Grade 4: Bundle 2

Bundle 2

Changes Over Time to Earth's Surface and Resources

Performance Expectations		
4-ESS1-1, 4-ESS2-1, 4-ESS2-2, 4-ESS3-1, 4-ESS3-2, 3-5-ETS1-1, 3-5-ETS1-2, 3-5-ETS1-3		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Constructing Explanations and Designing Solutions **Planning and Carrying Out Investigations** **Analyzing and Interpreting Data** **Obtaining, Evaluating, and Communicating Information**	**ESS1.C (2): The History of Planet Earth** **ESS2.A (2): Earth Materials and Systems** **ESS2.E (2): Biogeology** **ESS2.B (2): Plate Tectonics and Large-Scale System Interactions** **ESS3.A (2): Natural Resources** **ESS3.B (3): Natural Hazards** **ETS1.B (2): Designing Solutions to Engineering Problems**	**Patterns** **Cause and Effect**

Bundle 2: Changes over Time to Earth's Surface and Resources is composed of five scopes. Each of these scopes provides the students with an opportunity to build their knowledge and start forming ideas that will help them complete their mission at the end of this bundle and build toward a complete answer to their Anchoring Phenomena question. Students will begin by being introduced to their Anchoring Phenomena, which introduces them to their bundle mission of creating an ad to attract new workers to a coal-mining project.

The students will then move through multiple scopes in which they will learn the following concepts:

- The locations of mountain ranges, deep-ocean trenches, ocean-floor structures, earthquakes, and volcanoes usually occur near the borders of Earth's tectonic plates.
- Patterns of rock formations and fossils can tell us what changes to Earth's surface have occurred over time.
- Earth's surface also changes slowly over time due to forces from wind, water, and ice.
- Renewable and nonrenewable resources exist in and on Earth's surface, and their use affects the environment.
- Natural hazards such as earthquakes, volcanic eruptions, and tsunamis also cause changes to Earth's surface, but humans can take steps to reduce their impacts.

The students will also engage in the Science and Engineering Practices and Crosscutting Concepts listed above throughout the scopes in this bundle.

Grade 4: Bundle 2 Snapshot

Anchoring Phenomena: What types of changes to Earth's surface have occurred over time, and why?

Mission Goal: The students' mission is to create an ad to attract new workers to a coal-mining project.

Scope	Investigative Phenomena	Instructional Focus	Connection to Bundle Mission
Rock Patterns 	If environments change so slowly, how can we know what they used to be like?	Describe how patterns of rock formations and fossils can tell us what changes to Earth's surface have occurred over time.	When digging through the rock, what can workers expect to see?
Changing Land 	How do landforms change over time?	Understand how Earth's surface changes slowly over time due to forces from wind, water, and ice.	How will mining change the look of the mountain?
Plate Tectonics 	What causes the patterns of Earth's features?	Know that the locations of mountain ranges, deep-ocean trenches, ocean-floor structures, earthquakes, and volcanoes usually occur near the borders of Earth's tectonic plates.	Since the mine is located between two tectonic plates, what risks might workers encounter?
Renewable and Nonrenewable Resources 	We use energy for many things, such as fueling our cars and lighting our cities. Where do we get the majority of our energy from?	List examples of renewable and nonrenewable resources that exist in and on Earth's surface and how their use affects the environment.	How can your coal-mining company help protect Earth's resources?
Natural Processes 	How can we reduce the impacts of natural Earth processes on humans?	Understand how natural hazards such as earthquakes, volcanic eruptions, and tsunamis cause changes to Earth's surface, but humans can take steps to reduce their impacts.	How can your coal-mining company reduce the risks of any natural processes that might occur?

Bundle 2:
Scope 1

Rock Patterns

Three-Dimensional Learning

Performance Expectations
4-ESS1-1 Identify evidence from patterns in rock formations and fossils in rock layers 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. Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	**ESS1.C (2): 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.	**Patterns** Patterns can be used as evidence to support an explanation. (4-ESS1-1)

Bundle 2: Scope 1

Rock Patterns

Three-Dimensional Learning

Disciplinary Core Ideas	
• **ESS1.C (2): 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.	• All the elements found in the Rock Patterns scope are designed to address the subelement for ESS1.C (2). • Students begin the scope by making observations based on what they see in the rock formations of the Grand Canyon. • Students go on to explore fossils found in different rock layers to see what kind of events affect the layers of Earth and how earthquakes cause changes in patterns of rock formations.
Science and Engineering Practices	
• **Constructing Explanations and Designing Solutions** Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	• In Explore 1, students observe fossil evidence in layers of clay to see what kinds of events affect the layers of Earth. • In Explore 2, students explain how they would know an earthquake had occurred if they observed the patterns in rock layers. In addition, they relate their observations to the phenomena of how rocks can give us clues to the past.
Crosscutting Concepts	
• **Patterns** Patterns can be used as evidence to support an explanation. (4-ESS1-1)	• In Explore 1, students compare their group's model with another group's model, looking for patterns. • In Explore 2, students make observations about how earthquakes can cause changes in patterns of rock formations. They then explain how the force of an earthquake affected the pattern of their model.

The above illustrates how we integrate the three dimensions through the scope. As we know that opportunities naturally occur to model other Crosscutting Concepts and Science and Engineering Practices in many ways, we only call out the ones directly aligned by the NGSS Framework here.

