Shelby County Schools Science Vision

Shelby County Schools' vision of science education is to ensure that from early childhood to the end of the 12th grade, all students have heightened curiosity and an increased wonder of science; possess sufficient knowledge of science and engineering to engage in discussions; are able to learn and apply scientific and technological information in their everyday lives; and have the skills such as critical thinking, problem solving, and communication to enter careers of their choice, while having access to connections to science, engineering, and technology.

To achieve this, Shelby County Schools has employed The Tennessee Academic Standards for Science to craft meaningful curricula that is innovative and provide a myriad of learning opportunities that extend beyond mastery of basic scientific principles.

Introduction

In 2014, the Shelby County Schools Board of Education adopted a set of ambitious, yet attainable goals for school and student performance. The District is committed to these goals, as further described in our strategic plan, Destination 2025. In order to achieve these ambitious goals, we must collectively work to provide our students with high quality standards aligned instruction. The Tennessee Academic Standards for Science provide a common set of expectations for what students will know and be able to do at the end of each grade, can be located in the Tennessee Science Standards Reference. Tennessee Academic Standards for Science are rooted in the knowledge and skills that students need to succeed in post-secondary study or careers. While the academic standards establish desired learning outcomes, the curricula provides instructional planning designed to help students reach these outcomes. The curriculum maps contain components to ensure that instruction focuses students toward college and career readiness. Educators will use this guide and the standards as a roadmap for curriculum and instruction. The sequence of learning is strategically positioned so that necessary foundational skills are spiraled in order to facilitate student mastery of the standards.

Our collective goal is to ensure our students graduate ready for college and career. Being College and Career Ready entails, many aspects of teaching and learning. We want our students to apply their scientific learning in the classroom and beyond. These valuable experiences include students being facilitators of their own learning through problem solving and thinking critically. The Science and Engineering Practices are valuable tools used by students to engage in understanding how scientific knowledge develops. These practices rest on important "processes and proficiencies" with longstanding importance in science education. The science maps contain components to ensure that instruction focuses students toward understanding how science and engineering can contribute to meeting many of the major challenges that confront society today. The maps are centered around five basic components: the Tennessee Academic Standards for Science, Science and Engineering Practices, Disciplinary Core Ideas, Crosscutting Concepts, and Phenomena.

The Tennessee Academic Standards for Science were developed using the National Research Council's 2012 publication, A Framework for K-12 Science Education as their foundation. The framework presents a new model for science instruction that is a stark contrast to what has come to be the norm in science classrooms. Thinking about science had become memorizing concepts and solving mathematical formulae. Practicing science had become prescribed lab situations with predetermined outcomes. The framework proposes a three-dimensional approach to science education that capitalizes on a child's natural curiosity. The Science Framework for K-12 Science Education provides the blueprint for developing the effective science practices*.* The *Framework* expresses a vision in science education that requires students to operate at the nexus of three dimensions of learning: Science and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas. The *Framework* identified a small number of disciplinary core ideas that all students should learn with increasing depth and sophistication, from Kindergarten through grade twelve. Key to the vision expressed in the *Framework* is for students to learn these disciplinary core ideas in the context of science and engineering practices. The importance of combining Science and Engineering Practices, Crosscutting Concepts and Disciplinary Core Ideas is stated in the *Framework* as follows:

Standards and performance expectations that are aligned to the framework must take into account that students cannot fully understand scientific and engineering ideas without engaging in the practices of inquiry and the discourses by which such ideas are developed and refined. At the same time, they cannot learn or show competence in practices except in the context of specific content. (NRC Framework, 2012, p. 218)

To develop the skills and dispositions to use scientific and engineering practices needed to further their learning and to solve problems, students need to experience instruction in which they use multiple practices in developing a particular core idea and apply each practice in the context of multiple core ideas. We use the term "practices" instead of a term such as "skills" to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice. Students in grades K-12 should engage in all eight practices over each grade band**.** Crosscutting concepts have application across all domains of science. As such, they are a way of linking the different domains of science. Crosscutting concepts have value because they provide students with connections and intellectual tools that are related across the differing areas of disciplinary content and can enrich their application of practices and their understanding of core ideas. There are seven crosscutting concepts that bridge disciplinary boundaries, uniting core ideas throughout the fields of science and engineering. Their purpose is to help students deepen their understanding of the disciplinary core ideas and develop a coherent and scientifically based view of the world.

