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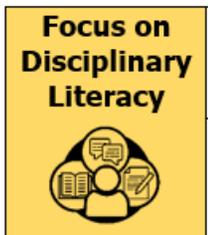
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### UNIT NARRATIVE

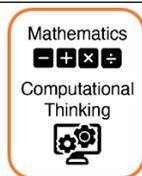
Unit 5 includes standards that are all review from 6<sup>th</sup> and 7<sup>th</sup> grade and focus on the changing Earth.

In lesson 1 the students will engage in a modeling activity to explore the layers of the Earth. Then in lesson 2 students will model the the major tectonic plate that makes up the lithosphere and describe the type(s) of crust that makeup each of the major tectonic plates. In lesson 3, students will describe the evidence that supports that Earth has changed over time, including fossil evidence, plate tectonics, and superposition. Next, in lesson 4 students will describe and model the properties of the asthenosphere and mantle that allow for the movement of the tectonic plates. In lesson 5, students will continue to study tectonic plates but, in this lesson, they will describe and model how the movement of tectonic plates cause crustal features and geologic events.

**The best science instruction practice is to remember ABC (activity before concept) and CBV (concept before vocabulary.) Students need to engage in investigation, discourse, reading, and writing to discover science concepts not being told the science content. We want students to be doing science, not memorizing science. This may be counter-intuitive to you and may not be the way you learned science, but research proves this is best practice for instruction and learning**



In science, disciplinary literacy is synonymous with the science and engineering practices. The SEPs are the context through which all science concepts should be taught. In the lessons, you will find the Science and Engineering practices icons when the SEPs are being explicitly used by students.



CONTENT

## STANDARDS

Below are the standards **taught** and **assessed** in this unit.

### Readiness Standards

7.10B describe how plate tectonics causes ocean basin formation, earthquakes, mountain building, and volcanic eruptions, including super volcanoes and hot spots.

### Supporting Standards

7.10A describe the evidence that supports that Earth has changed over time, including fossil evidence, plate tectonics, and superposition;  
6.10B model and describe the layers of Earth, including the inner core, outer core, mantle, and crust

## UNDERSTANDINGS AND QUESTIONS

Important big ideas and processes for the unit.

### Key Understandings

- The Earth is made of 4 layers, the inner core, outer core, mantle, and crust. Each layer is made up of different elements and has different characteristics.
- The lithosphere is the solid, outer part of Earth, including the brittle upper portion of the mantle and the crust. Earth's crust is made up of oceanic and continental crust.
  - Oceanic crust is made up of basalt.
  - Continental crust is mostly made of granite.
  - Basalt has a greater density than granite.
- Earth's lithosphere is divided into thick tectonic plates. The major tectonic plates are the African plate, Antarctic plate, Eurasian plate, Indo-Australian plate, North American plate, South American plate, and Pacific plate
- The evidence that supports the movement of the tectonic plates provide scientists with clues about Earth's past and how it is changed over time.
- The arrangement of sedimentary rock layers and the types of fossils found in the layers is a detailed record of events that provide scientists with clues about Earth's past and how it has changed over time.

- The plasticity of the mantle allows convection currents, caused by uneven heating inside the Earth, to move mantle and the asthenosphere. The movement of the mantle allows the tectonic plates to move also.
- Plates move because of convection currents in the mantle. Crustal features (landforms) such as mountain ranges, volcanoes, faults, and ocean basins are formed when tectonic plates interact with another plate. There are three types of plate boundary interactions: divergent, convergent, and transform.

### Key Questions

- What properties are useful in distinguishing and modeling the various distinct layers and structures of Earth?
- What is the lithosphere?
- What type of rock makes up Earth's crust?
- What are tectonic plates?
- How has the Earth changed over time and how do we know?
- How do the tectonic plates move?
- What happens to the crust when tectonic plates interact with another plate?

