Chapter Two

SCIENCE

Standard	Understanding Volcanic Hazards	Volcanic Processes	Tephra Popcorn	Lava Building Blocks	Rock Stars	Fire and Ice	Lahar in a Jar!	Rock, Rubble, Review	Earth Blocks	Volcano Fan Club	Tephra Explorer	Shoobox Geologist	Perious Beauty Video
SCIENCE													
Big Idea: Ecosystems (LS2); Core Content: Flow of Energy Through Ecosystems													
5-8 LS2A Populations and numbing factors comprise all ecosystems.													
5-8 LS2B Relationships between producers, consumers and decomposers													
5-8 LS2C Ecosystem processes: energy and photosynthesis													
5-8 LS2D Ecosystem processes: factors affecting populations													
5-8 LS2E Investigations of environmental issues													
Big Idea: Biological Evolution (LS3); Core Content: Inheritance, Variation, and Adaptation													
5-8 LS3A Theory of Evolution													
5-8 LS3B Genes, chromosomes and genetic information													
5-8 LS3C Reproduction													
5-8 LS3D Sexual and asexual reproduction													
5-8 LS3E Adaptations													
5-8 LS3F Extinction													
5-8 LS3G Evidence for evolution													

Educator Standards Matrix

Chapter Two

SOCIAL STUDIES

SOCIAL STUDIES		SOCIAL STUDIES												
		Understanding Volcanic Hazards	Volcanic Processes	Tephra Popcorn	Lava Building Blocks	Rock Stars	Fire and Ice	Labar in a Jar!	Rock, Rubble, Review	Earth Blocks	Volcano Fan Club	Tephra Explorer	Shoebox Geologists	Perious Beauty Video
Social Studies														
EALR 3 Geography														
3.1 Physical & cultural characteristics														
3.1.1 Maps and Geographic Tools														
3.1.2 Char & Spatial Org of Places/Regions														
3.2 Human Interaction with Environment														
3.2.1 Human-Environmental Interaction														
3.2.2 Culture														
3.2.3 Human Migration														
3.3 Geographic Context of Global Issues														
3.3.1 Geographic Context of Global Issues														
EALR 4 History														
4.1 Understands Historical Chronology														
4.1.1 Chronology														
4.1.2 Chronological Eras														
4.2 Causal Factors that Shaped History														
4.2.1 Individuals and Movements														
4.2.2 Cultures and Cultural Groups														
4.2.3 Ideas and Technology														
4.3 Multiple Perspectives/Interp. Of History														
4.3.1 Historical Interpretation														
4.3.2 Multiple Causation														
4.4 Understand Present/Plan for Future														
4.4.1 Historical Antecedents														
EALR 5 Social Studies Skills														
5.2 Inquiry-based Research														
5.2.1 Form Questions														
5.2.2 Analyzes Sources														

Educator Standards Matrix

Chapter Two

MATHEMATICS

	Understanding Volcanic Hazards	Volcanic Processes	Lava Building Blocks	Rock Stars	Fire and Ice	Labor in a Jar!	Rock, Rubble, Review	Earth Blocks	Volcano Fan Club	Tephra Explorer	Shoobox Geologists	Perilous Beauty Video
Mathematics												
EA LR 1 Concepts/Procedures												
Number and Numeration												
1.1 Number Sense												
1.1.1 Concept & Symbolic Representation												
1.1.2 Relative Values												
1.1.3 Properties of Addition/Multiplication												
1.1.4 Ratio, Percent, Direct Proportion												
Computation												
1.1.5 Meanings												
1.1.6 Computational Procedures												
1.1.7 Apply Strategies/Uses Tools												
Procedures and Estimation												
1.2 Concepts/Procedures from Measurement												
1.2.3 Unit of Measurement Affects Precision												
1.2.6 Obtain Reasonable Estimates												
Probability and Statistics												
1.4 Probability and Statistics												
1.4.5 Data in Diagrams, Plots, and Graphs												
Symbols and Notations												
1.5 Algebraic Sense												
1.5.3 Mathematical Equality and Inequality												
1.5.4 Variables to Write Expressions												
Evaluating and Solving												
1.5.6 Solve Equations with Variables												
EA LR 2 Define and Solve Problems												
2.2 Construct Solutions												
2.2.4 Determine Viable/Correct Answers												

