Kaboom! Volunteers in Classrooms

Presentation Summaries and Related Next Generation Standards

Grades 3 - 5

PRESENTATION SUMMARIES

Mount St Helens 1980 Eruption

This presentation begins by discussing tectonic plates and their boundaries and how Pacific Northwest volcanoes are formed. Most of the presentation is focused on the events of the May 18,1980 eruption of Mount St. Helens. Events covered are the earthquake, landslide, lateral blast, pyroclastic flows, ash plume and lahars. Afterwards, students participate in a hands-on activity, where students use pictures of the 6 volcanic events to analyze their characteristics and how they impacted the land.

Survivors and Colonizers

This presentation briefly reviews the 1980 eruption and then discusses the different types of landscapes created by the eruption, as well as different factors that affected whether organisms survived or colonized the landscape after the eruption. After learning about the landscape and survival/colonization factors, students view pictures of organisms and decided whether the organism survived or colonized, how it did so, and how its presence affected both the landscape and other organisms. In the follow-up activity, students roll dice to learn about how chance affects survival, and then create different scenarios to reflect how the eruption affected plants and animals differently.

Rocks

Though this presentation focuses on igneous (volcanic) rocks. it begins by discussing three types of rock (igneous, sedimentary, metamorphic) and how they fit together in the rock cycle. Then, students will learn how color can give clues to what type of eruption created the rock. Students will view photos of eruptions and determine what kind of rocks were created. Then students will learn about the texture of a rock, and how that gives clues to how it was formed. Afterward, students will do 2 activities, one where students model crystal formation, and one where students look at rock sample pairs to identify them

Lava Tubes

This presentation begins by discussing that lava tubes are made from basaltic eruptions, and then shows the steps of lava tube formation. The presenter will then discuss Ape Cave, and what is inside (features, organisms). Students will also learn about bats and White Nose Syndrome. Finally students will learn how to prepare for a visit to Ape Cave.

RELATED NEXT GENERATION STANDARDS

Mount St Helens 1980 Eruption- 3rd Grade

3-PS2-1.
Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. [Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all.]

3-PS2-2.
Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. [Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.]

Science and Engineering Practices:	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. • Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3) Connections to Nature of Science Science Knowledge is Based on Empirical Evidence • Science findings are based on recognizing patterns. (3-PS2-2)	ESS3.B: Natural Hazards • A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1) PS2.A: Forces and Motion • Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) (3-PS2-1) • The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (3-PS2-2) PS2.B: Types of Interactions • Objects in contact exert forces on each other. (3-PS2-1)	Patterns • Patterns of change can be used to make predictions. (3-ESS2-1),(3-ESS2-2) (3-PS2-2) • Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1) Cause and Effect • Cause and effect relationships are routinely identified, tested, and used to explain change. (3-ESS3-1), (3-PS2-3)

Mount St Helens 1980 Eruption- 4th Grade

4-PS3-1.
Use evidence to construct an explanation relating the speed of an object to the energy of that object.

4-PS3-2.
Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

4-PS3-3.
Ask questions and predict outcomes about the changes in energy that occur when objects collide. [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.]

4-ESS2-2.
Analyze and interpret data from maps to describe patterns of Earth's features. [Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]

Science and Engineering Practices:	Disciplinary Core Ideas	Crosscutting Concepts
<u>Analyzing and Interpreting Data</u> Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. (3-ESS2-1) Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. • Obtain and combine information from books and other reliable media to explain phenomena. (3-ESS2-2)	<u>PS3.A: Definitions of Energy</u> • The faster a given object is moving, the more energy it possesses. (4-PS3-1) • Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2),(4-PS3-3) <u>PS3.B: Conservation of Energy and EnergyTransfer</u> • Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2),(4-PS3-3)	<u>Energy and Matter</u> • Energy can be transferred in various ways and between objects. (4-PS3-1),(4-PS3-2), (4-PS3-3),(4-PS3-4) <u>Patterns</u> • Patterns can be used as evidence to support an explanation. (4-ESS2-2) <u>Cause and Effect</u> • Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1)

Mount St Helens 1980 Eruption- 5th Grade

5-ESS2-1.
Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.]

Science and Engineering Practices:	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop a model using an example to describe a scientific principle. (5-ESS2-1) Using Mathematics and Computational Thinking Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions. • Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2)	ESS2.A: Earth Materials and Systems • Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1)	Energy and Matter • Energy can be transferred in various ways and between objects. (5-PS3-1) Scale, Proportion, and Quantity • Standard units are used to measure and describe physical quantities such as weight and volume. (5-ESS2-2) Systems and System Models • A system can be described in terms of its components and their interactions. (5-ESS2-1)

Survivors and Colonizers- 3rd Grade

3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.]

3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]

3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. [Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.]

Science and Engineering Practices:	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop models to describe phenomena. (3-LS1-1) Connections to Nature of Science Scientific Knowledge is Based on Empirical Evidence • Science findings are based on recognizing patterns. (3-LS1-1)	LS1.B: Growth and Development of Organisms • Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1) LS2.C: Ecosystem Dynamics, Functioning, and Resilience • When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (secondary to 3-LS4-4) LS4.B: Natural Selection • Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2) LS4.C: Adaptation • For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3) LS4.D: Biodiversity and Humans • Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4)	Patterns • Patterns of change can be used to make predictions. (3-LS1-1) Cause and Effect • Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2) Scale, Proportion, and Quantity • Observable phenomena exist from very short to very long time periods. (3-LS4-1) Systems and System Models • A system can be described in terms of its components and their interactions. (3-LS4-4)

Survivors and Colonizers- 4th Grade

4-LS1-1.
Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]

4-LS1-2.
Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. [Clarification Statement: Emphasis is on systems of information transfer.] [*Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function*.]