### Common Misconceptions

- Thinking that tectonic plates move rapidly
- Thinking geologic events are not caused by tectonic plate movement
- Thinking that plate boundaries are well-defined lines on the Earth's surface
- Confusing continental drift with plate tectonics
- Thinking that plate tectonics is not an ongoing process
- Not realizing that the same fossil evidence on separate continents means that the land masses were once connected
- Assuming superposition guarantees chronological order
- Thinking that geological changes (e.g., movement of continents or the formation of mountains) occur rapidly
- Assuming all rocks contain fossils
- Thinking that fossils represent only extinct species

**ROADMAP**

<b>ROADMAP AT A Glance: Unit 5 Changing earth</b>				
<b>Day</b>	<b>Date</b>	<b>TEKS</b>	<b>Lesson</b>	<b>Lesson Title</b>
1		6.10B	1	Layers of the Earth
2		7.10A	2	The Lithosphere
3				
4		7.10A	3	Evidence of a Dynamic Earth
5				
6		7.10B	4	Movement of Tectonic Plates
7				
8		7.10B	5	Tectonic Plate Interactions
9				
				TX_SCI_8thScience_F25_UE5

Lesson #01: Layers of the Earth		Date:
<b>Objective</b>	<b>Instructional Notes</b> <ul style="list-style-type: none"> <li>• Students will engage with a model that shows the composition/state of each layer. (such as solid crust; molten mantle, etc)</li> <li>• Students will participate in a reading to learn and complete a characteristic chart with a diagram.</li> <li>• Students will create a model showing the thickness of the layers</li> </ul>	<b>Lesson Look Fors</b>
SWBAT create and analyze models of the compositional layers of the Earth		<b>Look for teachers to:</b>
<b>Standards</b>		<input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.
TEKS 6.10B model and describe the layers of Earth, including the inner core, outer core, mantle, and crust;		<input type="checkbox"/> Promote the use of partners and whole class discussion.
<b>Vocabulary</b>		<b>Look or students to:</b>
Crust Inner Core Lava Mantle Molten Magma Outer Core		<input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence.
<b>Science Practices</b>		<b>Students Do and Know</b>
2. Developing and using models 8. Obtaining, evaluating, and communicating information	<ul style="list-style-type: none"> <li>• Students will model the layers of the earth</li> </ul>	
<b>Recurring Themes and Concepts</b>	 <ul style="list-style-type: none"> <li>• The Earth is made of 4 layers, the inner core, outer core, mantle, and crust. Each layer is made up of different elements and has different characteristics.</li> </ul>	
		

Lesson #02: The Lithosphere (2 Day Lesson)		Date:
<b>Objective</b>	<b>Instructional Notes</b>	<b>Lesson Look Fors</b>
<b>SWBAT</b> describe the two types of crust that make up Earth's lithosphere and model the tectonic plates	<ul style="list-style-type: none"> <li>Students will investigate to compare the density of basalt and granite.</li> <li>Students will engage in a reading to learn to deepen their understanding of the crust that makes up the Earth's lithosphere.</li> <li>Students will engage in a modeling activity to explore the major tectonic plate that makes up the lithosphere and describe the type(s) of crust that makeup each of the major tectonic plate.</li> <li>Students will identify and describe the type of crust that makes up a tectonic plate based on its location on a map.</li> </ul>	<b>Look for teachers to:</b>
<b>Standards</b>		<b>Look or students to:</b>
<b>TEKS 7.10A</b> describe the evidence that supports that Earth has changed over time, including fossil evidence, plate tectonics, and superposition		<input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion.
<b>Vocabulary</b>		<input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence.
Asthenosphere Continental Crust Extrusive Rock Intrusive Rock Lithosphere Oceanic Crust Tectonic Plate		<b>Students Do and Know</b>
<b>Science Practices</b>		 <p>engage in a modeling activity to explore the major tectonic plate that makes up the lithosphere and describe the type(s) of crust that makeup each of the major tectonic plate.</p>
2. Developing and using models 3. Planning and carrying out investigations		 <ul style="list-style-type: none"> <li>The lithosphere is the solid, outer part of Earth, including the brittle upper portion of the mantle and the crust. Earth's crust is made up of oceanic and continental crust.             <ul style="list-style-type: none"> <li>Oceanic crust is made up of basalt.</li> <li>Continental crust is mostly made of granite.</li> <li>Basalt has a greater density than granite</li> </ul> </li> </ul>
<b>Recurring Themes and Concepts</b>		