Bundle 2: Scope 1

Rock Patterns

Prior Knowledge and Progression

By the end of Grade 2, students should know that some events on Earth occur in cycles, such as day and night, and others have a beginning and an end, such as a volcanic eruption. Some events, such as an earthquake, happen very quickly; others, such as the formation of the Grand Canyon, occur very slowly, over a time period much longer than one can observe.

Category	K-2	3-5	Middle School	High School
ESS1.C The History of Planet Earth	Some events on Earth occur very quickly; others can occur very slowly.	Certain features on Earth can be used to order events that have occurred in a landscape.	Rock strata and the fossil record can be used as evidence to organize the relative occurrence of major historical events in Earth's history.	The rock record resulting from tectonic and other geoscience processes as well as objects from the solar system can provide evidence of Earth's early history and the relative ages of major geologic formations.

Scope Overview

This scope begins with the introduction to the student Investigative Phenomena in the Engage section. Students will use their Graphic Organizers as their note-taking devices to record the information gained in each section as they begin to form a conceptual model of the content as they move through the scope. The teacher uses the Accessing Prior Knowledge (APK) element to help pull out students' current knowledge levels as well as any preconceptions they have before beginning the scope. In this Rock Patterns APK, students think about what causes landscapes to change. This will help uncover possible preconceptions students have before beginning the lesson. Teachers can keep any such preconceptions in mind as they move through the scope. The final element in the Engage section is the Hook. Here, the students have their first experience with the content. They will build on their knowledge as they continue moving through the scope.

Students then dig deeper into the content through the two Explore activities. In Explore 1, students observe fossil evidence in layers of clay to see what kinds of events affect the layers of Earth. In Explore 2, they observe how an earthquake causes changes in patterns of rock formations. Explores 1 and 2 include a formative CER assessment to help the teacher gauge student understanding at that point. By the end of the Engage and Explore activities, students should be able to identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

Students will continue to refine their knowledge of the content as they move through the elements in the Explain and Elaborate sections. Teachers can use any or all of the provided elements. We know that most classrooms have limited time, so teachers should choose the Explain and Elaborate elements that best fit the needs of their students. The teacher can then formally assess the students' understanding by using any of the three summative assessments provided in the Evaluate section. If the students require additional help gaining proficiency with the content, resources can be found in the Intervention section. Students who have achieved mastery of the concept can move over to the Acceleration pieces.

Documents are available to help the teacher assess the CCCs and SEPs taught in this scope. These are located in the Home section of each scope. Question prompts or artifacts to look for throughout the scope are provided, as well as sample answers to help the teacher plot students' understanding on the rubric. The information that is gathered on these forms can be used to track progress on the CCC and SEP Segment Inventory of Skills found in each bundle and on the CCC and SEP Yearlong Inventory of Skills document located in the Teacher Toolbox.

Scope Snapshot: Rock Patterns

Section	Element	Description
ENGAGE	Investigative Phenomena	If environments change so slowly, how can we know what they used to be like?
	APK	Students think about what causes landscapes to change.
	Graphic Organizer	The Graphic Organizer is a note-taking device students can use as they move through this scope.
	Hook	Students make observations based on what they see in the rock formations of the Grand Canyon.
EXPLORE	Explore 1: Activity	**Rock Layers** Students observe fossil evidence in layers of clay to see what kinds of events affect the layers of Earth.
	Explore 2: Activity	**Earthquake!** Students observe how an earthquake causes changes in the pattern of rock formations.
EXPLAIN	Picture Vocabulary	A slide presentation of important vocabulary terms along with a picture and definition as well as a vocabulary activity in which students use vocabulary words to create an illustration
	STEMscopedia	Expository text to support science content, which can be used as reference material in conjunction with Linking Literacy activities
	Linking Literacy	Strategies to help students comprehend the informational text in the STEMscopedia, including pre-, during-, and post-reading activities
	Communicate Science	Students use different forms of communication to discuss scientific topics connected to the content of this scope.
	Concept Review Game	An interactive game that can be played as a class or individually to help students review the science concepts in the module
	Content Connections Video	An inquiry video that engages students and provides meaning

ELABORATE	Math Connections	A practice that uses grade-level-appropriate math activities to address the concept
	Reading Science: Three Lexile Levels (A, B, and C)	**The Changing Surface of Earth** This provides additional expository text that supports real-world application of the content, including five to eight comprehension questions. Teachers can choose which level to assign each student based on students' reading Lexile levels.
	Science Today: Watch It!	**Whale Fossil** Students explore real-world connections and applications of science content through interactions with an engaging video provided by the Associated Press.
	Career Connections	**Archaeologist** A video that introduces students to STEM careers and the 21st Century Skills needed to succeed in those fields
	SEP Simulations	**Rock Patterns** Students interact with Science and Engineering Practices by manipulating on-screen elements in this performance-based assessment.
EVALUATE	Claim-Evidence-Reasoning	A new interstate highway is being built near a fault line! Construction workers, while making room for the new road, cut through the side of a hill. The drawing shows what they observed in each of the exposed rock layers, labeled A–F. Write a scientific explanation describing the characteristics of the environment and any events that took place while layer C was forming.
	Open-Ended Response Assessment	A short-answer and essay assessment to evaluate students' mastery of the concept
	Multiple Choice Assessment	A standards-based assessment designed to gauge students' understanding of the science concept by using their selections of the best possible answers from a list of choices
INTERVENTION	Guided Practice	Students create their own rock layers, come together as a group to create a large rock layer, and then read the rock layers like a story to explain what happened.
	Independent Practice	A short-answer and essay assessment to evaluate students' mastery of the concept
	Concept Attainment Quiz	A standards-based assessment designed to gauge students' understanding of the science concept by using their selections of the best possible answers from a list of choices
ACCELERATION	Extensions	A set of ideas and activities that can help further elaborate on the concept
	Books on Topic	A list of trade books for the scope
	Science Art	Students design and draw a "fossil story" that depicts events that happened in an area over time.

