

4th Grade Unit 2  
9 weeks



# Earth's Systems: Processes that Shape the Earth

## Unit Planning Team:

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# Essential Questions



How can water, ice, wind and vegetation change the land? What evidence do you have to support this explanation?

What patterns of Earth's features can be determined with the use of maps?

How can we reduce the impacts of natural hazards (processes) on humans?

Earth's Systems: Processes that Shape the Earth

Students who demonstrate understanding can:

- 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.]
- 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, or volume of water flow.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]
- 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.]
- 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 or improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Planning and Carrying Out Investigations</b></p> <p>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.</p> <ul style="list-style-type: none"><li>Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1)</li></ul> <p><b>Analyzing and Interpreting Data</b></p> <p>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.</p> <ul style="list-style-type: none"><li>Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2)</li></ul>	<p><b>ESS1.C: The History of Planet Earth</b></p> <ul style="list-style-type: none"><li>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)</li></ul> <p><b>ESS2.A: Earth Materials and Systems</b></p> <ul style="list-style-type: none"><li>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)</li></ul> <p><b>ESS2.B: Plate Tectonics and Large-Scale System Interactions</b></p> <ul style="list-style-type: none"><li>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)</li></ul> <p><b>ESS2.E: Biogeology</b></p> <ul style="list-style-type: none"><li>Living things affect the physical characteristics of their regions. (4-ESS2-1)</li></ul>	<p><b>Patterns</b></p> <ul style="list-style-type: none"><li>Patterns can be used as evidence to support an explanation. (4-ESS1-1, 4-ESS2-2)</li></ul> <p><b>Cause and Effect</b></p> <ul style="list-style-type: none"><li>Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1, 4-ESS3-2)</li></ul> <p><b>Connections to Engineering, Technology, and Applications of Science</b></p> <p><b>Influence of Engineering, Technology, and Science on Society and the Natural World</b></p> <ul style="list-style-type: none"><li>Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2)</li></ul>

# Earth's Systems: Processes that Shape the Earth

Background knowledge videos:

- ESS1C - History of the Planet Earth
- ESS2A - Earth Materials & Systems
- ESS2B - Plate Tectonics/Large Scale Systems
- ESS2E - Biogeology
- ESS3B - Natural Hazards

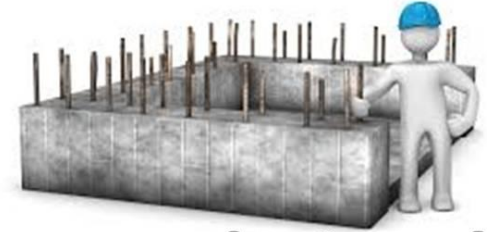
These videos are designed to assist in providing background knowledge with the associated DCI.

The information in the videos follows the progression through high school.

Constructing Explanations and Designing Solutions	ESS3.B: Natural Hazards	Connections to Nature of Science
<p>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.</p> <ul style="list-style-type: none"><li>Identify the evidence that supports particular points in an explanation. (4-ESS1-1)</li><li>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)</li></ul>	<ul style="list-style-type: none"><li>A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)</li></ul> <p><b>ETS1.B: Designing Solutions to Engineering Problems</b></p> <ul style="list-style-type: none"><li>Testing a solution involves investigating how well it performs under a range of likely conditions.</li></ul>	<p><b>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</b></p> <ul style="list-style-type: none"><li>Science assumes consistent patterns in natural systems. (4-ESS1-1)</li></ul>
<p><b>Connections to other DCIs in fourth grade:</b> 4.ETS1.C (4-ESS3-2)</p> <p><b>Connections to other DCIs across grade levels:</b> K-2.ETS1.A (4-ESS3-2); 2.ESS1.C (4-ESS1-1, 4-ESS2-1); 2.ESS2.A (4-ESS2-1); 2.ESS2.B (4-ESS2-2); 2.ESS2.C (4-ESS2-2); K-2.ETS1.B (4-ESS3-2); K-2.ETS1.C (4-ESS3-2); 3.LS4.A (4-ESS1-1); 5.ESS2.A (4-ESS2-1); 5.ESS2.C (4-ESS2-2); 6.ETS1.B (4-ESS3-2); 7.ESS2.A (4-ESS1-1, 4-ESS2-2, 4-ESS3-2); 7.ESS2.B (4-ESS1-1, 4-ESS2-2); 7.ESS3.B (4-ESS3-2); 8.LS4.A (4-ESS1-1); 8.ESS1.C (4-ESS1-1, 4-ESS2-2)</p>		