Lesson #03: Evidence of a Dynamic Earth (2 Day Lesson)		Date:
<b>Objective</b>	<b>Instructional Notes</b> <ul style="list-style-type: none"> <li>Students will analyze maps to collect evidence to support the claim that the continents on Earth were once joined together in a supercontinent called Pangea.</li> <li>Students will then use the evidence to piece the landmasses together to recreate Pangea.</li> <li>Students will then participate in a reading to learn to learn how the arrangement of sedimentary rock layers and the types of fossils found in the layers provided evidence to how Earth has changed.</li> <li>Students participate in a card sort where they will sequence the order of events in the formation of a sedimentary rock formation.</li> <li>Students will describe the evidence scientists use to support the claim that Earth has changed over time. Students will correctly identify the relative age of the layers in a sedimentary rock formation. Students will identify the clues that fossils found in rock formation give about the changes in the environment.</li> </ul>	<b>Lesson Look Fors</b>
SWBAT describe the evidence scientists use to support the claim that Earth has changed over time.		<b>Look for teachers to:</b>
<b>Standards</b>		<input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss. <input type="checkbox"/> Promote the use of partners and whole class discussion.
TEKS 7.10A describe the evidence that supports that Earth has changed over time, including fossil evidence, plate tectonics, and superposition;		<b>Look or students to:</b>
<b>Vocabulary</b>		<input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence.
Fault Fold Intrusion Law of Superposition Pangea		<b>Students Do and Know</b>
<b>Science Practices</b>		<ul style="list-style-type: none"> <li>Students will describe the evidence scientists use to support the claim that Earth has changed over time.</li> <li>The evidence that supports the movement of the tectonic plates provide scientists with clues about Earth's past and how it is changed over time.</li> <li>The arrangement of sedimentary rock layers and the types of fossils found in the layers is a detailed record of events that provide scientists with clues about Earth's past and how it has changed over time.</li> </ul>
1. Asking questions and defining problems 2. Developing and using models	 	
<b>Recurring Themes and Concepts</b>		

Lesson #04: Movement of Tectonic Plates (2 Day Lesson)		Date:	
<b>Objective</b>	<b>Instructional Notes</b>	<b>Lesson Look Fors</b>	
<p><b>SWBAT</b> describe and model the properties of the asthenosphere and mantle that allow for the movement of the tectonic plates.</p>	<ul style="list-style-type: none"> <li>• Students will participate in two activities to explore the properties (plasticity and uneven heating creating convection currents) of the mantle and the asthenosphere that allow for the movement of the tectonic plates.</li> <li>• Students will complete a paragraph to describe the properties of the asthenosphere and mantle that allow for the movement of the tectonic plates.</li> </ul>	<p><b>Look for teachers to:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.</li> <li><input type="checkbox"/> Promote the use of partners and whole class discussion.</li> </ul> <p><b>Look or students to:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Engage in discourse and productive struggle</li> <li><input type="checkbox"/> Justify their reasoning and support their ideas with evidence.</li> </ul>	
<b>Standards</b>		<p><b>TEKS 7.10B</b> describe how plate tectonics causes ocean basin formation, earthquakes, mountain building, and volcanic eruptions, including supervolcanoes and hot spots.</p>	
<b>Vocabulary</b>		<p>Plasticity Convection Currents</p>	
<b>Science Practices</b>		<ol style="list-style-type: none"> <li>1. Asking questions and defining problems</li> <li>2. Developing and using models</li> <li>3. Planning and carrying out investigations</li> <li>8. Obtaining, evaluating, and communicating information</li> </ol>	
<b>Recurring Themes and Concepts</b>			
		<p><b>Students Do and Know</b></p> <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 20px;">  <p>Do</p> </div> <div> <ul style="list-style-type: none"> <li>• Students will describe and model the properties of the asthenosphere and mantle that allow for the movement of the tectonic plates.</li> </ul> </div> </div> <div style="margin-top: 20px;"> <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 20px;">  <p>Know</p> </div> <div> <ul style="list-style-type: none"> <li>• The plasticity of the mantle allows convection currents, caused by uneven heating inside the Earth, to move mantle and the asthenosphere. The movement of the mantle allows the tectonic plates to move also.</li> </ul> </div> </div> </div>	