The map is meant to support effective planning and instruction to rigorous standards. It is *not* meant to replace teacher planning, prescribe pacing or instructional practice. In fact, our goal is not to merely "cover the curriculum," but rather to "uncover" it by developing students' deep understanding of the content and mastery of the standards. Teachers who are knowledgeable about and intentionally align the learning target (standards and objectives), topic, text(s), task, and needs (and assessment) of the learners are best-positioned to make decisions about how to support student learning toward such mastery.

Teachers are therefore expected--with the support of their colleagues, coaches, leaders, and other support providers--to exercise their professional judgment aligned to our shared vision of effective instruction, the Teacher Effectiveness Measure (TEM) and related best practices. However, while the framework allows for flexibility and encourages each teacher/teacher team to make it their own, our expectations for student learning are non-negotiable. We must ensure all of our children have access to rigor—high-quality teaching and learning to grade level specific standards, including purposeful support of literacy and language learning across the content areas.

Science and Engineering Practices

1. Asking questions & defining problems
2. Developing & using models
3. Planning & carrying out investigations
4. Analyzing & interpreting data
5. Using mathematics & computational thinking
6. Constructing explanations & designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, & communicating information

Disciplinary Core Ideas

<u>**Physical Science**</u>
PS 1: Matter & its interactions
PS 2: Motion & stability: Forces & interactions
PS 3: Energy
PS 4: Waves & their applications in technologies for information transfer

<u>**Life Sciences**</u>
LS 1: From molecules to organisms: structures & processes
LS 2: Ecosystems: Interactions, energy, & dynamics
LS 3: Heredity: Inheritance & variation of traits
LS 4: Biological evaluation: Unity & diversity

<u>**Earth & Space Sciences**</u>
ESS 1: Earth's place in the universe
ESS 2: Earth's systems
ESS 3: Earth & human activity

<u>**Engineering, Technology, & the Application of Science**</u>
ETS 1: Engineering design
ETS 2: Links among engineering, technology, science, & society

Crosscutting Concepts

1. Patterns
2. Cause & effect
3. Scale, proportion, & quantity
4. Systems & system models
5. Energy & matter
6. Structure & function
7. Stability & change

Learning Progression

At the end of the elementary science experience, students can observe and measure phenomena using appropriate tools. They are able to organize objects and ideas into broad concepts first by single properties and later by multiple properties. They can create and interpret graphs and models that explain phenomena. Students can keep notebooks to record sequential observations and identify simple patterns. They are able to design and conduct investigations, analyze results, and communicate the results to others. Students will carry their curiosity, interest and enjoyment of the scientific world view, scientific inquiry, and the scientific enterprise into middle school.

At the end of the middle school science experience, students can discover relationships by making observations and by the systematic gathering of data. They can identify relevant evidence and valid arguments. Their focus has shifted from the general to the specific and from the simple to the complex. They use scientific information to make wise decision related to conservation of the natural world. They recognize that there are both negative and positive implications to new technologies.

As an SCS graduate, former students should be literate in science, understand key science ideas, aware that science and technology are interdependent human enterprises with strengths and limitations, familiar with the natural world and recognizes both its diversity and unity, and able to apply scientific knowledge and ways of thinking for individual and social purposes.

Structure of the Standards

- Grade Level/Course Overview: An overview that describes that specific content and themes for each grade level or high school course.
- Disciplinary Core Idea: Scientific and foundational ideas that permeate all grades and connect common themes that bridge scientific disciplines.
- Standard: Statements of what students can do to demonstrate knowledge of the conceptual understanding. Each performance indicator includes a specific science and engineering practice paired with the content knowledge and skills that students should demonstrate to meet the grade level or high school course standards.