## Prior to 4th grade, students should have knowledge, understanding of, and experiences with the following ideas:

- ★ Some events happen very quickly, while other events occur very slowly over time.
- ★ Some events occur over a time period much longer than one can observe.
- ★ Wind and water can change the shape of the land.
- ★ Maps show where things are located.
- ★ Maps can show the shapes and kinds of land and water in an area.
- ★ Water is found in the ocean, rivers, lakes, and ponds.
- ★ Water, as part of Earth's landforms, exists as solid ice and in liquid form.

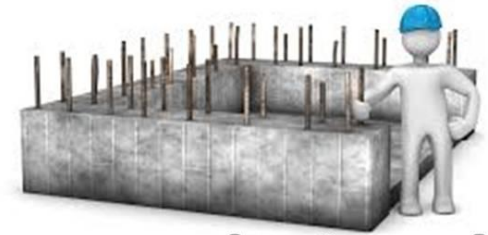


## Foundational Knowledge

*With the implementation of new standards, students may not have had opportunities to engage in these foundational understandings and ideas before 4th grade. You may need to provide opportunities for students to experience these ideas as you move forward.*

Prior to 4th grade, students should have knowledge, understanding of, and experiences with the following ideas:

- ★ Engineers develop solutions to prevent damage to Earth's surface.
- ★ A variety of natural hazards result from natural processes.
- ★ Humans cannot eliminate natural hazards but can take steps to reduce their impacts.



Foundational  
Knowledge

*With the implementation of new standards, students may not have had opportunities to engage in these foundational understandings and ideas before 4th grade. You may need to provide opportunities for students to experience these ideas as you move forward.*



How can water, ice, wind and vegetation change the land? What evidence do you have to support this explanation?

How can we reduce the impacts of natural hazards (processes) on humans?



## Big Ideas

- ★ 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.
- ★ Living things affect the physical characteristics of their regions.
- ★ A variety of natural hazards result from natural processes like earthquakes, tsunamis, and volcanic eruptions.
- ★ Humans cannot eliminate the hazards but can take steps to reduce their impact.
- ★ Testing a solution involves investigating how well it performs under a range of likely conditions.

What patterns of Earth's features can be determined with the use of maps?



## Big Ideas

- ★ Local, regional, and global patterns of rock formations reveal changes over time due to earth forces.
- ★ The presence and location of certain fossil types indicate the order in which rock layers were formed.
- ★ Rainfall helps to shape the land and affects the types of living things found in a region.
- ★ 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 located the different land and water features of Earth.



## Earth's Systems: Processes that Shape the Earth

Students who demonstrate understanding can:

**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.]

### Disciplinary Core Ideas

#### 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)

### Clarifications:

**Misconception: Earth's surface has always looked the way it does today.**

Earth's surface is always changing. Landforms are built up and worn down all the time. Long ago, Earth looked much different than it does now.

**Misconception: A fossil cannot form in volcanic rock.**

Most often, fossils are formed in sedimentary rock, but sometimes fossils can form in volcanic rock.

**Misconception: Fish fossils cannot be found on mountains.**

Earth is always changing. There was once a large ocean in the middle of the United States. So, ocean fossils can be found where mountains exist today.

Identify and  
CLARIFY the  
STANDARDS





## Earth's Systems: Processes that Shape the Earth

Students who demonstrate understanding can:

**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, or volume of water flow.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]

**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 or improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]

**Disciplinary Core Ideas**

**ESS2.A: 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. (4-ESS2-1)

**ESS2.E: Biogeology**

- Living things affect the physical characteristics of their regions. (4-ESS2-1)

**ESS3.B: Natural Hazards**

- A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)

**ETS1.B: Designing Solutions to Engineering Problems**

- Testing a solution involves investigating how well it performs under a range of likely conditions. (4-ESS3-2)

### Clarifications:

**Misconception: Scientists can predict earthquakes.**

So far, scientists can't predict when an earthquake will happen. They can calculate how likely it is that an earthquake will occur in an area, but only very generally.