Lesson #05: Tectonic Plate Interactions (2 Day Lesson)		Date:
<b>Objective</b>	<b>Instructional Notes</b>	<b>Lesson Look Fors</b>
<b>SWBAT</b> describe and model how the movement of tectonic plates cause crustal features and geologic events	<ul style="list-style-type: none"> <li>• Students will locate crustal features on a map using latitude and longitude coordinates and identify patterns that these features occur at plate boundaries.</li> <li>• Students will model the different types of plate interactions.</li> <li>• Students will complete a reading to learn and apply the modeling and map activity to the new concepts they learned.</li> <li>• Students will complete a card short and chart to identify and describe the type of plate boundary, the type of plates that are interacting, the crustal features that are formed, and an example of each.</li> </ul>	<b>Look for teachers to:</b>
<b>Standards</b>		<input type="checkbox"/> Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.
<b>TEKS 7.10B</b> describe how plate tectonics causes ocean basin formation, earthquakes, mountain building, and volcanic eruptions, including supervolcanoes and hot spots		<input type="checkbox"/> Promote the use of partners and whole class discussion.
<b>Vocabulary</b>		<b>Look or students to:</b>
Convergent Boundary Divergent Boundary Subduction Transform Boundary		<input type="checkbox"/> Engage in discourse and productive struggle <input type="checkbox"/> Justify their reasoning and support their ideas with evidence.
<b>Science Practices</b>		<b>Students Do and Know</b>
2. Developing and using models 4. Analyzing and interpreting data 7. Engaging in argument from evidence	<ul style="list-style-type: none"> <li>• Students will describe and model how the movement of tectonic plates cause crustal features and geologic events</li> </ul>	
<b>Recurring Themes and Concepts</b>	 <ul style="list-style-type: none"> <li>• Plates move because of convection currents in the mantle. Crustal features (landforms) such as mountain ranges, volcanoes, faults, and ocean basins are formed when tectonic plates interact with another plate. There are three types of plate boundary interactions: divergent, convergent, and transform.</li> </ul>	
		

## UNPACKED STANDARDS

Focus standards for this unit.

Standard:	7.10B describe how plate tectonics causes ocean basin formation, earthquakes, mountain building, and volcanic eruptions, including super volcanoes and hot spots.	
Specificity	Content Builder	
<p>Cognition: describe Content: how plate tectonics causes (geologic events) Including, but not limited to:</p> <ul style="list-style-type: none"> <li>● Plate tectonics               <ul style="list-style-type: none"> <li>○ Types of plates:                   <ul style="list-style-type: none"> <li>▪ Continental plates - less dense plate</li> <li>▪ Oceanic plates - more dense plate</li> </ul> </li> </ul> </li> <li>● Ocean basin formation               <ul style="list-style-type: none"> <li>○ Divergent boundary - plate boundary where the plates separate</li> <li>○ Seafloor spreading</li> </ul> </li> <li>● Earthquakes               <ul style="list-style-type: none"> <li>○ Transform boundary - plates slide past each other in different directions</li> </ul> </li> <li>● Mountain building               <ul style="list-style-type: none"> <li>○ Convergent boundary - plate boundary where plates are colliding</li> <li>○ Continental / continental boundary</li> </ul> </li> <li>● Volcanic eruptions               <ul style="list-style-type: none"> <li>○ Convergent boundary - plate boundary where plates are colliding</li> <li>○ Continental / oceanic boundary (subduction zone)</li> <li>○ Supervolcanoes                   <ul style="list-style-type: none"> <li>▪ A volcanic center that has had an eruption of a magnitude of 8 on the Volcano Explosivity Index A caldera forms</li> <li>▪ Ex: Valles Caldera in New Mexico and Long Valley in eastern California</li> </ul> </li> <li>○ Hotspots                   <ul style="list-style-type: none"> <li>▪ Tons of boiling magma pushes toward the surface in one spot.</li> <li>▪ Rising high pressure magma finds an opening, and it explodes to the surface.</li> <li>▪ Ex: Hawaii</li> </ul> </li> </ul> </li> </ul>	<p>Plate tectonics is the driving force that shapes the Earth's surface through the movement of plates. It causes ocean basins, earthquakes, mountains, and volcanic eruptions. Plate movements are relatively slow, occurring at a few centimeters per year, and they do not always result in immediate geological changes. Understanding how plate tectonics influences these processes is vital for comprehending the dynamic nature of our planet that continues to shape Earth's surface.</p> <p>A boundary is where two tectonic plates meet. The plates are always in motion due to the convection current that occurs beneath the Earth's surface. However, this motion is very slow and happens over a long period of time. At these plate boundaries, different types of motion can occur:</p> <div data-bbox="1583 581 2039 1008" data-label="Image"> <p>The diagram illustrates three types of plate boundaries: Divergent, Convergent, and Transform. Each is shown in a 3D block diagram with arrows indicating plate movement. Below these are cross-sectional views of the Earth's crust and mantle. Labels include Oceanic Ridge, Oceanic Trench, Transform Fault, OCEAN, CRUST, and MANTLE.</p> </div> <p><b>Divergent Boundaries</b> We find mid-ocean ridges at divergent boundaries where plates move apart; they look like large rifts in the ocean floor. An example of this occurs at the mid-Atlantic ridge. When a divergent boundary occurs on land, we get rifts or canyons like the Great Rift Valley in East Africa (unlike the Grand Canyon, which formed by weathering and erosion).</p> <p><b>Convergent Boundaries</b> We can find mountains and trenches at convergent boundaries where plates push together. When two plates with continental crust collide, we get high mountains, like the Himalayas in Asia where the Indo-Australian plate is colliding into the Eurasian plate. Since oceanic crust is so much more dense than continental crust, the oceanic crust sinks beneath the continental crust when these two collide (come together).</p>	