Educator Standards Matrix
 Chapter Two
 MATHEMATICS

MATHEMATICS	Understanding Volcanic Hazards	Volcanic Processes	Tephra Popcorn	Lava Building Blocks	Rock Stars	Fire and Ice	Labar in a Jar!	Rock, Rubble, Review	Earth Blocks	Volcano Fan Club	Tephra Explorer	Shoobox Geologist	Perious Beauty Video
EALR 3 Mathematical Reasoning													
Analyze Information													
3.1 Analyze Information													
3.1.1 Analyze Mathematical Info. of Results													
Conclude													
3.2 Conclude													
3.2.1 Draw and Support Conclusions													
Verify Results													
3.3 Verify Results													
3.3.1 Justify Results Using Evidence													
3.3.2 Reasonableness of Results													
3.3.3 Validate Thinking													
EALR 4 Communicates Knowledge													
Gather Information													
4.1 Gather Information													
4.1.1 Develop and Follow a Plan													
Organize, Represent, and Share Info.													
4.2 Organize, Represent, and Share Info.													
4.2.2 Represent Info. in Graphs/Other Forms													
4.2.3 Use Mathematical Language to Explain													

Educator Standards Matrix
 Chapter Two
 READING

READING	Understanding Volcanic Hazards											
	Volcanic Processes	Tephra Popcorn	Lava Building Blocks	Rock Spats	Fire and Ice	Labar in a Jar!	Rock, Rubble, Review	Earth Blocks	Volcano Fan Club	Tephra Explorer	Shockox Geologist	Petrous Beauty Video
Reading												
EARL 1 Skills and Strategies to Read												
1.2 Vocabulary strategies												
1.2.1 Use Resources/Reference Skills												
1.2.2 Vocabulary Strategies												
1.3 Build Vocabulary Through Wide Reading												
1.3.1 Understand/Apply New Vocabulary												
1.3.2 Content/Academic Vocabulary												
1.4 Word Recognition/Read Fluently												
1.4.2 Fluency to Enhance Comprehension												
1.4.3 Different Reading Rates												
EARL 2 Understand Meaning												
2.1 Evidence of Reading Comprehension												
2.1.3 Comprehension During and After Reading												
2.1.4 Use Prior Knowledge												
2.1.5 Predict and Infer												
2.1.6 Generate and Answer Questions												
2.1.7 Determine Importance/Summarize Text												
2.2 Text Components to Comprehend Text												
2.2.1 Time, Order, and/or Sequence												
2.2.2 Printed/Electronic Text Features												
2.2.3 Understand/Analyze Story Elements												
2.2.4 Text Organizational Structures												

Educator Standards Matrix
 Chapter Two
 WRITING

WRITING	Understanding Volcanic Hazards	Volcanic Processes	Tephra Popcorn	Lava Building Blocks	Rock Stars	Fire and Ice	Labar in a Jar!	Rock, Rubble, Kestow	Volcano Fan Club	Tephra Explor	Shoobox Geology	Pentons Beauty Video
3.3 Knows/Applies Writing Conventions												
3.3.1 Uses Legible Handwriting												
3.3.2 Spells Accurately in Final Draft												
3.3.3 Applies Capitalization Rules												
3.3.4 Applies Punctuation Rules												
3.3.5 Applies Usage Rules												
3.3.6 Uses Complete Sentences in Writing												
3.3.7 Applies Paragraph Conventions												
EARL 4												
4.1 Analyzes/Evaluates Others' Own Writing												
4.1.1 Analyzes/Evaluates Using Est. Criteria												
4.1.2 Analyzes/Evaluates Own Writing												

Educator Standards Matrix

Chapter Two

WRITING

WRITING	Understanding Volcanic Hazards	Volcanic Processes	Tephra Popcorn	Lava Building Blocks	Rock Stars	Fire and Ice	Labour in a Jar!	Rock, Rubble, Review	Earth Blocks	Volcano Fan Club	Tephra Explorers	Shoobox Geologist	Perilous Beauty Video
Writing													
EARL 1 Understand/Use a Writing Process													
1.1 Prewrites to Generate Ideas													
1.1.1 Generates Ideas/Plans Writing													
1.5 Publishes Text to Share													
1.5.1 Appropriate for audience/purpose													
EARL 2 Variety of Forms/Audiences													
2.1 Adapts Writing for Variety of Audiences													
2.1.1 Multiple and Various Audiences													
2.2 Writes for Different Purposes													
2.2.1 Different Purposes for Writing													
2.3 Writes Variety of Forms/Genres													
2.3.1 Uses a Variety of Forms/Genres													
2.4.1 Documents Used in Career Setting													
EARL 3 Write Clearly and Effectively													
3.1 Develops ideas and Organizes Writing													
3.1.1 Selects topic/use relevant details													
3.1.2 Effective Organizational Structure													
3.2 Uses Appropriate Style													
3.2.1 Different audience affect writer's voice													
3.2.2 Language audience/purpose appropriate													
3.2.3 Uses a Variety of Sentences													