Purpose of Science Curriculum Maps

This map is a guide to help teachers and their support providers (e.g., coaches, leaders) on their path to effective, college and career ready (CCR) aligned instruction and our pursuit of Destination 2025. It is a resource for organizing instruction around the Tennessee Academic Standards for Science, which define what to teach and what students need to learn at each grade level. The map is designed to reinforce the grade/course-specific standards and content (scope) and provides *suggested* sequencing, pacing, time frames, and aligned resources. Our hope is that by curating and organizing a variety of standards-aligned resources, teachers will be able to spend less time wondering what to teach and searching for quality materials (though they may both select from and/or supplement those included here) and have more time to plan, teach, assess, and reflect with colleagues to continuously improve practice and best meet the needs of their students.

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8th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback					
Quarter 1		Quarter 2		**Quarter 3**	Quarter 4
Unit 1 Motion and Forces	Unit 2 Electricity and Magnetism	Unit 3 Waves	Unit 4 Our Universe	**Unit 5** **Restless Earth**	Unit 6 Change Over Time
4 weeks	5 weeks	6 weeks	3 weeks	**9 weeks**	9 weeks
UNIT 5: Restless Earth (9 weeks)					
Overarching Question(s)					
How and why is Earth constantly changing?					
Unit 5, Lesson 1	**Lesson Length**	**Essential Question**		**Vocabulary**	
The Rock Cycle	1 week	What is the rock cycle?		weathering, igneous rock, rock cycle, rift zone, erosion, sedimentary rock, uplift, deposition, metamorphic rock, subsidence	
Standards and Related Background Information		**Instructional Focus**		**Instructional Resources**	
DCI(s) ESS2: Earth's Systems **Standard(s)** 8.ESS2.3 Describe the relationship between the processes and forces that create igneous, sedimentary, and metamorphic rocks. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 8.ESS2.3 Different processes are responsible for forming each different type of rock. It is possible to understand parts of the geologic history of places or regions by looking at the types of rocks found		**Learning Outcomes** • Describe weathering, erosion, and deposition. • Describe the formation of sedimentary, igneous, and metamorphic rocks. • Discuss how rock changes as it goes through the rock cycle. • Explain uplift, subsidence, and rift zone.		**Curricular Resources** HMH Tennessee Science TE, Unit 8, Lesson 2 pp. 566-579 Engage • Engage Your Brain #s 1 and 2, SE p. 469 • Active Reading #s 3 and 4, SE p. 469 Weathering, Erosion, and Deposition • Water Erosion Activity, TE p. 568 Three Classes of Rock • Igneous Rock Formation, TE p. 568 Explore Weathering, Erosion, and Deposition • Modeling Weathering Quick Lab, TE p. 569 Rock Cycle	

there. While understanding traditional models for the rock cycle is expected, it is important that students are able to use these models to explain events that have occurred in the past, accounting for changes that take place over spans of time far exceeding human lifetimes.

Igneous rocks indicate undisturbed or younger areas. Patterns in the distribution of igneous rocks coincide with the patterns for earthquakes and the plate boundaries explained in tectonic theory.

The presence of sedimentary rocks in an area indicates that that area was once lower lying and that erosive processes occurring in nearby areas.

Metamorphic rocks can form from either igneous or sedimentary rocks, and are evidence for tectonic pressures, for example in the uplift of mountains.

Suggested Science and Engineering Practice(s)
Developing and Using Models 8.ESS2.3
Students create models which are responsive and incorporate features that are not visible in the natural world, but have implications on the behavior of the modeled systems and can identify limitations of their models.

Suggested Phenomenon

Click on the picture to access the Grand Canyon video. Allow students to watch the video without the sound and complete a See Think Wonder Template.

Possible Guiding Question(s):
How was this landform created?