### Instructional Implications

- Provide opportunities for students to explore and describe how convection currents create tectonic plate movement in Earth’s mantle.
- Have students explore and explain plate boundary types and the geological events they can create along
  - convergent, divergent, and transform tectonic boundaries.
- Use diagrams, animations, or models to help students visualize the processes involved in plate tectonics.
- Engage students in hands-on activities to create models of tectonic plates and simulate their movements.
- Provide real-world examples to demonstrate the effects of plate tectonics.
- Help students see the Recurring Themes and Concepts of stability and change and cause and effect in this standard.

### Student Misconceptions

- Thinking that tectonic plates move rapidly
- Thinking geologic events are not caused by tectonic plate movement
- Thinking that plate boundaries are well-defined lines on the Earth’s surface
- Confusing continental drift with plate tectonics
- Students may struggle to connect the movement of tectonic plates to the specific geologic events they cause.

### Possible STAAR Stimuli

Investigation	Diagram	Visual/Image/Illustration
Model	Informational Text/List	

### Vocabulary

convection current convergent boundary divergent boundary earthquake	fault geological event hot spot mid-ocean ridge	mountain building ocean basin plate tectonics seafloor spreading	subduction super volcano transform boundary volcano
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or smash together). Where the oceanic crust dips beneath the continental crust, a trench is formed on the seafloor. In addition, as this oceanic crust sinks into the mantle and is heated, it begins to melt and rise to the surface, causing mountains and volcanoes to form. This is happening where the Pacific plate (oceanic crust) is colliding with and sinking beneath the South American plate, forming the Andes mountains. The Pacific Ring of Fire is a zone of earthquakes and volcanoes frequently occurring along the Pacific Ocean coastline where plates converge.

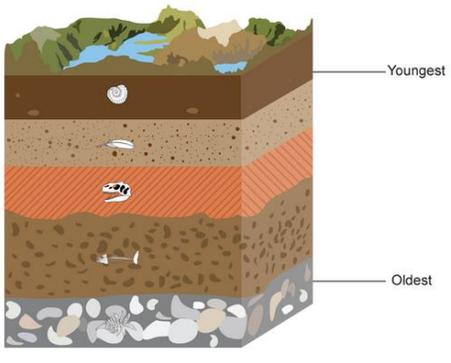
#### Transform Boundaries

Plates slide or scrape past each other at transform boundaries. The tension between these plates is released when they slide past, and this leads to faulting, earthquakes, and changes in Earth’s surface. This happens often in California along the San Andreas Fault.

**Supervolcanoes and Hot Spots** Beneath the Earth’s crust, magma is constantly moving. This is because of the convection currents that exist in the mantle. This results in volcanic activity.