Science and Engineering Practices:	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2)	LS1.A: Structure and Function • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1) LS1.D: Information Processing • Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)	Systems and System Models • A system can be described in terms of its components and their interactions. (4-LS1-1),(4-LS1-2)

Survivors and Colonizers- 5th Grade

5-PS3-1.
Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. [Clarification Statement: Examples of models could include diagrams, and flow charts.]

5-LS2-1.
Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food.

Science and Engineering Practices:	Disciplinary Core Ideas	Crosscutting Concepts
<u>Developing and Using Models</u> Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Use models to describe phenomena. (5-PS3-1) <u>Engaging in Argument from Evidence</u> Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Support an argument with evidence, data, or a model. (5-LS1-1)	<u>PS3.D: Energy in Chemical Processes and Everyday Life</u> • The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1) <u>LS1.C: Organization for Matter and Energy Flow in Organisms</u> • Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1) <u>LS2.A: Interdependent Relationships in Ecosystems</u> • The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. (5-LS2-1) <u>LS2.B: Cycles of Matter and Energy Transfer in Ecosystems</u> • Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)	<u>Energy and Matter</u> • Energy can be transferred in various ways and between objects. (5-PS3-1) <u>Energy and Matter</u> • Matter is transported into, out of, and within systems. (5-LS1-1) <u>Systems and System Models</u> • A system can be described in terms of its components and their interactions. (5-LS2-1)

Rocks- 3rd Grade

3-PS2-3.
Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. [Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.] [*Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.*]

Science and Engineering Practices:	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. • Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3) Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (3-PS2-2) Connections to Nature of Science Science Knowledge is Based on Empirical Evidence • Science findings are based on recognizing patterns. (3-PS2-2)	PS2.B: Types of Interactions • Objects in contact exert forces on each other. (3-PS2-1) • Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (3-PS2-3),(3-PS2-4)	Patterns • Patterns of change can be used to make predictions. (3-PS2-2) Cause and Effect • Cause and effect relationships are routinely identified, tested, and used to explain change. (3-PS2-3)

Rocks- 4th Grade

4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers for changes in a landscape over time to support an explanation for changes in a landscape over time. [Clarification Statement: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.]

4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. [Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.]

Science and Engineering Practices:	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Identify the evidence that supports particular points in an explanation. (4-ESS1-1) Planning and Carrying Out Investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2)	ESS1.C: The History of Planet Earth • Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1) ESS2.A: Earth Materials & Systems • Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS2.B: Plate Tectonics and Large-Scale System Interactions • The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2)	Patterns • Patterns can be used as evidence to support an explanation. (4-ESS1-1) • Patterns can be used as evidence to support an explanation. (4-ESS2-2) Connections to Nature of Science Scientific knowledge assumes an Order and Consistency in Natural Systems • Science assumes consistent patterns in natural systems. (4-ESS1-1) Cause and Effect • Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1)

Rocks- 5th Grade

5-PS1-3.
Make observations and measurements to identify materials based on their properties. [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.]

5-ESS2-1.
Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.]

Science and Engineering Practices:	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Use models to describe phenomena. (5-PS1-1) Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)	PS1.A: Structure and Properties of Matter • Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3) ESS2.A: Earth Materials and Systems • Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1)	Cause and Effect • Cause and effect relationships are routinely identified and used to explain change. (5-PS1-4) Scale, Proportion, and Quantity • Natural objects exist from the very small to the immensely large. (5-PS1-1) Connections to Nature of Science Scientific Knowledge Assumes an Order and Consistency in Natural Systems • Science assumes consistent patterns in natural systems. (5-PS1-2) Systems and System Models • A system can be described in terms of its components and their interactions. (5-ESS2-1)

Lava Tubes- 4th Grade

4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers for changes in a landscape over time to support an explanation for changes in a landscape over time. [Clarification Statement: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.]

4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. [Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.]

Science and Engineering Practices:	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Identify the evidence that supports particular points in an explanation. (4-ESS1-1) Planning and Carrying Out Investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2)	ESS1.C: The History of Planet Earth • Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1) ESS2.A: Earth Materials & Systems • Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) ESS2.B: Plate Tectonics and Large-Scale System Interactions • The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2)	Patterns • Patterns can be used as evidence to support an explanation. (4-ESS1-1) • Patterns can be used as evidence to support an explanation. (4-ESS2-2) Connections to Nature of Science Scientific knowledge assumes an Order and Consistency in Natural Systems • Science assumes consistent patterns in natural systems. (4-ESS1-1) Cause and Effect • Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1)

Lava Tubes- 5th Grade

5-PS1-3.
Make observations and measurements to identify materials based on their properties. [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.]

5-ESS2-1.
Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.]

5-ESS3-1.
Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Science and Engineering Practices:	Disciplinary Core Ideas	Crosscutting Concepts
<u>Developing and Using Models</u> Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Use models to describe phenomena. (5-PS1-1) <u>Planning and Carrying Out Investigations</u> to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)	PS1.A: Structure and Properties of Matter • Measurements of a variety of properties can be used to identify materials. (5-PS1-3) ESS2.A: Earth Materials and Systems • Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1) <u>ESS3.C: Human Impacts on Earth Systems</u> • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)	<u>Cause and Effect</u> • Cause and effect relationships are routinely identified and used to explain change. (5-PS1-4) <u>Scale, Proportion, and Quantity</u> • Natural objects exist from the very small to the immensely large. (5-PS1-1) <u>Connections to Nature of Science</u> Scientific Knowledge Assumes an Order and Consistency in Natural Systems • Science assumes consistent patterns in natural systems. (5-PS1-2) <u>Systems and System Models</u> • A system can be described in terms of its components and their interactions. (5-ESS2-1)