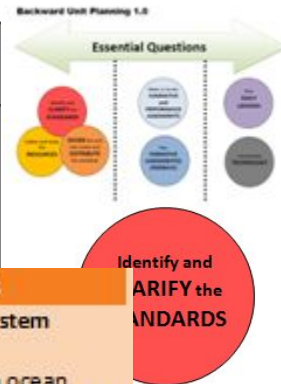
**Misconception: Earthquakes only happen on land, not on the ocean floor.**

Earthquakes can happen on the part of Earth's crust we call "land," but they can also happen on the ocean floor. The tectonic plates are not the same as continents. Remember that the ocean floor is part of Earth's crust. It is just a part that is covered in water. When an earthquake happens on the ocean floor, it can cause a large wave, called a tsunami.

## Earth's Systems: Processes that Shape the Earth

Students who demonstrate understanding can:

**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.]



### Disciplinary Core Ideas

#### 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)

### Clarifications:


**Misconception: Erosion usually happens quickly, during storms and landslides.**

Most erosion happens slowly, little by little. Little by little, rivers erode their banks. Little by little, hills are worn down. Over long periods of time, these small changes add up. Of course, erosion can also happen quickly, during a landslide or hurricane

**Misconception: Some kinds of landforms, such as mountains and valleys, don't change.**

Even though mountains are so large they don't seem to change, they really are changing all the time. Slowly, over many years, tall, pointed mountains can be worn down until they are lower and more rounded.

**EARTH AND SPACE SCIENCE**



**UNIT:**  
**The Changing Earth**

[View Unit ▶](#)

**CONCEPT:**

- Erosion and Deposition**
- Landforms**
- Earthquakes**
- Volcanoes**
- Fossils**

**Gather and  
study the  
RESOURCES**

Discovery Education  
Science Techbook Units



Weeks	Performance Expectation/ DCI	5E Lesson Plan and Resources
<div>1-2</div> <div>PART 1</div>	<p><b>Foundational Knowledge:</b></p> <p>2ESS1-1 Use information from several sources to provide evidence that Earth events can occur quickly or slowly.</p> <p>2-ESS2-2 Develop a model to represent the shapes and kinds of land and bodies of water in an area.</p> <p><b>Erosion &amp; Deposition:</b></p> <p><b>4-ESS2-1</b> - Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.</p>	<p><b>Foundational Knowledge:</b> <a href="#">Sand Castle Investigations</a> This activity is designed for use in 2nd grade; provides foundational ideas they may not have prior to this unit.</p> <p><b>Option 1: <a href="#">Model Lesson</a></b>      <b>Option 2: <a href="#">5E Lesson Plan</a></b> Additional details listed below...</p> <p><b>Engage:</b></p> <p><b>Begin KLEWS Chart on Erosion</b> <a href="#">KLEWS chart</a> <a href="#">KLEWS Chart video</a> <a href="#">KLEWS blank chart</a>  <b><a href="#">Video: Weathering and Erosion</a></b> (play video twice)</p> <p><b>Explore: Students will choose from 12 videos, watch videos of their choosing and complete a matrix on the information they learned.</b>  <a href="#">Erosion Note-taking Matrix</a>    <a href="#">Discovery Education Videos</a></p> <p>Fold a paper in half. Have them draw a picture on one side of the paper showing what the landform may have looked like before the change occurred and draw a picture on the other side of the paper showing what the landform looks like after the change.</p> <p>Or</p> <p>Stations (see Exploration section in <a href="#">5E Lesson Plan</a> for further details)</p> <ul style="list-style-type: none"> <li>•</li> </ul> <p>Probes for engagement,evaluation and/or elaboration <a href="#">Science Assessment Probes Page</a> (intranet password required)</p> <p>Is it Erosion?    deposition/erosion/weather</p> <p>Can a Plant Break Rocks?    weathering</p> <p>Grand Canyon    erosion/ weathering</p> <p>Mountains and Beaches    deposition/erosion/weathering</p> <p><b>Additional Resource:</b> Trade Book (not district purchased)  <a href="#">Erosion Changing Earth's Surface</a> By: Robin Koontz</p>