**Hot Spots** Hot spot volcanism is unique because the volcanoes created are not created near tectonic plate boundaries. Instead, they are formed in the middle of plates. Hot spots are created by an area deep within the Earth’s mantle where heat rises and begins to melt the rock at the base of the lithosphere. The crust becomes brittle, and the magma pushes through the crust, creating a volcano in the hot spot area. As the volcano continues to push magma to the surface, it cools and begins to build land. Hot spots do not move, but the plate above them does. Therefore, most volcanoes created by hot spots eventually will stop because it is cut off from the supply of magma from the hot spot. Earth is home to 40 to 50 hot spots and Hawaii and New Zealand are two examples

**Supervolcanoes** are volcanoes that have had with a Volcanic Explosivity Index (VEI) of greater than 8. This means the eruption deposits are greater than 1,000 cubic kilometers (240 cubic miles). These types of volcanoes are formed when magma rises in the mantle and pools beneath the crust and cannot escape; this creates pressure until the crust can no longer hold, and the eruption occurs. They can occur over hot spots or near subduction zones. These eruptions can have devastating effects near and far from the site of the eruptions. Eruptions like these disrupt the global climate and can create mini ice ages and extinctions. However, these types of eruptions are rare, and the latest one was about 25,000 years ago. One of the largest supervolcanoes on Earth is the one that sits under Yellowstone National Park in the USA and it has erupted several times in Earth’s history.

Standard:	7.10A describe the evidence that supports that Earth has changed over time, including fossil evidence, plate tectonics, and superposition	
Specificity	Content Builder	
<p>Cognition: Describe Content: evidence that supports that Earth has changed over time Including, but not limited to:</p> <ul style="list-style-type: none"> <li>● Plate tectonics <ul style="list-style-type: none"> <li>○ Continental drift theory - the hypothesis that Earth's continents were once one large landmass and have moved over geologic time relative to each other <ul style="list-style-type: none"> <li>▪ Proposed in 1912 by Alfred Wegener</li> <li>▪ A large supercontinent breaking apart (Pangaea)</li> <li>▪ Continents in motion</li> <li>▪ No explanation regarding a mechanism to explain movement</li> <li>▪ Evidence might include: <ul style="list-style-type: none"> <li>➢ Continents fit together like puzzle pieces.</li> <li>➢ Fossil and rock correlation</li> <li>➢ Superposition (law of) - Each rock layer is older than the one above it.</li> <li>➢ Fossils on the edge of one continent were like those on the facing edge of the matching continent's corresponding rock layer.</li> <li>➢ Index fossils - widely distributed organisms that lived during only one short period of time</li> </ul> </li> </ul> </li> <li>○ Plate tectonics - scientific theory that explains how major landforms are created <ul style="list-style-type: none"> <li>▪ Proposed in 1960 by Harry Hess</li> <li>▪ Development of mechanisms (convection currents in the mantle) for continental drift</li> <li>▪ Magnetic striping and reversal</li> <li>▪ Correlation of fossil data from drilling on either side of the mid-ocean ridge</li> <li>▪ Seismic activity zones and plate boundaries - Ring of Fire</li> <li>▪ Location of mountain ranges</li> </ul> </li> </ul> </li> <li>● Fossil evidence <ul style="list-style-type: none"> <li>○ Fossils - mineral replacements, preserved remains, or traces of organisms that lived in the past</li> </ul> </li> </ul>	<p>Evidence supports changes to Earth's surface over time. Plate tectonics explains the movement of Earth's plates, forming mountains, earthquakes, and volcanoes. Earth's top layer is called the lithosphere and it comprises the crust and the rigid upper mantle. It is divided into tectonic plates. The plates move very slowly on top of a flowing asthenosphere, the middle layer of the mantle. This movement causes Earth's surface to change at the boundaries between plates.</p> <p>The fossil record shows identical or similar fossils in areas separated by vast distances.</p> <p>The principle of superposition helps determine the order of geological events based on rock layers. The outermost layer, known as the crust, is composed of rock. The rocks are in layers, from the oldest to the youngest rock. This layering is called the law of superposition. Rock found on top is the youngest, and rock found furthest from the top is the oldest. Scientists use this to determine the age of landforms and fossils, depending on the layer in which the specimen or feature is located.</p> <p>By studying this evidence, students appreciate Earth's dynamic nature and the ongoing processes that shape it.</p>	
	Instructional Implications	
	<p>When you teach this concept, remember to:</p> <ul style="list-style-type: none"> <li>● Explore Alfred Wegner's continental drift theory and Harry Hess's plate tectonic theory.</li> </ul>	