Bundle 2: Scope 2

Changing Land

Three-Dimensional Learning

Performance Expectations		
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. Assessment Boundary: Assessment is limited to a single form of weathering or erosion.		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.	**ESS2.A (2): Earth Materials and 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. **SS2.E (2): Biogeology** Living things affect the physical characteristics of their regions.	**Cause and Effect** Cause and effect relationships are routinely identified, tested, and used to explain change.

Bundle 2: Scope 2

Changing Land

Three-Dimensional Learning

Disciplinary Core Ideas	
• **ESS2.A (2): Earth Materials and Systems** All living things are made up of cells, which are the smallest units that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). • **SS2.E (2): Biogeology** Living things affect the physical characteristics of their regions.	• All the elements found in the Changing Land scope are designed to address the subelements for ESS2.A (2) and SS2.E (2). • Students begin the scope by comparing the breakdown of sugar cubes using different methods. • Students go on to explore the effects of waves on a beach, different processes that can change Earth's surface, and the rate of water erosion. They conclude by identifying the agents of weathering and erosion.
Science and Engineering Practices	
• **Planning and Carrying Out Investigations** Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.	• In the Hook, students conduct an investigation to produce data to serve as the basis for evidence that sugar cubes can be broken down using different methods. • In Explore 1, students will plan and conduct an investigation about the effects waves have on a beach.
Crosscutting Concepts	
• **Cause and Effect** Cause and effect relationships are routinely identified, tested, and used to explain change.	• In Explore 1, students use their results from their investigation to explain the causes of beach erosion and its effect on beaches. • In Explore 2, students use their data to explain how the speed of wind and the amount of time the wind blew affected the movement of paper. • In Explore 3, students use their data to explain what happened to the soil in the cake pan as the slope of the area changed.

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Bundle 2:
Scope 2

Changing Land

Prior Knowledge and Progression

By the end of Grade 2, students should know that wind and water can change the shape of the land. The resulting landforms, together with the materials on the land, provide homes for living things.

Category	K-2	3-5	Middle School	High School
ESS2.A Earth Materials and Systems	Wind and water change the shape of the land.	Four major Earth systems interact. Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, organisms, and gravity break rocks, soils, and sediments into smaller pieces and move them around.	Energy flows and matter cycles within and among Earth's systems, including the sun and Earth's interior as primary energy sources. Plate tectonics is one result of these processes.	Feedback effects exist within and among Earth's systems.

Scope Overview

This scope begins with the introduction to the student Investigative Phenomena in the Engage section. Students will use their Graphic Organizers as their note-taking devices to record the information gained in each section as they begin to form a conceptual model of the content as they move through the scope. The teacher uses the Accessing Prior Knowledge (APK) element to help pull out students' current knowledge levels as well as any preconceptions they have before beginning the scope. In this Changing Land APK, students think about why some rocks look different from others. This will help uncover possible preconceptions students have before beginning the lesson. Teachers can keep any such preconceptions in mind as they move through the scope. The final element in the Engage section is the Hook. Here, the students have their first experience with the content. They will build on their knowledge as they continue moving through the scope.

Students then dig deeper into the content through the four Explore activities. In Explore 1, they investigate and observe the effects of waves on the beach. In Explore 2, students create models to demonstrate the processes that can change Earth's surface. In Explore 3, students investigate and observe the rate of water erosion as the slope of the area changes. In Explore 4, they identify the agents of weathering and erosion by sorting cards into proper categories. Explores 1 and 3 include a formative CER assessment to help the teacher gauge student understanding at that point. By the end of the Engage and Explore activities, students should be able to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

Students will continue to refine their knowledge of the content as they move through the elements in the Explain and Elaborate sections. Teachers can use any or all of the provided elements. We know that most classrooms have limited time, so teachers should choose the Explain and Elaborate elements that best fit the needs of their students. The teacher can then formally assess the students' understanding by using any of the three summative assessments provided in the Evaluate section. If the students require additional help gaining proficiency with the content, resources can be found in the Intervention section. Students who have achieved mastery of the concept can move over to the Acceleration pieces.

Documents are available to help the teacher assess the CCCs and SEPs taught in this scope. These are located in the Home section of each scope. Question prompts or artifacts to look for throughout the scope are provided, as well as sample answers to help the teacher plot students' understanding on the rubric. The information that is gathered on these forms can be used to track progress on the CCC and SEP Segment Inventory of Skills found in each bundle and on the CCC and SEP Yearlong Inventory of Skills document located in the Teacher Toolbox.