Educator Standards Matrix
 Chapter Two
 COMMUNICATION

COMMUNICATION	Understanding Volcanic Hazards	Tephra Processes	Lava Building Blocks	Rock Slabs	Fire and Ice	Labor in a Jar!	Rock, Rubble, Review	Earth Blocks	Volcano Fan Club	Tephra Explorer	Shoobox Geologist	Perilous Beauty Video
Communication												
EARL 1 Listening/Observation Skills												
1.1 Listening/Observation Skills												
1.1.1 Listening Strategies												
1.1.2 Skills/Strategies to Interpret Info.												
1.2 Synthesize Info from variety of sources												
1.2.1 Relationships bt Visual/Auditory Info.												
1.2.2 Mass Media Bias/Persuasive Tech.												
EARL 2 Interact/Work Effectively w Others												
2.1 Interact Effectively in Multicultural Context												
2.1.1 Needs of Audience/Adjust Language												
2.2 Work Collaboratively, Solve problems												
2.2.1 Skills that Demonstrate Respect.												
2.2.2 Contribute Responsibility in Group Setting												
2.3 Communicate Interculturally												
2.3.1 Cultural/Individual Perspectives												
2.3.2 Intercultural Communication Strategies												
EARL 3 Effectively Present Ideas												
3.1 Topic/Theme, Audience, Purpose to Plan												
3.1.1 Plan/Organize Presentation												
3.2 Uses Media to Support Presentations												
3.2.1 Uses resources to enhance presentation.												
3.3 Uses Effective Delivery												
3.3.1 Effective Oral Comm./Presentations												

Living with a Volcano in Your Backyard

Washington Essential Academic Learning Requirements & Grade Level Expectations

SCIENCE

Chapter Three

Educator Standards Matrix
Chapter Three
SCIENCE

	Play-Dough Topo	Topographic Maps and Mount Rainier	Planning Your Trip to MRNP!	The Next Eruption of Mount Rainier	Reducing Volcanic Risk Video	Don't Be Scared - Be Prepared!	A Volcano Tussle	Living Well with a Volcano in Your Backyard
EALR 1: Systems								
Big Idea: Systems (SYS); Core Content: Inputs, Outputs, Boundaries and Flows								
6-8 SYSA Systems and Subsystems								
6-8 SYSB Boundaries of a system								
6-8 SYSC Outputs and Inputs of Systems								
6-8 SYSD Open and Closed Systems								
6-8 SYSE Flow of matter into/out of systems								
6-8 SYSF Investigation of Systems in the natural and designed world								
EALR 2: Inquiry								
Big Idea: Inquiry (INQ); Core Content: Questioning and Investigating								
6-8 INQA Scientific questioning								
6-8 INQB Types of questions and investigations								
6-8 INQC Collecting, analyzing and displaying data are part of investigations								
6-8 INQD Types of variables								
6-8 INQE Modeling								
6-8 INQF Results vs. inference vs. general conclusions								
6-8 INQG Scientific reporting								
6-8 INQH Intellectual honesty in science								
6-8 INQI Ethical codes of experiments								

Educator Standards Matrix

Chapter Three

SCIENCE

SCIENCE

Living Well with a Volcano in Your Backyard

A Volcano Tussle

Don't Be Scared - Be Prepared!

Reducing Volcanic Risk Video

The Next Eruption of Mount Rainier

Planning Your Trip to MRRNP!

Topographic Maps and Mount Rainier

Play-Dough Topo

EALR 3: Application Big Idea: Application (APP); Core Content: Science, Technology and Problem Solving																																							
6-8 APPA People use technology to solve problems																																							
6-8 APPB Science and Technology Careers																																							
6-8 APPC Interdependence of science and technology																																							
6-8 APPD Technological design																																							
6-8 APPE Generating solutions to a problem																																							
6-8 APPF Designing and testing solutions																																							
6-8 APPG Benefits of science and technology																																							
6-8 APPH People contribute to society through science and technology																																							
EALR 4: Domains of Science: Physical Science Big Idea: Force and Motion (PS1); Core Content: Balanced and Unbalanced Forces																																							
6-8 PS1A Average speed																																							
6-8 PS1B Friction is a force																																							
6-8 PS1C Unbalanced forces will cause change in speed or direction of motion																																							
6-8 PS1D Unbalanced forces and motion changes of objects with more or less mass																																							