<ul style="list-style-type: none"> <li>○ Index fossils - widely distributed organisms that lived during only one short period of time</li> <li>○ Fossils on the edge of one continent were like those on the facing edge of the matching continent.</li> <li>• Superposition</li> </ul>	<ul style="list-style-type: none"> <li>• Use diagrams, animations, or interactive models to illustrate the movement and interaction of tectonic plates.</li> <li>• Analyze evidence to support continental drift and Pangaea by comparing the fit of the continents.</li> <li>• Analyze evidence to support plate tectonic theory by comparing fossil records on continents and geological features.</li> <li>• Explain how undisturbed rock layers can provide a chronological record of Earth's changes, with younger rocks on top and older rocks at the bottom. Engage students in hands-on activities such as examining rock layers or creating stratigraphic sequences to reinforce their understanding of superposition.</li> </ul>		
<b>Student Misconceptions</b>	<b>Possible STAAR Stimuli</b>		
<ul style="list-style-type: none"> <li>• Students may struggle connecting the various pieces of evidence (e.g., fossils, plate tectonics, and superposition) to form an understanding of Earth's changes.</li> <li>• Thinking that plate tectonics is not an ongoing process</li> <li>• Not realizing that the same fossil evidence on separate continents means that the land masses were once connected</li> <li>• Assuming superposition guarantees chronological order</li> <li>• Thinking that geological changes (e.g., movement of continents or the formation of mountains) occur rapidly</li> <li>• Assuming all rocks contain fossils</li> <li>• Thinking that fossils represent only extinct species</li> </ul>	Diagram	Visual/Image/ Illustration	Model
	Informational Text/List		
	<b>Vocabulary</b>		
continental drift theory fossil record Pangaea superposition		fault magma plate tectonics theory	

## VERTICAL STANDARDS

This section details the **progression** of key student expectations/standards\*\* in the courses **before** and **after** this course. This will help you understand what **prior knowledge skills to build upon** and guide you in knowing what **skills you are preparing your students** for in the subsequent course.

6 <sup>th</sup> Grade	7 <sup>th</sup> Grade	8 <sup>th</sup> Grade
6.10A differentiate between the biosphere, hydrosphere, atmosphere, and geosphere and identify components of each system	7.10A describe the evidence that supports that Earth has changed over time, including fossil evidence, plate tectonics, and superposition; and	
6.10B model and describe the layers of Earth, including the inner core, outer core, mantle, and crust	7.10B describe how plate tectonics causes ocean basin formation, earthquakes, mountain building, and volcanic eruptions, including supervolcanoes and hot spots	
6.10C describe how metamorphic, igneous, and sedimentary rocks form and change through geologic processes in the rock cycle.		

## VOCABULARY GLOSSARY

Domain-specific words and definitions for this unit.

Key Content Vocabulary
<p>List and define key vocabulary terms</p> <ul style="list-style-type: none"> <li>• <b>Asthenosphere</b> - lies beneath the lithosphere and consists of several hundred miles of partially molten rock.</li> <li>• <b>Continental Crust</b>- the part of the lithosphere made up of igneous granite rock found under the continents.</li> <li>• <b>Convection Currents</b> - transfer of thermal energy from one place to another by mass motion of a fluid such as water, air, or molten rock.</li> <li>• <b>Convergent Boundary</b> – a tectonic boundary where two plates are moving toward each other.</li> <li>• <b>Divergent Boundary</b> - a tectonic boundary where two plates are moving away from each other.</li> <li>• <b>Extrusive Rock</b> – igneous rock that forms from lava that hardened on the surface of the Earth.</li> <li>• <b>Fault</b> - a large diagonal crack running through a rock.</li> <li>• <b>Fold</b> – the bending of rock due to stresses such as compression, tension, or shearing.</li> <li>• <b>Intrusion</b> – the forcing of molten rock into cracks, faults, or between layers of rock formations.</li> <li>• <b>Intrusive Rock</b> – igneous rock that forms from magma that hardens beneath the surface of the Earth.</li> <li>• <b>Law of Superposition</b> - states that each rock layer or strata is older than the one above it.</li> <li>• <b>Lithosphere</b> - the rigid outer part of the earth, consisting of the crust and upper mantle.</li> </ul>