Scope Snapshot: Changing Land

Section	Element	Description
ENGAGE	Investigative Phenomena	How do landforms change over time?
	APK	Students think about why some rocks look different from others.
	Graphic Organizer	The Graphic Organizer is a note-taking device students can use as they move through this scope.
	Hook	Students compare the breakdown of sugar cubes using different methods.
EXPLORE	Explore 1: Scientific Investigation	**Waves on the Beach** Students investigate and observe the effects of waves on the beach.
	Explore 2: Activity	**What Processes Can Change Land?** Students create models to demonstrate the processes that can change Earth's surface.
	Explore 3: Scientific Investigation	**Rushing Water** Students investigate and observe the rate of water erosion as the slope of the area changes.
	Explore 4: Activity	**Agents of Weathering and Erosion** Students identify the agents of weathering and erosion by sorting cards into the proper category.
EXPLAIN	Picture Vocabulary	A slide presentation of important vocabulary terms along with a picture and definition as well as a vocabulary activity in which students use vocabulary words to create an illustration
	STEMscopedia	Expository text to support science content, which can be used as reference material in conjunction with Linking Literacy activities
	Linking Literacy	Strategies to help students comprehend the informational text in the STEMscopedia, including pre-, during-, and post-reading activities
	Communicate Science	Students use different forms of communication to discuss scientific topics connected to the content of this scope.
	Concept Review Game	An interactive game that can be played as a class or individually to help students review the science concepts in the module
	Content Connections Video	An inquiry video that engages students and provides meaning

ELABORATE	Math Connections	A practice that uses grade-level-appropriate math activities to address the concept
	Reading Science: Three Lexile Levels (A, B, and C)	**Water: One of Earth's Most Powerful Forces** This provides additional expository text that supports real-world application of the content, including five to eight comprehension questions. Teachers can choose which level to assign each student based on students' reading Lexile levels.
	Science Today: Watch It!	**Desert** Students explore real-world connections and applications of science content through interactions with an engaging video provided by the Associated Press.
	Career Connections	**Farmer** A video that introduces students to STEM careers and the 21st Century Skills needed to succeed in those fields
	Scientist Spotlight	**Kate Hutton** – Seismologist
	Simulation Practice	**Landforms** A ready-made interactive experience to support students' understanding of the science concept
EVALUATE	Claim-Evidence-Reasoning	The photographs of large rocks along a shoreline show the same location, but they were taken at different times. Compare the two images. Write a scientific explanation for the changes that happened to the rocks over the years.
	Open-Ended Response Assessment	A short-answer and essay assessment to evaluate students' mastery of the concept
	Multiple Choice Assessment	A standards-based assessment designed to gauge students' understanding of the science concept by using their selections of the best possible answers from a list of choices.
INTERVENTION	Guided Practice	Students construct a model of a mountain that can be changed by weathering, erosion, and deposition.
	Independent Practice	A short-answer and essay assessment to evaluate students' mastery of the concept
	Concept Attainment Quiz	A standards-based assessment designed to gauge students' understanding of the science concept by using their selections of the best possible answers from a list of choices
ACCELERATION	Extensions	A set of ideas and activities that can help further elaborate on the concept
	Books on Topic	A list of trade books for the scope
	Science Art	Students construct a wheel of change to demonstrate how agents of change impact the land.

Bundle 2: Scope 3

Plate Tectonics

Three-Dimensional Learning

Performance Expectations

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
Analyzing and Interpreting Data Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2)	**ESS2.B (2): 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.	**Patterns** Patterns can be used as evidence to support an explanation. (4-ESS2-2)

Disciplinary Core Ideas	
• **ESS2.B (2): 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.	• All the elements found in the Plate Tectonics scope are designed to address the subelement for ESS2.B (2). Students begin the scope by observing, comparing, and describing landforms shown on a map. They go on to explore patterns of land shown on maps, how to model plate movement and resulting landforms on Earth, and where most volcanoes and earthquakes occur.
Science and Engineering Practices	
• **Analyzing and Interpreting Data** Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2)	• In the Hook, students use maps to make predictions about what might have caused mountains to form near the coasts of continents. • In Explore 1, students analyze maps to make connections between the edges of tectonic plates and the location of certain landforms.
Crosscutting Concepts	
• **Patterns** Patterns can be used as evidence to support an explanation. (4-ESS2-2)	• In the Hook, students look for patterns of land formations on maps. • In Explore 2, students make predictions about where certain landforms might form based on patterns they observe on maps.

The above illustrates how we integrate the three dimensions through the scope. As we know that opportunities naturally occur to model other Crosscutting Concepts and Science and Engineering Practices in many ways, we only call out the ones directly aligned by the NGSS Framework here.

Bundle 2:
Scope 3

Plate Tectonics

Prior Knowledge and Progression

By the end of Grade 2, students should know that rocks, soils, and sand are present in most areas where plants and animals live. There may also be rivers, streams, lakes, and ponds. Maps show where things are located. One can map the shapes and kinds of land and water in any area.

Category	K-2	3-5	Middle School	High School
ESS2.B Plate Tectonics and Large-Scale System Interactions	Maps show where things are located. One can map the shapes and kinds of land and water in any area.	Earth's physical features occur in patterns, as do earthquakes and volcanoes. Maps can be used to locate features and determine patterns in those events.	Plate tectonics is the unifying theory that explains movements of rocks at Earth's surface and geological history. Maps are used to display evidence of plate movement.	Radioactive decay within Earth's interior contributes to thermal convection in the mantle.