Educator Standards Matrix
 Chapter Three
 SCIENCE

	Play-Dough Topo	Topographic Maps and Mount Rainier	Planning Your Trip to MRNPI	The Next Eruption of Mount Rainier	Reducing Volcanic Risk Video	Don't Be Scared - Be Prepared!	A Volcano Tussle	Living Well with a Volcano in Your Backyard
Big Idea: Matter Properties and Change (PS2); Core Content: Atoms and Molecules								
6-8 PS2A Properties of substances								
6-8 PS2B Properties of mixtures and compounds								
6-8 PS2C Matter, elements, and atoms								
6-8 PS2D Compounds, molecules and atoms								
6-8 PS2E Solids, liquids and gases								
6-8 PS2F Conservation of mass								
Big Idea: Energy Transfer, Transformation and Conservation (PS3); Core Content: Interactions of Energy and Matter								
6-8 PS3A Forms of energy, transformations and transfers								
6-8 PS3B Transferring of heat energy								
6-8 PS3C Heat, vibration of atoms and thermal insulators								
6-8 PS3D Visible light								
6-8 PS3E Energy transformations into electricity								
6-8 PS3F Energy transferrance via waves; wave properties								

SCIENCE

Educator Standards Matrix
 Chapter Three
 SCIENCE

	Play-Dough Topo	Topographic Maps and Mount Rainier	Planning Your Trip to MRNPI	The Next Eruption of Mount Rainier	Reducing Volcanic Risk Video	Don't Be Scared - Be Prepared!	A Volcano Tussle	Living Well with a Volcano in Your Backyard
Big Idea: Earth in Space (ES1); Core Content: The Solar System								
6-8 ES1A The Moon; its motion and properties								
6-8 ES1B Composition of the Solar System								
6-8 ES1C Motion of objects in Solar System								
6-8 ES1D Gravity								
6-8 ES1E Relationship of earth, sun, Milky Way galaxy, other galaxies								
Big Idea: Earth Systems, Structures and Processes (ES2); Core Content: Cycles in Earth Systems								
6-8 ES2A Atmosphere, stratosphere and troposphere								
6-8 ES2B Sun as the energy source for phenomena on Earth's surface								
6-8 ES2C Water cycle								
6-8 ES2D Water is a solvent								
6-8 ES2E Layers of earth: crust, mantle and core								
6-8 ES2F Crust structure and plate movement								
6-8 ES2G Landforms; processes that build them up and break them down								
6-8 ES2H Rock cycle; igneous, metamorphic and sedimentary rocks								

SCIENCE

Educator Standards Matrix
 Chapter Three
 SCIENCE

	Play-Dough Topo	Topographic Maps and Mount Rainier	Planning Your Trip to MRNPI	The Next Eruption of Mount Rainier	Reducing Volcanic Risk Video	Don't Be Scared - Be Prepared!	A Volcano Tussle	Living Well with a Volcano in Your Backyard
Big Idea: Earth History (ES3); Evidence of Change								
6-8 ES3A Earth history and processes								
6-8 ES3B Sedimentary rocks and fossils as evidence of earth's history and age								
6-8 ES3C Sedimentary rocks and formations as evidence of geologic events								
6-8 ES3D Processes that shaped the earth								
6-8 ES3E Living organisms play roles in shaping landforms								
EALR 4: Domains of Science: Life Science								
Big Idea: Structure and Function of Organisms (LS1); Core Content: From Cells to Organisms								
6-8 LS1A Cells as the fundamental unit of life								
6-8 LS1B One-celled organisms								
6-8 LS1C Multicellular organisms								
6-8 LS1D Plant and animals cells; their similarities and differences								
6-8 LS1E Classifying organisms								
6-8 LS1F Lifestyle choices and environments affect organisms								