- **Oceanic Crust** – the part of the lithosphere made up of igneous basalt rock found under the oceans.
- **Pangea** - a supercontinent that existed during the late Paleozoic and early Mesozoic eras.
- **Plasticity** - the ability to flow or to change shape when subjected to stress.
- **Subduction** - the sideways and downward movement of the edge of a plate of the earth's crust into the mantle beneath another plate.
- **Tectonic Plate** - pieces of the Earth's crust and uppermost mantle that together make up the lithosphere.
- **Transform Boundary** - a tectonic boundary where two plates slide past each other.
- **Unconformity**- a missing piece of rock layer due to erosion.

**Consumable Materials and Lab Supplies for Unit 4 (1 per group of 4 students unless noted)**

Lesson	Commercial Vendor or Home	Lab Supplies (Science Vendor)
Lesson 01: Layers of the Earth	<p><u>Suggested Materials for Teacher Model</u> (you can substitute as needed)</p> <ul style="list-style-type: none"> <li>• 20-oz soda bottles – 1 for each class</li> <li>• Plaster of Paris</li> <li>• resealable baggie- snack size</li> <li>• icing</li> <li>• knife</li> <li>• vegetable oil</li> <li>• slime</li> <li>• disposable spoon</li> <li>• marker</li> <li>• food coloring</li> <li>• gram crackers</li> <li>• disposable bowl for mixing plaster of Paris</li> </ul> <p><u>Materials for Student Model</u></p> <ul style="list-style-type: none"> <li>• 4 colors of clay</li> <li>• Dental floss (about 8")</li> <li>• Colored Pencils</li> </ul>	
Lesson 02: The Lithosphere	<p><u>Name that Plate</u> (per student)</p> <p>Construction paper</p>	<p><u>Don't Take it for Granite!</u></p> <ul style="list-style-type: none"> <li>• Sample of granite and basalt (found in igneous rock sample)</li> <li>• Hand lens</li> <li>• 100 mL graduated cylinder</li> <li>• Balance</li> <li>• Water</li> </ul>

		<u>Name that Plate (Per student)</u> <ul style="list-style-type: none"> <li>• Scissors</li> <li>• Markers or colored pencil</li> </ul>
Lesson 03: Evidence of a Dynamic Earth	<u>Evidence of a Changing Earth</u> <ul style="list-style-type: none"> <li>• Construction paper</li> </ul>	<u>Evidence of a Changing Earth</u> <ul style="list-style-type: none"> <li>• Map pencils</li> <li>• Glue</li> <li>• Scissors</li> </ul>
Lesson 04: Movement of Tectonic Plates	<u>Plasticity Lab</u> <ul style="list-style-type: none"> <li>• Cornstarch</li> <li>• Water</li> <li>• Craft stick</li> <li>• Paper towels</li> <li>• Small paper cup</li> </ul> <u>Thermal Energy Transfer</u> <ul style="list-style-type: none"> <li>• Wax paper</li> <li>• Clear plastic pan (dollar store – potted plant tray will work)</li> <li>• Water</li> <li>• Paper towels</li> <li>• 4 foam cups</li> <li>• Cold water (ice)</li> <li>• Food coloring</li> </ul>	<u>Plasticity Lab</u> <ul style="list-style-type: none"> <li>• Balance</li> <li>• Pipette</li> <li>• 50 mL beaker</li> </ul> <u>Thermal Energy Transfer</u> <ul style="list-style-type: none"> <li>• Hot plate</li> <li>• Pipette</li> <li>• 500 mL beaker</li> </ul> Heat resistant gloves
Lesson 04: Tectonic Plate Interactions	<u>Thinking Task (per student)</u> <ul style="list-style-type: none"> <li>• Sheet Protector</li> <li>• dry erase marker</li> </ul> <u>Modeling Tectonic Plate Interactions</u> <ul style="list-style-type: none"> <li>• Wax paper</li> <li>• ½ 16 oz. tub of frosting</li> <li>• Plastic knife</li> <li>• 1 red Fruit Roll-Ups© snack</li> <li>• 1 whole graham cracker</li> <li>• Cup with water</li> </ul>	