Weeks	Performance Expectation/ DCI	5E Lesson Plan and Resources
<div>1-2</div> <div>PART 2</div>	<p><b>Foundational Knowledge:</b></p> <p>2ESS1-1 Use information from several sources to provide evidence that Earth events can occur quickly or slowly.</p> <p>2-ESS2-2 Develop a model to represent the shapes and kinds of land and bodies of water in an area.</p> <p><b>Erosion &amp; Deposition:</b></p> <p><b>4-ESS2-1</b> - Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.</p>	<p><b>Explain:</b>  Students will share results in groups and then participate in class instruction. Weathering (breaking down of rocks) and erosion (movement of weathered material) should be addressed. Post information on KLEWS Chart. Videos to further explain: <a href="#">BrainPop Erosion Video</a> <a href="#">Erosion Demonstration Video</a> <a href="#">Bill Nye-erosion clip Erosion Lab Video</a> This is a good video for weathering and erosion. It is interactive and has places to stop for discussion and making drawings in student science notebooks.</p> <p><b>Elaborate:</b>  <a href="#">Article</a> from NEWSELA <i>Residents watch crumbling cliffs on California coast creep closer to homes</i></p> <p><i>Design challenge:</i> The residents in California are in need of your help. They need you design a prevention system to reduce erosion around the falling houses.</p> <p>After reading the article, The students will get into groups and design a system to support a falling house (cereal box) on the California Coast.</p> <p><i>Materials:</i> string (4ft), straws(6), toilet paper rolls (4), tape, pipe cleaners (4), wax paper (12X12), cereal box, sand</p> <p><b>Evaluate:</b></p> <ul style="list-style-type: none"> <li>• How will students demonstrate that they have achieved the lesson objective?</li> <li>• This should be embedded throughout the lesson as well as at the end of the lesson</li> </ul> <p>Students will evaluate their structure support system and re-design if necessary.  Students will make observations about the effects of each type of erosion.  Students will make a claim about which type of erosion had to biggest effect on structure.  Teacher will use ice, spray bottle and a fan to imitate the effects of hail, rain, and wind.</p>

Weeks	Performance Expectation/ DCI	5E Lesson Plan and Resources
<p style="text-align: center;"><b>3-4</b></p> <p style="text-align: center;"><b>PART 1</b></p>	<p><b>Foundational Knowledge:</b></p> <p>2ESS1-1 Use information from several sources to provide evidence that Earth events can occur quickly or slowly.</p> <p>2-ESS2-2 Develop a model to represent the shapes and kinds of land and bodies of water in an area.</p> <p><b>Landforms:</b></p> <p><b>4-ESS2-2</b> - Analyze and interpret data from maps to describe patterns of Earth's features.</p> <p><a href="#"><u>Standards Overview</u></a></p>	<p><b>Foundational Knowledge:</b>  <a href="#"><u>Option 1: DE Model Lesson</u></a>      Option 2: 5E Suggested Model below</p> <p><b>Engage:</b>  <a href="#"><u>DE Engage Page</u></a> - Scroll to bottom of page to the section: <i>What do you already know about landforms?</i>          Complete Describing Landforms 1 and Landforms 2 interactives.</p> <p><b>Explore:</b>          Landforms Illustrations from DE - What landforms do students recognize? Could put in SmartBoard and label. <a href="#"><u>Desert</u></a>   <a href="#"><u>Grand Canyon</u></a>   <a href="#"><u>Badlands</u></a>   <a href="#"><u>Explore Landforms</u></a></p> <p>Assessment Probes <a href="#"><u>Science Assessment Probes Page</u></a> (intranet password required)          Grand Canyon   Mountains   Describing Earth's Plates   Where Do You Find Earth's Plates?  <a href="#"><u>Virtual Lab: Erosion</u></a></p> <p><b>Explain:</b> <i>(continued on next slide...)</i>  <a href="#"><u>Landform Pictures</u></a></p> <p>DE Resources:  <a href="#"><u>Landforms Video</u></a>   <a href="#"><u>Teacher's Guide to Video</u></a>  <a href="#"><u>How Weathering and Erosion Affect Landforms</u></a>  <a href="#"><u>The Effects of Erosion and Weathering on Mountains</u></a>  <a href="#"><u>In-Depth Landforms Video</u></a>   <a href="#"><u>Teacher's Guide to Video</u></a>  <a href="#"><u>Transformation of Earth's Surface Happens Slowly and Quickly</u></a>  <a href="#"><u>Plumes, Volcanoes and Moving Plates</u></a>  <a href="#"><u>Mountains, Volcanoes, and Earthquakes</u></a>  <a href="#"><u>Vocabulary Focus Activity</u></a></p>