SCIENCE

Educator Standards Matrix
 Chapter Three
 SCIENCE

	Play-Dough Topo	Topographic Maps and Mount Rainier	Planning Your Trip to MRRNP!	The Next Eruption of Mount Rainier	Reducing Volcanic Risk Video	Don't Be Scared - Be Prepared!	A Volcano Tussle	Living Well with a Volcano in Your Backyard
Big Idea: Ecosystems (LS2); Core Content: Flow of Energy Through Ecosystems								
6-8 LS2A Populations and nonliving factors comprise all ecosystems								
6-8 LS2B Relationships between producers, consumers and decomposers								
6-8 LS2C Ecosystem processes: energy and photosynthesis								
6-8 LS2D Ecosystem processes: factors affecting populations								
6-8 LS2E Investigations of environmental issues								
Big Idea: Biological Evolution (LS3); Core Content: Inheritance, Variation, and Adaptation								
6-8 LS3A Theory of Evolution								
6-8 LS3B Genes, chromosomes and genetic information								
6-8 LS3C Reproduction								
6-8 LS3D Sexual and asexual reproduction								
6-8 LS3E Adaptations								
6-8 LS3F Extinction								
6-8 LS3G Evidence for evolution								

Educator Standards Matrix
 Chapter Three
 MATHEMATICS

	Play-Dough Topo	Topographic Maps and Mount Rainier	Planning Your Trip to MRPNP!	The Next Eruption of Mount Rainier	Reducing Volcanic Risk Video	Don't Be Scared - Be Prepared!	A Volcano Tussle	Living Well with a Volcano in Your Backyard
MATHEMATICS								
1.5 Algebraic Sense								
1.5.3 Mathematical Equality and Inequality								
1.5.4 Variables to Write Expressions								
EALR 2 Define and Solve Problems								
2.2 Construct Solutions								
2.2.4 Determine Viable/Correct Answers								
EALR 3 Mathematical Reasoning								
Analyze Information								
3.1 Analyze Information								
3.1.1 Analyze Mathematical Info. or Results								
Conclude								
3.2 Conclude								
3.2.1 Draw and Support Conclusions								
Verify Results								
3.3 Verify Results								
3.3.1 Justify Results Using Evidence								
EALR 4 Communicates Knowledge Organize, Represent, and Share Info.								
Organize, Represent, and Share Info.								
4.2 Organize, Represent, and Share Info.								
4.2.2 Represent Info. in Graphs/Other Forms								

Educator Standards Matrix
 Chapter Three
 READING

	Play-Dough Topo	Topographic Maps and Mount Rainier	The Next Eruption of Mount Rainier	Reducing Volcanic Risk Video	Don't Be Scared - Be Prepared!	A Volcano Tussle	Living Well with a Volcano in Your Backyard
Reading							
EALR 1 Skills and Strategies to Read							
1.2 Vocabulary strategies							
1.2.1 Use Resources/Reference Skills							
1.2.2 Vocabulary Strategies							
1.3 Build Vocabulary Through Wide Reading							
1.3.1 Understand/Apply New Vocabulary							
1.3.2 Content/Academic Vocabulary							
1.4 Word Recognition/Read Fluently							
1.4.2 Fluency to Enhance Comprehension							
1.4.3 Different Reading Rates							
EALR 2 Understand Meaning							
2.1 Evidence of Reading Comprehension							
2.1.3 Comprehension During and After Reading							
2.1.4 Use Prior Knowledge							

READING

Educator Standards Matrix
 Chapter Three
 READING

READING	Play-Dough Topo	Topographic Maps and Mount Rainier	Planning Your Trip to MRNPI	The Next Eruption of Mount Rainier	Reducing Volcanic Risk Video	Don't Be Scared - Be Prepared!	A Volcano Tussle	Living Well with a Volcano in Your Backyard
2.1.5 Predict and Infer								
2.1.6 Generate and Answer Questions								
2.1.7 Determine Importance/Summarize Text								
2.2 Text Components to Comprehend Text								
2.2.1 Time, Order, and/or Sequence								
2.2.2 Printed/Electronic Text Features								
2.2.3 Understand/Analyze Story Elements								
2.2.4 Text Organizational Structures								
2.3 Analyzing, Interpreting, Synthesizing								
2.3.1 Similarities/Differences and Cause/Effect								
2.3.2 Information for Specific Topic or Purpose								
2.3.3 Literary Devices								
2.3.4 Information from Variety of Sources								
2.4 Use of language, style, Purpose&Persp.								
2.4.1 Draw Conclusions and Develop Insights								
2.4.2 Style of Writing for Purpose/Influence								
2.4.3 Verify Validity and Accuracy								
2.4.4 Tone and Use of Persuasive Devices								
2.4.5 Generalize/Express Insight Beyond Text								
2.4.6 Ideas/Concepts in Multiple Texts								
2.4.7 Author's Perspective/Beliefs/Assumptions								
EA LR 3 Different Materials/Purposes								
3.1 Read to Learn New Information								
3.1.1 Appropriate resources								
3.2 Read to Perform a Task								
3.2.2 Functional Documents								
3.4 Literary/Narrative Experience								
3.4.2 Variety of Literary Genres								
3.4.3 Recurring Themes								