Scope Overview

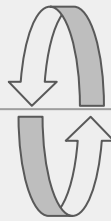
This scope begins with the introduction to the student Investigative Phenomena in the Engage section. Students will use their Graphic Organizers as their note-taking devices to record the information gained in each section as they begin to form a conceptual model of the content as they move through the scope. The teacher uses the Accessing Prior Knowledge (APK) element to help pull out students' current knowledge levels as well as any preconceptions they have before beginning the scope. In this Plate Tectonics APK, students think about the continents and which student statement they agree with most. This will help uncover possible preconceptions students have before beginning the lesson. Teachers can keep any such preconceptions in mind as they move through the scope. The final element in the Engage section is the Hook. Here, the students have their first experience with the content. They will build on their knowledge as they continue moving through the scope.

Students then dig deeper into the content through the three Explore activities. In Explore 1, they use maps to make connections between the edges of tectonic plates and the locations of certain landforms. In Explore 2, students use graham crackers and marshmallow fluff to model plate movement and resulting landforms on Earth. In Explore 3, students describe where most volcanoes and earthquakes occur. Explore 1 includes a formative CER assessment to help the teacher gauge student understanding at that point. By the end of the Engage and Explore activities, students should be able to analyze and interpret data from maps to describe patterns of Earth's features.

Students will continue to refine their knowledge of the content as they move through the elements in the Explain and Elaborate sections. Teachers can use any or all of the provided elements. We know that most classrooms have limited time, so teachers should choose the Explain and Elaborate elements that best fit the needs of their students. The teacher can then formally assess the students' understanding by using any of the three summative assessments provided in the Evaluate section. If the students require additional help gaining proficiency with the content, resources can be found in the Intervention section. Students who have achieved mastery of the concept can move over to the Acceleration pieces.

Documents are available to help the teacher assess the CCCs and SEPs taught in this scope. These are located in the Home section of each scope. Question prompts or artifacts to look for throughout the scope are provided, as well as sample answers to help the teacher plot students' understanding on the rubric. The information that is gathered on these forms can be used to track progress on the CCC and SEP Segment Inventory of Skills found in each bundle and on the CCC and SEP Yearlong Inventory of Skills document located in the Teacher Toolbox.

Scope Snapshot: Plate Tectonics

Section	Element	Description
ENGAGE	Investigative Phenomena	Why are there more earthquakes in certain places?
	APK	Students think about the continents and which student statement they agree with most.
	Graphic Organizer	The Graphic Organizer is a note-taking device students can use as they move through this scope.
	Hook	Students observe, compare, and describe landforms shown on a map.
EXPLORE	Explore 1: Activity	**Patterns in Land** Students use maps to make connections between the edges of tectonic plates and the locations of certain landforms.
	Explore 2: Activity	**Tectonic Plates** Students use graham crackers and marshmallow fluff to model plate movement and resulting landforms on Earth.
	Explore 3: Tuva	**Volcanos around the World** Students describe where most volcanoes and earthquakes occur.
	Picture Vocabulary	A slide presentation of important vocabulary terms along with a picture and definition as well as a vocabulary activity in which students use vocabulary words to create an illustration
	STEMscopedia	Expository text to support science content, which can be used as reference material in conjunction with Linking Literacy activities
EXPLAIN	Linking Literacy	Strategies to help students comprehend the informational text in the STEMscopedia, including pre-, during-, and post-reading activities
	Communicate Science	Students use different forms of communication to discuss scientific topics connected to the content of this scope.
	Concept Review Game	An interactive game that can be played as a class or individually to help students review the science concepts in the module
	Content Connections Video	An inquiry video that engages students and provides meaning

ELABORATE	Math Connections	A practice that uses grade-level-appropriate math activities to address the concept
	Reading Science: Three Lexile Levels (A, B, and C)	**The Hiking Trip** This provides additional expository text that supports real-world application of the content, including five to eight comprehension questions. Teachers can choose which level to assign each student based on students' reading Lexile levels.
	Science Today: Watch It!	**Volcanoes** Students explore real-world connections and applications of science content through interactions with an engaging video provided by the Associated Press.
	Career Connections	**Geologist** A video that introduces students to STEM careers and the 21st Century Skills needed to succeed in those fields
	Scientist Spotlight	**Allan Cox** – Physicist
EVALUATE	Claim-Evidence-Reasoning	A large number of earthquakes and volcanic eruptions occur in the basin of the Pacific Ocean, known as the Ring of Fire. The Ring of Fire has 452 volcanoes and is home to over 90 of the world's active and dormant volcanoes. Using scientific explanation and the information provided on the map, explain why the Ring of Fire developed where it did.
	Open-Ended Response Assessment	A short-answer and essay assessment to evaluate students' mastery of the concept
	Multiple Choice Assessment	A standards-based assessment designed to gauge students' understanding of the science concept by using their selections of the best possible answers from a list of choices
INTERVENTION	Guided Practice	Students locate patterns of Earth's features on maps and transfer the data to their own maps.
	Independent Practice	A short-answer and essay assessment to evaluate students' mastery of the concept
	Concept Attainment Quiz	A standards-based assessment designed to gauge students' understanding of the science concept by using their selections of the best possible answers from a list of choices
ACCELERATION	Extensions	A set of ideas and activities that can help further elaborate on the concept
	Books on Topic	A list of trade books for the scope
	Science Art	Students make models of plate movements, using sandwich cookies.