Weeks	Performance Expectation/ DCI	5E Lesson Plan and Resources
<p><b>3-4</b></p> <p><b>PART 2</b></p>	<p><b>Foundational Knowledge:</b></p> <p>2ESS1-1 Use information from several sources to provide evidence that Earth events can occur quickly or slowly.</p> <p>2-ESS2-2 Develop a model to represent the shapes and kinds of land and bodies of water in an area.</p> <p><b>Landforms:</b></p> <p><b>4-ESS2-2</b> - Analyze and interpret data from maps to describe patterns of Earth's features.</p> <p><a href="#">Standards Overview</a></p>	<p><b>Explain</b> <i>(continued from previous slide):</i>  DE: <a href="#">How Weathering and Erosion Create Landforms</a> <a href="#">Maps and Landforms</a>  <a href="#">Rock Cycle</a> (study jams)</p> <p>DE: <a href="#">Ocean Landforms and Mapping Videos</a> - These videos would support understanding of the various landforms found on the ocean floor.</p> <p><a href="#">Landforms of the Ocean PPT</a> <a href="#">PDF option</a> - Choose pieces that are appropriate for your needs and kids. Students need to understand that landforms appear on the Earth's surface and in the oceans. The ocean floor contains all of the geographic features that can be found on the continents: Mountains, volcanoes, plains, valleys, and canyons. These underwater landforms are many times taller, deeper, longer, and wider than those on dry land.</p> <p><b>Elaborate:</b>  DE: <a href="#">Hands-On Lab: The Disappearing Soccer Field</a></p> <p><a href="#">Creating and Building Landforms</a> - This website gives some creative ideas for hands-on creation that students could do to show understanding. Students could draw and label, paint and label, create paper art and label, or use modeling clay or other medium to create landforms.</p> <p><b>Evaluate:</b>  DE: <a href="#">Landforms Assessment</a> <a href="#">Landforms Constructed Response</a></p>

Weeks	Performance Expectation/ DCI	5E Lesson Plan and Resources
<p><b>5-6</b></p> <p><b>PART</b></p> <p><b>1</b></p>	<p><b>Earthquakes:</b></p> <p><b>4-ESS2-2</b> - Analyze and interpret data from maps to describe patterns of Earth's features.</p> <p><b>4-ESS2-2.1.1</b> - Patterns can be used as evidence to support an explanation.</p> <p><b>4-ESS2-2.4.1</b> - Analyze and interpret data to make sense of phenomena using logical reasoning.</p> <p><b>4-ESS3-2</b> - Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.</p>	<p><a href="#">Option 1: DE Model Lesson</a>    Option 2: 5E Suggested Model below</p> <p><b>Engage:</b>  <a href="#">DE Explore - Experiencing Earthquakes</a> (video 2:04)  <a href="#">Earthquakes 101</a> National Geographic Video</p> <p><i><b>Guiding Questions:</b></i>          What patterns of Earth's features can be determined with the use of maps?          How can we reduce the impacts of natural hazards (processes) on humans?</p> <p><b>Explore:</b> (options to choose from)  <a href="#">DE Science Lab - Earthquakes</a></p> <p><a href="#">DE Hands On Lab - Designing an Earthquake Proof House</a></p> <p><a href="#">DE Earthquakes Assignments</a></p> <p><a href="#">The Great Shake</a> - RPS Design Challenge Activity</p> <p><a href="#">DE Hands On Activity - Plate Boundaries and Earthquakes</a></p>