Educator Standards Matrix
 Chapter Three
 WRITING

	Play-Dough Topo	Topographic Maps and Mount Rainier	Planning Your Trip to MRRNP!	The Next Eruption of Mount Rainier	Reducing Volcanic Risk Video	Don't Be Scared - Be Prepared!	A Volcano Tussle	Living Well with a Volcano in Your Backyard
Writing								
EALR 1 Understand/Use a Writing Process								
1.1 Prewrites to Generate Ideas								
1.1.1 Generates Ideas/Plans Writing								
1.5 Publishes Text to Share								
1.5.1 Appropriate for audience/purpose								
EALR 2 Variety of Forms/Audiences								
2.1 Adapts Writing for Variety of Audiences								
2.1.1 Multiple and Various Audiences								
2.2 Writes for Different Purposes								
2.2.1 Different Purposes for Writing								
2.3 Writes Variety of Forms/Genres								
2.3.1 Uses a Variety of Forms/Genres								
2.4.1 Documents Used in Career Setting								

WRITING

Educator Standards Matrix

Chapter Three

WRITING

	Play-Dough Topo	Topographic Maps and Mount Rainier	Planning Your Trip to MRNPI	The Next Eruption of Mount Rainier	Reducing Volcanic Risk Video	Don't Be Scared - Be Prepared!	A Volcano Tussle	Living Well with a Volcano in Your Backyard
WRITING								
EA LR 3 Write Clearly and Effectively								
3.1 Develops Ideas and Organizes Writing								
3.1.1 Selects topic/use relevant details								
3.1.2 Effective Organizational Structure								
3.2 Uses Appropriate Style								
3.2.1 Different audience affect writer's voice								
3.2.2 Language audience/purpose appropriate								
3.2.3 Uses a Variety of Sentences								
3.3 Knows/Applies Writing Conventions								
3.3.1 Uses Legible Handwriting								
3.3.2 Spells Accurately in Final Draft								
3.3.3 Applies Capitalization Rules								
3.3.4 Applies Punctuation Rules								
3.3.5 Applies Usage Rules								
3.3.6 Uses Complete Sentences in Writing								
3.3.7 Applies Paragraph Conventions								
EA LR 4								
4.1 Analyzes/Evaluates Others/Own writing								
4.1.1 Analyzes/Evaluates Using Est. Criteria								
4.1.2 Analyzes/Evaluates Own Writing								

Educator Standards Matrix
 Chapter Three
 COMMUNICATIONS

	Play-Dough Topo	Topographic Maps and Mount Rainier	Planning Your Trip to MRRNP!	The Next Eruption of Mount Rainier	Reducing Volcanic Risk Video	Don't Be Scared - Be Prepared!	A Volcano Tussle	Living Well with a Volcano in Your Backyard
COMMUNICATION								
Communication								
EARL 1 Listening/Observation Skills								
1.1 Listening/Observation Skills								
1.1.1 Listening Strategies								
1.1.2 Skills/Strategies to interpret info.								
1.2 Synthesize info from variety of sources								
1.2.1 Relationships bt Visual/Auditory Info.								
1.2.2 Mass Media Bias/Persuasive Tech.								
EARL 2 Interact/Work Effectively w Others								
2.1 Interact Effectively in Multicultural Context								
2.1.1 Needs of Audience/Adjust Language								
2.2 Work Collaboratively, Solve problems								
2.2.1 Skills that Demonstrate Respect								
2.2.2 Contribute Responsibly in Group Setting								
2.3 Communicate Interculturally								
2.3.1 Cultural/Individual Perspectives								
2.3.2 Intercultural Communication Strategies								
EARL 3 Effectively Present Ideas								
3.1 Topic/Theme, Audience, Purpose to Plan								
3.1.1 Plan/Organize Presentation								
3.2 Uses Media to Support Presentations								
3.2.1 Uses resources to enhance presentation								
3.3 Uses Effective Delivery								
3.3.1 Effective Oral Comm./Presentations								
EARL 4 Evaluates Effectiveness of Comm.								
4.1 Assesses Own/Others Communication								
4.1.1 Evaluates Own Strengths/Weaknesses								
4.1.2 Evaluates Others Strengths/Weaknesses								

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