- Crayon Rock Cycle Quick Lab, TE p. 569

Explain
Weathering, Erosion, and Deposition
- List #5, SE p. 470
- Active Reading #7, SE p. 471

Three Classes of Rock
- Active Reading #8, SE p. 472
- Think Outside the Book #9, SE p. 472
- Compare #10, Se p. 473

Rock Cycle
- Active Reading #11, SE p. 474
- Visualize It! #12, SE p. 475
- Think Outside the Book #13, SE p. 475
- Identify #14, SE p. 475
- Magma to Rock and Back Again Discussion, TE p. 568

Tectonic Plate Motion and the Rock Cycle
- Compare #15, SE p. 476
- Visualize It! #16, SE p. 476

Extend
Reinforce and Review
- Model the Rock Cycle Activity, TE p. 572
- Concept Map Graphic Organizer, TE p. 572
- Visual Summary, SE p. 478

Going Further
- Ecology Connection, TE p. 572
- Art Connection, TE p. 572
- Why It Matters, SE p. 477

Evaluate

Suggested Crosscutting Concept(s) Stability and Change 8.ESS2.3 Students make explanations of stability and change discussing components of a system.		Formative Assessment • Reteach, TE p. 573 • Throughout TE • Lesson Review, SE p. 479 Summative Assessment • The Rock Cycle Alternative Assessment, TE p. • Lesson Quiz **Additional Resources** • 8.ESS2.3 Student Activity, Teacher Guide, Rock Notes, Engagement, Generalized Geologic Map of Tennessee, and Tennessee Geologic Map • Rock Cycle STUDY JAMS! Video and Quiz • Weathering & Erosion STUDY JAMS! Video and Quiz **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) Students will use a sentence frame and pre-taught vocabulary to discuss how rock changes as it goes through the rock cycle. Visuals for the rock cycle

		Use graphic organizers or concept maps to support students in descriptions of the rock cycle. Highlight these signal words for describing: for example, for instance, in support of this, in fact, as evidence When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows….? But does your claim account for…(evidence) Response Starters I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

8th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback					
Quarter 1		Quarter 2		**Quarter 3**	Quarter 4
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4 weeks	5 weeks	6 weeks	3 weeks	**9 weeks**	9 weeks

UNIT 5: Restless Earth (9 weeks)			
Overarching Question(s)			
How and why is Earth constantly changing?			
Unit 5, Lesson 2	**Lesson Length**	**Essential Question**	**Vocabulary**
Three Classes of Rock	1 week	How do rocks form?	rock, composition, texture

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) ESS2: Earth's Systems **Standard(s)** 8.ESS2.3 Describe the relationship between the processes and forces that create igneous, sedimentary, and metamorphic rocks. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 8.ESS2.3 Different processes are responsible for forming each different type of rock. It is possible to understand parts of the geologic history of places or regions by looking at the types of rocks found there. While understanding traditional models for the rock cycle is expected, it is important that students are able to use these models to explain	**Learning Outcomes** • Describe the components of rock. • Describe two properties that are used to classify rock. • Describe the process by which igneous rock forms. • Explain where intrusive igneous rock forms. • Explain where extrusive igneous rock forms. • Describe the process by which sedimentary rock forms. • Identify the three major types of sedimentary rock and explain how they form. • Describe the process by which metamorphic rock forms. • Describe the two types of metamorphic rock.	**Curricular Resources** HMH Tennessee Science TE, Unit 8, Lesson 3, pp. 584-599 Engage • Engage Your Brain #s 1 and 2, SE p. 485 • Active Reading #s 3 and 4, SE p. 485 Sedimentary Rock • Making Sedimentary Rocks Activity, TE p. 586 Metamorphic Rock • Metamorphic Candy Bar Daily Demo, TE p. 586 Explore Igneous Rock • Modeling Rock Formation S.T.E.M. Lab, TE p. 587 Metamorphic Rock • Stretching Out Quick Lab, TE p. 587