Weeks	Performance Expectation/ DCI	5E Lesson Plan and Resources
<div>5-6</div> <div>PART 2</div>	<p><b>Earthquakes:</b></p> <p><b>4-ESS2-2</b> - Analyze and interpret data from maps to describe patterns of Earth's features.</p> <p><b>4-ESS2-2.1.1</b> - Patterns can be used as evidence to support an explanation.</p> <p><b>4-ESS2-2.4.1</b> - Analyze and interpret data to make sense of phenomena using logical reasoning.</p> <p><b>4-ESS3-2</b> - Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.</p>	<p><b>Explain:</b></p> <p><a href="#">DE Video Segment: Earthquake</a> (video 6:04) Locate segment on Earthquakes</p> <p><a href="#">DE Video Segment: Earthquakes</a> (video 2:40) Locate segment on Earthquakes</p> <p><a href="#">PBS Earthquake Lesson Plans</a> (includes videos and lessons)</p> <p>ReadWorks Articles:     <a href="#">Why are there Earthquakes</a>     <a href="#">How Plates Affect Our Planet</a>     <a href="#">Earthquakes- Tremors from Below</a></p> <p><a href="#">DE Explore - What Causes an Earthquake</a> only this section</p> <p><a href="#">DE Reading Passage - The Shaking Ocean Floor</a></p> <p><b>Elaborate:</b></p> <p><a href="#">DE Elaborate with STEM - Project Measuring Earthquakes</a></p> <p><a href="#">DE Elaborate with STEM - Build Your Own Tool</a></p> <p><b>Evaluate:</b></p> <p><a href="#">DE - Earthquakes Assignment 1</a></p> <p><a href="#">DE Constructed Response Earthquakes</a></p>

Weeks	Performance Expectation/ DCI	5E Lesson Plan and Resources
<p style="text-align: center;"><b>7-8</b></p> <p style="text-align: center;"><b>PART 1</b></p>	<p><b>Volcanoes:</b></p> <p><b>4-ESS3-2</b> - Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.</p> <p><b>4-ESS3-2.2.1</b> - Cause and effect relationships are routinely identified, tested, and used to explain change.</p> <p><b>4-ESS3-2.6.1</b> - Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.</p> <p><b>4-ESS3-2.ESS3.B.1</b> - A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.</p>	<p><u><a href="#">Option 1: Model Lesson</a></u>    Option 2: 5E Suggested Model below</p> <p><b>Engage:</b>  <i>Guiding Questions:</i>          -What is a volcano?          -What causes them to erupt?</p> <p>Begin KLEWS chart on Volcanoes    <a href="#">KLEWS chart</a> and <a href="#">KLEWS blank chart</a></p> <p><a href="#">DE Video: Process how volcanoes are formed</a>  <a href="#">DE Video: Introduction to Volcanoes</a>  <a href="#">DE Video: Living on the Edge of Danger</a></p> <p><b>Explore:</b>  <i>Guiding Questions:</i>          -How do scientists classify volcanoes?          -How do volcanoes change Earth's surface?          -What determines the way a volcano erupts?</p> <p><a href="#">DE Video: Volcanoes are Mountains</a></p> <p>DE Hands-on Activity: <a href="#">Cake Batter Lava</a></p>