Bundle 2: Scope 4

Renewable and Nonrenewable Resources

Three-Dimensional Learning

Performance Expectations

4-ESS3-1 Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; nonrenewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Obtaining, Evaluating, and Communicating Information Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)	**ESS3.A (2): Natural Resources** Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.	**Cause and Effect** Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS3-1)

Disciplinary Core Ideas

• **ESS3.A (2): Natural Resources** Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.	• All the elements found in the Renewable and Nonrenewable Resources scope are designed to address the subelement for ESS3.A (2). Students begin the scope by discussing different types of energy resources and developing a movement to illustrate one of them. They go on to explore how to classify natural resources and the effects of various energy sources and to develop a plan for a source of energy other than fossil fuels for a town with a problem.

Science and Engineering Practices

• **Obtaining, Evaluating, and Communicating Information** Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)	• In Explore 2, students work collaboratively to read a scenario and plan a skit that describes what energy source could have caused it and what will happen as a result of the scenario. • In Explore 3, students research information on how to help a town with an energy-source problem.

Crosscutting Concepts

• **Cause and Effect** Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS3-1)	• In Explore 1, students predict what might happen to fuel if we use all the resources used to make it. • In Explore 2, students identify the how humans and wildlife were affected by different energy resources.

The above illustrates how we integrate the three dimensions through the scope. As we know that opportunities naturally occur to model other Crosscutting Concepts and Science and Engineering Practices in many ways, we only call out the ones directly aligned by the NGSS Framework here.

Bundle 2: Scope 4

Renewable and Nonrenewable Resources

Prior Knowledge and Progression

By the end of Grade 2, students should know that living things need water, air, and resources from the land and try to live in places that have the things they need. Humans use natural resources for everything they do; for example, they use soil and water to grow food, wood to burn to provide heat or to build shelters, and materials such as iron or copper extracted from Earth to make cooking pans.

Category	K-2	3-5	Middle School	High School
ESS3.A Natural Resources	Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.	Energy and fuels humans use are derived from natural sources and their use affects the environment. Some resources are renewable over time, others are not.	Humans depend on Earth's land, ocean, atmosphere, and biosphere for different resources, many of which are limited or not renewable. Resources are distributed unevenly around the planet as a result of past geologic processes.	Resource availability has guided the development of human society and use of natural resources has associated costs, risks, and benefits.

Scope Overview

This scope begins with the introduction to the student Investigative Phenomena in the Engage section. Students will use their Graphic Organizers as their note-taking devices to record the information gained in each section as they begin to form a conceptual model of the content as they move through the scope. The teacher uses the Accessing Prior Knowledge (APK) element to help pull out students' current knowledge levels as well as any preconceptions they have before beginning the scope. In this Renewable and Nonrenewable Resources APK, students should think about renewable and nonrenewable resources while they read each student statement and choose the statement they agree with the most. This will help uncover possible preconceptions students have before beginning the lesson. Teachers can keep any such preconceptions in mind as they move through the scope. The final element in the Engage section is the Hook. Here, students have their first experience with the content. They will build on their knowledge as they continue moving through the scope.

Students then dig deeper into the content through the three Explore activities. In Explore 1, they distinguish between and identify uses of renewable and nonrenewable resources. In Explore 2, students act out the effect of energy by performing a skit based on the scenario they receive. In Explore 3, students gather research from multiple sources to develop a plan for a source of energy other than fossil fuels for a town with an energy-source problem. Explore 2 includes a formative CER assessment to help the teacher gauge student understanding at that point. By the end of the Engage and Explore activities, students should be able to describe how energy and fuels are derived from natural resources and their uses affect the environment.

Students will continue to refine their knowledge of the content as they move through the elements in the Explain and Elaborate sections. Teachers can use any or all of the provided elements. We know that most classrooms have limited time, so teachers should choose the Explain and Elaborate elements that best fit the needs of their students. The teacher can then formally assess the students' understanding by using any of the three summative assessments provided in the Evaluate section. If the students require additional help gaining proficiency with the content, resources can be found in the Intervention section. Students who have achieved mastery of the concept can move over to the Acceleration pieces.

Documents are available to help the teacher assess the CCCs and SEPs taught in this scope. These are located in the Home section of each scope. Question prompts or artifacts to look for throughout the scope are provided, as well as sample answers to help the teacher plot students' understanding on the rubric. The information that is gathered on these forms can be used to track progress on the CCC and SEP Segment Inventory of Skills found in each bundle and on the CCC and SEP Yearlong Inventory of Skills document located in the Teacher Toolbox.

Scope Snapshot: Renewable and Nonrenewable Resources

Section	Element	Description
ENGAGE	Investigative Phenomena	We use energy for many things, such as fueling our cars and lighting our cities. Where do we get the majority of our energy from?
	APK	Students think about renewable and nonrenewable resources while they read each student statement and choose the statement they agree with most.
	Graphic Organizer	The Graphic Organizer is a note-taking device students can use as they move through this scope.
	Hook	Students discuss different types of energy resources and develop a movement to illustrate one of them.
EXPLORE 	Explore 1: Activity	**How Can We Classify Natural Resources?** Students distinguish between and identify uses of renewable and nonrenewable resources.
	Explore 2: Activity	**Effects of Energy Skit** Students act out the effect of energy by performing a skit based on the scenario they receive.
	Explore 3: Research	**Renewable and Nonrenewable Resources** Students gather research from multiple sources to develop a plan for a source of energy other than fossil fuels for the town of McCally.
EXPLAIN 	Picture Vocabulary	A slide presentation of important vocabulary terms along with a picture and definition as well as a vocabulary activity in which students use vocabulary words to create an illustration
	STEMscopedia	Expository text to support science content, which can be used as reference material in conjunction with Linking Literacy activities
	Linking Literacy	Strategies to help students comprehend the informational text in the STEMscopedia, including pre-, during-, and post-reading activities
	Communicate Science	Students use different forms of communication to discuss scientific topics connected to the content of this scope.
	Concept Review Game	An interactive game that can be played as a class or individually to help students review the science concepts in the module
	Content Connections Video	An inquiry video that engages students and provides meaning