events that have occurred in the past, accounting for changes that take place over spans of time far exceeding human lifetimes. Igneous rocks indicate undisturbed or younger areas. Patterns in the distribution of igneous rocks coincide with the patterns for earthquakes and the plate boundaries explained in tectonic theory. The presence of sedimentary rocks in an area indicates that that area was once lower lying and that erosive processes occurring in nearby areas. Metamorphic rocks can form from either igneous or sedimentary rocks, and are evidence for tectonic pressures, for example in the uplift of mountains. **Suggested Science and Engineering Practice(s)** Developing and Using Models 8.ESS2.3 Students create models which are responsive and incorporate features that are not visible in the natural world, but have implications on the behavior of the modeled systems and can identify limitations of their models. **Suggested Crosscutting Concept(s)** Stability and Change 8.ESS2.3 Students make explanations of stability and change discussing components of a system.	**Suggested Phenomenon**  Click on the picture to access the Grand Canyon video. Allow students to watch the video without the sound and complete a See Think Wonder Template. Possible Guiding Question(s): How was this landform created?	• Rock Test Kitchen Virtual Lab, TE p. 587 Explain Rocks and Their Classification • Active Reading #5, SE p. 486 • Do the Math #6, SE p. 486 • Visualize It! #7, SE p. 487 Igneous Rock • Infer #8, SE p. 488 • Active Reading #9, SE p. 489 • Venn Diagram #10, SE p. 489 Sedimentary Rock • Visualize It! #11, SE p. 490 • Active Reading #12, SE p. 491 • Compare #13, SE p. 491 Metamorphic Rock • Describe #14, SE p. 492 • Active Reading #15, SE p. 493 • Think Outside the Book #16, SE p. 493 Explain It!, SE pp. 494-497 Extend Reinforce and Review • Rockin' Review Game Activity, TE p. 590 • Mind Map Graphic Organizer, TE p. 590 • Visual Summary, SE p. 498 Going Further • Architecture Connection, TE p. 590 Evaluate Formative Assessment • Reteach, TE p. 591

		• Throughout TE • Lesson Review, SE p. 499 Summative Assessment • Three Classes of Rock Alternative Assessment, TE p. 591 • Lesson Quiz • Unit 8 Big Idea, SE p. 500 • Unit 8 Review, SE pp. 501-504 **Additional Resources** • Igneous Rocks STUDY JAMS! Slide Show and Quiz • Sedimentary Rocks STUDY JAMS! Slide Show and Quiz • Metamorphic Rocks STUDY JAMS! Slide Show and Quiz **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking, refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) Students will work with a partner to write 3-4 sentences describing the process by which sedimentary rock forms using sentence stems.

		Visuals for how rocks form Use graphic organizers or concept maps to support students in description of the how rocks form. Highlight these signal words for describing: for example, for instance, in support of this, in fact, as evidence When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between….? What link do you see between… What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows….? But does your claim account for…(evidence) Response Starters I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

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UNIT 5: Restless Earth (9 weeks)			
Overarching Question(s)			
How and why is Earth constantly changing?			
Unit 5, Lesson 3	**Lesson Length**	**Essential Question**	**Vocabulary**
Earth's Interior	1 week	What is known about Earth's interior?	crust, lithosphere, seismic wave, mantle, asthenosphere, core, mesosphere

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**
DCI(s) ESS2: Earth's Systems **Standard(s)** 8.ESS2.2 Evaluate data collected from seismographs to create a model of Earth's structure. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 8. ESS2.2 Seismic waves are mechanical waves that transfer energy just like other mechanical waves. The source of their energy is usually from Earth's shifting plates. Like other mechanical waves, seismic waves interact with the medium through	**Learning Outcomes** • Summarize how the solar system formed. • Identify the materials that formed Earth. • Describe sources of energy in Earth's interior. • Explain how Earth's layers formed. • Describe Earth's compositional layers: core, mantle, crust. • Describe Earth's physical layers: lithosphere, asthenosphere, mesosphere, outer core, and inner core. • Describe seismic waves and how scientists detect them. • Summarize what the study of seismic waves have revealed about Earth's interior.	**Curricular Resources** HMH Tennessee Science TE, Unit 9, Lesson 1, pp. 618-632 Engage • Engage Your Brain #s 1 and 2, SE p. 509 • Active Reading #s 3 and 4, SE p. 509 Explore Earth's Formation • Differentiation of Solid Materials S.T.E.M. Lab, TE p. 621 Earth's Layers • Modeling the Formation of Earth's Layers Quick Lab, TE p. 621 The Study of Earth's Interior