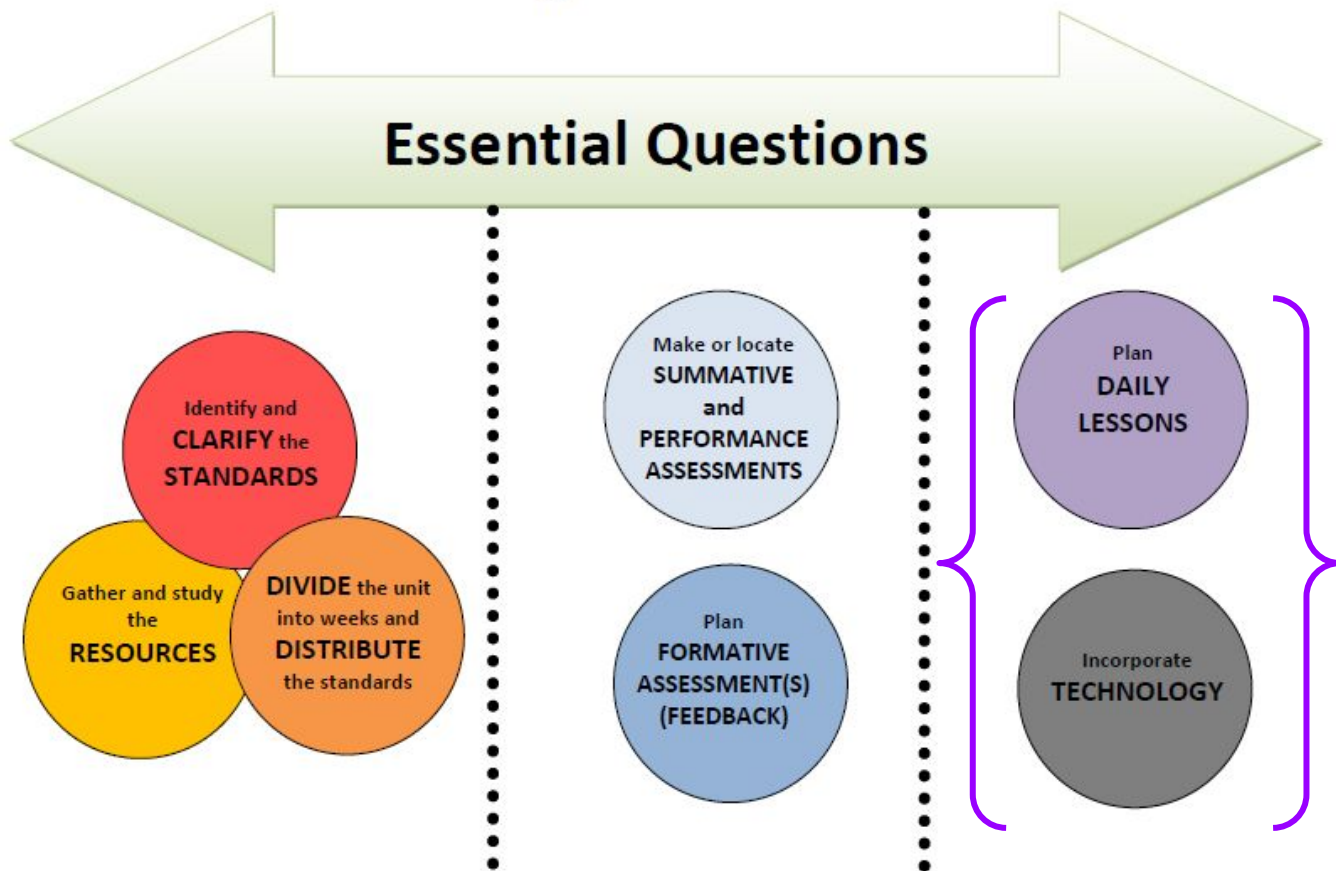
Weeks	Performance Expectation/ DCI	5E Lesson Plan and Resources
<p><b>7-8</b></p> <p><b>PART 2</b></p>	<p><b>Volcanoes:</b></p> <p><b>4-ESS3-2</b> - Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.</p> <p><b>4-ESS3-2.2.1</b> - Cause and effect relationships are routinely identified, tested, and used to explain change.</p> <p><b>4-ESS3-2.6.1</b> - Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.</p> <p><b>4-ESS3-2.ESS3.B.1</b> - A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.</p>	<p><b>Explain:</b>  <i>Guiding Questions:</i>          -Why do volcanoes often form along plate boundaries?          -How do volcanoes help create new land?</p> <p><b><u><a href="#">DE Video Segment: Volcanoes</a></u></b>          Use this video to discuss where volcanoes occur, the ring of fire and tectonic plates.</p> <p><b>Elaborate:</b>          Assessment Probe <u><a href="#">Science Assessment Probes Page</a></u> (intranet password required)          - What do you know about volcanoes and earthquakes ( make sure both have been taught)</p> <p><b><u><a href="#">DE Explore Volcanoes Activity</a></u> Interactive volcano with stages of volcanic eruption.</b>  <u><a href="#">DE Studying Volcanoes Article</a></u></p> <p><b>Evaluate:</b>          Review: Guiding Questions          Complete <u><a href="#">three way venn diagram - DE</a></u> to review three types of volcanoes.</p> <p><u><a href="#">DE Constructed Response Assessment 1</a></u></p> <p><u><a href="#">DE Suggested Assessment 2</a></u></p>