ELABORATE	Math Connections	A practice that uses grade-level-appropriate math activities to address the concept
	Reading Science: Three Lexile Levels (A, B, and C)	**The Poster Contest** This provides additional expository text that supports real-world application of the content, including five to eight comprehension questions. Teachers can choose which level to assign each student based on students' reading Lexile levels.
	Science Today: Watch It!	**Pedal Power** Students explore real-world connections and applications of science content through interactions with an engaging video provided by the Associated Press.
	Career Connections	**Geologist** A video that introduces students to STEM careers and the 21st Century Skills needed to succeed in those fields
	SEP Simulations	**Renewable and Nonrenewable Resources** Students interact with Science and Engineering Practices by manipulating on-screen elements in this performance-based assessment.
	Simulation Practice	**Alternative Energy** A ready-made interactive experience to support students' understanding of the science concept
EVALUATE	Claim-Evidence-Reasoning	The pie charts below show the various energy sources used in 2010. Write a scientific explanation that describes whether the United States used more renewable or nonrenewable energy resources in 2010.
	Open-Ended Response Assessment	A short-answer and essay assessment to evaluate students' mastery of the concept
	Multiple Choice Assessment	A standards-based assessment designed to gauge students' understanding of the science concept by using their selections of the best possible answers from a list of choices
INTERVENTION	Guided Practice	Students classify objects and substances into groups of natural resources and then into groups of renewable and nonrenewable resources.
	Independent Practice	A short-answer and essay assessment to evaluate students' mastery of the concept
	Concept Attainment Quiz	A standards-based assessment designed to gauge students' understanding of the science concept by using their selections of the best possible answers from a list of choices
ACCELERATION	Extensions	A set of ideas and activities that can help further elaborate on the concept
	Books on Topic	A list of trade books for the scope
	Science Art	Students create a postcard, using recycled materials.

Bundle 2: Scope 5

Natural Processes

Three-Dimensional Learning

Performance Expectations

4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.*

Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity. Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.

3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2)	**ESS3.B (3): Natural Hazards** A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take the steps to reduce their impacts. **ETS1.B (2): Designing Solutions to Engineering Problems** Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	**Cause and Effect** Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-2)

Bundle 2: Scope 5

Natural Processes

Three-Dimensional Learning

Disciplinary Core Ideas

• **ESS3.B (3): Natural Hazards** A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take the steps to reduce their impacts. • **ETS1.B (2): Designing Solutions to Engineering Problems** Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	• All the elements found in the Natural Processes scope are designed to address the subelements for ESS3.B (3) and ETS1.B (2). Students begin the scope by building a model of a structure that could withstand an earthquake. They go on to explore different ways to reduce the impact from natural hazards. They will conclude by designing and constructing a structure that can withstand a variety of natural disasters.

Science and Engineering Practices

• **Constructing Explanations and Designing Solutions** Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2)	• In the Hook, students build a model of a structure that could withstand an earthquake. Students also compare their buildings they built the first time to the ones they built the second time to determine which worked better and how they could have improved their designs. • In Explore 1, students construct explanations by discussing which safety ideas would help reduce the impacts of different natural hazards. • In Explore 2, students design and construct a structure that can withstand a variety of natural disasters.

Crosscutting Concepts

• **Cause and Effect** Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-2)	• In the Hook, students explain what happened to their building as a result of shaking the desk. • In Explore 1, students read about various natural hazards and write about their impacts.

ETS (Engineering, Technology and the Application of Science)

• 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. • 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. • 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	• In Explore 2, students use the scientific knowledge they have gained as well as the 21st Century Skill of collaboration to design and construct a structure that can withstand a variety of natural disasters.

The above illustrates how we integrate the three dimensions through the scope. As we know that opportunities naturally occur to model other Crosscutting Concepts and Science and Engineering Practices in many ways, we only call out the ones directly aligned by the NGSS Framework here.

Bundle 2:
Scope 5

Natural Processes

Prior Knowledge and Progression

By the end of Grade 2, students should know that some kinds of severe weather are more likely than others in a given region and that weather scientists forecast severe weather so that communities can prepare for and respond to these events.

Category	K-2	3-5	Middle School	High School
ESS3.B Natural Hazards	In a region, some kinds of severe weather are more likely than others. Forecasts allow communities to prepare for severe weather.	A variety of hazards result from natural processes; humans cannot eliminate hazards but can reduce their impacts.	Mapping the history of natural hazards in a region and understanding related geological forces can help forecast the locations and likelihoods of future events.	Natural hazards and other geological events have shaped the course of human history at local, regional, and global scales.