which they travel. Interactions include changes in the wave's speed as the medium changes, absorption, reflection, or refraction. For example, seismic waves traveling through the Earth's mantle will be refracted as the density of the material changes due to heating from Earth's core. Student models of Earth's structure should account for recorded wave behaviors. Earthquakes produce two different waves visible on seismographs: pressure waves (P-waves) and shear waves (S-waves). These two waves travel at different speeds, their relative positions on a recorded seismogram will be further apart as the distance from the epicenter to seismograph increases. The P-waves are longitudinal waves. They are able to compress both liquid and solid and therefore we expect them to travel through any matter in Earth's interior, regardless of its state. S-waves are a transverse wave. Students should explore models of s-waves to explain why s-waves cannot travel through liquids. On seismograms, both p and s waves are observable, unless an imaginary line connecting the location of the recording seismograph and the epicenter of the earthquake also passes through earth's outer core. When the waves from a seismic event pass through the outer core, only the p-waves are transmitted. The	• Identify and explain other methods and data that add to our understanding of Earth's interior. **Suggested Phenomenon**  When an earthquake occurs, the seismic waves (P and S waves) spread out in all directions through the Earth's interior. Seismic stations located at increasing distances from the earthquake epicenter will record seismic waves that have traveled through increasing depths in the Earth. Geologists use these records to establish the structure of Earth's interior. Students can complete a See Think Wonder Template after viewing the picture. Possible Guiding Question(s): What information can be gathered from an earthquake?	• Using Seismic Waves to Study Earth's Interior Quick Lab, TE p. 621 Explain Earth's Formation • Active Reading #5, SE p. 510 • Visualize It! #6, SE p. 511 • Think Outside the Book #7, SE p. 511 Earth's Layers • Active Reading #8, SE p. 512 • Visualize It! #9, SE p. 512 • Active Reading #13, SE p. 515 • Visualize It! #s 14-15, SE p. 515 • Compare and Contrast Composition Activity, TE p. 620 The Study of Earth's Interior • Relate #16, SE p. 516 • Active Reading #17, SE p. 517 • Visualize It! #18, SE p. 517 • Active Reading #19, SE p. 518 • Do the Math #20, SE p. 518 • Active Reading #21, SE p. 519 Extend Reinforce and Review • Cluster Diagram Graphic Organizer, TE p. 624 • Visual Summary, SE p. 520 Going Further • Language Arts Connection, TE p. 624 Evaluate Formative Assessment

absence of s-waves is evidence for the liquid outer core. **Suggested Science and Engineering Practice(s)** Developing and Using Models 8.ESS2.2 Students create models which are responsive and incorporate features that are not visible in the natural world, but have implications on the behavior of the modeled systems and can identify limitations of their models. **Suggested Crosscutting Concept(s)** Energy and Matter 8.ESS2.2 Students track energy changes through transformations in a system.	What can this information tells us about the Earth's interior?	• Reteach, TE p. 625 • Throughout TE • Lesson Review, SE p. 521 Summative Assessment • Earth's Interior Alternative Assessment, TE p. 625 • Lesson Quiz **Additional Resources** • 8.ESS2.2 Student Activity, Teacher Guide, and Student Assessment • Rare Blue Diamonds Form Deep, Deep, Deep Inside Earth Article • Evidence for Internal Earth Structure and Composition • Seismic Waves • Examining P and S Waves Moving Through Earth's Interior Animation • Explainer: Seismic Waves Come in Different 'Flavors' Article • IRIS Lesson **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking, refer to this resource: WIDA Doing and Talking Science

		Sample Language Objectives: (language domain along with a scaffold) Students will work with a partner to write 3-4 sentences to summarize how the solar system formed. Use graphic organizers or concept maps to support students in description of how the earth is constantly changing. Summarizing sentence stems: _________ begins with ... continues with ... and ends with ... Highlight these signal words for describing: for example, for instance, in support of this, in fact, as evidence When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between....? What link do you see between… Why do you think…? What is our evidence that….

		Do we have enough evidence to make that claim? But what about this other evidence that shows….? But does your claim account for…(evidence) Response Starters I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about ….