Weeks	Performance Expectation/ DCI	5E Lesson Plan and Resources
<div data-bbox="106 500 135 540">9</div> <div data-bbox="56 616 187 715">PART 1</div>	<p><b>Fossils:</b></p> <p><b>4-ESS1-1</b> - Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.</p> <p><b>4-ESS1-1.1.1</b> - Patterns can be used as evidence to support an explanation.</p> <p><b>4-ESS1-1.6.1</b> - Identify the evidence that supports particular points in an explanation.</p> <p><b>4-ESS1-1.ESS1.C.1</b> - 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.</p>	<div data-bbox="573 153 877 181">Option 1: Model Lesson</div> <div data-bbox="973 153 1445 181">Option 2: 5E Suggested Model below</div> <p><b>Engage:</b></p> <p>Begin KLEWS chart on Fossils <a href="#">KLEWS chart</a> <a href="#">KLEWS blank chart</a></p> <ul style="list-style-type: none"> <li>• <a href="#">DE Video: What are Fossils?</a> What are fossils? What are some examples of fossils?</li> <li>• <a href="#">DE Video: How Trace Fossils Form:</a> How do fossils form? What can we learn by studying fossils?</li> <li>• DE Images: <a href="#">Fossil Evidence</a> <a href="#">Fossil Fish</a> <a href="#">Fossil Shark's Teeth</a> What do you think this is? Where do you think it lived? What makes you think it lived there? What can we learn by studying fossils?</li> </ul> <p><b>Explore:</b></p> <p>What are fossils?</p> <p>What are some different types of fossils?</p> <p>How do fossils form?</p> <p>How is the age of a fossil determined?</p> <p>What can fossils tell us about Earth's past?</p> <p>Use <a href="#">Fossil Note-taking Matrix</a> as you watch these DE video segments:</p> <p><a href="#">What are Fossils</a> (2:20) (different from engage video) <a href="#">Fossils</a> (54 sec.) <a href="#">Body Fossils Trace Fossils</a> (2:34)</p> <p><a href="#">Using Rocks to Study the Past</a> (2:20) <a href="#">Every Fossil Has a Story</a> (3:03) <a href="#">The Woolly Mammoth</a> (4:25)</p> <p><a href="#">Discovering Fossils and Dinosaurs</a> (1:02) <a href="#">Clues From the Past</a> (2:59)</p> <p><b>Explain:</b></p> <p>Summarize your learning about Earth's history from fossils and how you learned it?</p> <p>Students could use: Board Builder, make a poster, google slides, etc to present information to their classmates.</p>



Weeks	Performance Expectation/ DCI	5E Lesson Plan and Resources
<p style="text-align: center;"><b>9</b></p> <p style="text-align: center;"><b>PART 2</b></p>	<p><b>Fossils:</b></p> <p><b>4-ESS1-1</b> - Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.</p> <p><b>4-ESS1-1.1.1</b> - Patterns can be used as evidence to support an explanation.</p> <p><b>4-ESS1-1.6.1</b> - Identify the evidence that supports particular points in an explanation.</p> <p><b>4-ESS1-1.ESS1.C.1</b> - 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.</p>	<p><b>Elaborate:</b></p> <p><a href="#">DE Virtual Lab: No Bones About It</a></p> <p>What conditions are best for fossil formation?</p> <p>Imagine that you are a paleontologist in charge of investigating why some animals are becoming extinct. In this project, you will complete the virtual lab No Bones About It.</p> <p><b>Evaluate:</b></p> <p><i>Review Guiding Questions:</i></p> <p>What are fossils?</p> <p>What are some different types of fossils?</p> <p>How do fossils form?</p> <p>How is the age of a fossil determined?</p> <p>What can fossils tell us about Earth's past?</p> <p><a href="#">Discovery Ed Constructed Response</a> (suggested assessment 1)</p> <p><a href="#">Discovery Ed Suggested Assessment</a></p>

## Backward Unit Planning 1.0



Now you're  
ready to  
plan your  
daily  
lessons!