Scope Overview

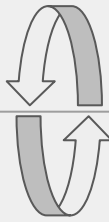
This scope begins with the introduction to the student Investigative Phenomena in the Engage section. Students will use their Graphic Organizers as their note-taking devices to record the information gained in each section as they begin to form a conceptual model of the content as they move through the scope. The teacher uses the Accessing Prior Knowledge (APK) element to help pull out students' current knowledge levels as well as any preconceptions they have before beginning the scope. In this Natural Processes APK, students will choose the natural process they think could cause the most damage to businesses, homes, and other locations. This will help uncover possible preconceptions students have before beginning the lesson. Teachers can keep any such preconceptions in mind as they move through the scope. The final element in the Engage section is the Hook. Here, students have their first experience with the content. They will build on their knowledge as they continue moving through the scope.

Students then dig deeper into the content through the two Explore activities. In Explore 1, they identify the hazards of earthquakes, floods, tsunamis, and volcanic eruptions, and then they create posters with suggestions on how to reduce their impacts. In Explore 2, students work collaboratively to design and construct a structure that can withstand a variety of natural disasters. Explore 1 includes a formative CER assessment to help the teacher gauge student understanding at that point. By the end of the Engage and Explore activities, students should be able to generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Students will continue to refine their knowledge of the content as they move through the elements in the Explain and Elaborate sections. Teachers can use any or all of the provided elements. We know that most classrooms have limited time, so teachers should choose the Explain and Elaborate elements that best fit the needs of their students. The teacher can then formally assess the students' understanding by using any of the three summative assessments provided in the Evaluate section. If the students require additional help gaining proficiency with the content, resources can be found in the Intervention section. Students who have achieved mastery of the concept can move over to the Acceleration pieces.

Documents are available to help the teacher assess the CCCs and SEPs taught in this scope. These are located in the Home section of each scope. Question prompts or artifacts to look for throughout the scope are provided, as well as sample answers to help the teacher plot students' understanding on the rubric. The information that is gathered on these forms can be used to track progress on the CCC and SEP Segment Inventory of Skills found in each bundle and on the CCC and SEP Yearlong Inventory of Skills document located in the Teacher Toolbox.

Scope Snapshot: Natural Processes

Section	Element	Description
ENGAGE	Investigative Phenomena	How could an architect design a house to withstand natural disasters?
	APK	Students choose the natural process they think could cause the most damage to businesses, homes, and other locations.
	Graphic Organizer	The Graphic Organizer is a note-taking device students can use as they move through this scope.
	Hook	Students build a model of a structure that could withstand an earthquake.
EXPLORE 	Explore 1: Activity	**Safety First!** Students view images to determine which organisms are unicellular and which are multicellular.
	Explore 2: Engineering Solution	**Volcano Island** Students use the scientific knowledge they have gained as well as the 21st Century Skill of collaboration to design and construct a structure that can withstand a variety of natural disasters.
EXPLAIN	Picture Vocabulary	A slide presentation of important vocabulary terms along with a picture and definition as well as a vocabulary activity in which students use vocabulary words to create an illustration
	STEMscopedia	Expository text to support science content, which can be used as reference material in conjunction with Linking Literacy activities
	Linking Literacy	Strategies to help students comprehend the informational text in the STEMscopedia, including pre-, during-, and post-reading activities
	Communicate Science	Students use different forms of communication to discuss scientific topics connected to the content of this scope.
	Concept Review Game	An interactive game that can be played as a class or individually to help students review the science concepts in the module
	Content Connections Video	An inquiry video that engages students and provides meaning

ELABORATE	Math Connections	A practice that uses grade-level-appropriate math activities to address the concept.
	Reading Science: Three Lexile Levels (A, B, C)	**Amazing Earth** This provides additional expository text that supports real-world application of the content, including five to eight comprehension questions. Teachers can choose which level to assign each student based on students' reading Lexile levels.
	Science Today: Read It!	**Pacific Coast** Students explore real-world connections and applications of science content through interactions with an engaging video provided by the Associated Press.
	Career Connections	**Oceanographer** A video that introduces students to STEM careers and the 21st Century Skills needed to succeed in those fields
	Scientist Spotlight	**Miriam Rodón Naveira** – Environmental Scientist
EVALUATE	Claim-Evidence-Reasoning	The following houses have been designed to withstand an earthquake and flooding: House 1 is all concrete and permanently secured to the ground. It is sitting high up on a hill, away from possible flooding. House 2 is shaped like a soccer ball, which reduces any pressure on the walls. It can float, and the base is balanced to help it stay upright. Which design would best protect the house against earthquakes and flooding, including tsunamis? Use a scientific explanation to justify your answer.
	Open-Ended Response Assessment	A short-answer and essay assessment to evaluate students' mastery of the concept
	Multiple Choice Assessment	A standards-based assessment designed to gauge students' understanding of the science concept by using their selections of the best possible answers from a list of choices
INTERVENTION	Guided Practice	Students discuss various images of natural disasters, how to prepare for them, and what to do at home or at school when disaster strikes.
	Independent Practice	A short-answer and essay assessment to evaluate students' mastery of the concept
	Concept Attainment Quiz	A standards-based assessment designed to gauge students' understanding of the science concept by using their selections of the best possible answers from a list of choices
ACCELERATION	Extensions	A set of ideas and activities that can help further elaborate on the concept
	Books on Topic	A list of trade books for the scope
	Science Art	Students create a calendar to help people prepare for hurricane season.