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UNIT 5: Restless Earth (9 weeks)			
Overarching Question(s)			
How and why is Earth constantly changing?			
Unit 5, Lesson 4	**Lesson Length**	**Essential Question**	**Vocabulary**
Plate Tectonics	1 week	What is plate tectonics?	Pangaea, sea-floor spreading, convergent boundary, plate tectonics, convection, divergent boundary, transform boundary, tectonic plate

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) ESS2: Earth's Systems **Standard(s)** 8.ESS2.4 Gather and evaluate evidence that energy from the earth's interior drives convection cycles within the asthenosphere which create changes within the lithosphere including plate movements, plate boundaries, and sea-floor spreading. 8.ESS2.5 Construct a scientific explanation using data that explains that the gradual processes of plate tectonics accounting for A) the distribution of fossils on different continents, B) the occurrence of earthquakes, and C) continental and ocean floor	**Learning Outcomes** • Describe plate tectonics. • Explain continental drift. • Discuss scientific evidence supporting continental drift. • Define tectonic plate. • Compare continental and oceanic crust. • Define convergent, divergent, and transform boundaries. • Describe three possible causes for the movement of tectonic plates.	**Curricular Resources** HMH Tennessee Science TE, Unit 9, Lesson 2, pp. 634-650 Engage • Engage Your Brain #s1 and 2, SE p. 523 • Active Reading #s 3 and 4, SE p. 523 • Continental Collisions Daily Demo, TE p. 637 Explore Tectonic Plates • Tectonic Ice Cubes Quick Lab, TE p. 637 Types of Plate Boundaries • Plate Boundaries Virtual Lab, TE p. 637

features (including mountains, volcanoes, faults, and trenches). **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 8.ESS2.4 Convection cycles occur when fluids are heated. The heated fluid flows upward. Fluid at the surface loses heat to the atmosphere and the cooled fluid descends as a result of its increased density. The heat driving the convection cycle comes from the elements found in Earth's core and lower mantle (not from residual heat from Earth's formation). The circular motion of the cycling asthenosphere drags the plates that make up Earth's floating lithospheres. The floating plates are moved together or apart at boundaries. Where plates move apart, liquid rock from earth's interior reaches the surface, and solidifies. Earth's mantle must be primarily solid, otherwise S-waves would not travel through it. This can cause confusion, when trying to explain how convection can occur within the mantle. Because students should recognize that convection does not occur in solids. The solid nature of the mantle is somewhat like considering glass a solid. Over very long periods of time, panes of glass oriented vertically become thinner at their tops and thicker at their	**Suggested Phenomenon**  From the deepest ocean trench to the tallest mountain, plate tectonics explains the features and movement of Earth's surface in the present and the past. Plate tectonics is the theory that Earth's outer shell is divided into several plates that glide over the mantle, the rocky inner layer above the core. The plates act like a hard and rigid shell compared to Earth's mantle. Allow students to watch the video without the sound and complete a See Think Wonder Template.	Causes of Tectonic Plates • Seafloor Spreading Exploration Lab, TE p. 637 Explain Theory of Plate Tectonics • Visualize It! #5, SE p. 524 • Active Reading #6, SE p. 525 • Summarize #7, SE p. 526 • Active Reading #8, SE p. 527 • Visualize It! #9, SE p. 527 • Fossil Locations Discussion, TE p. 636 • Evaluating Evidence Discussion, TE p. 636 Tectonic Plates • Think Outside the Book #10, SE p. 528 • Active Reading #11, SE p. 528 • Visualize It! #12, SE p. 529 Types of Plate Boundaries • Active Reading #13, SE p. 530 • Infer #14, SE p. 530 • Active Reading #15, SE p. 531 • What Boundary Is It? Activity, TE p. 636 Causes of Tectonic Plates • Active Reading #16, SE p. 532 • Compare #17, SE p. 533 • Modeling Sea-Floor Spreading Activity, TE p. 636

bottoms as they flow downward. Similarly, Earth's mantle exhibits liquid behaviors at geologic time scales. 8.ESS2.5 As this is one of the first scientific theories students will be exposed to by name, it is important properly communicate that theories are explanations of observations/patterns in nature. In this case, tectonic theory explains the three components of the standard. Though not part of the standard, it might be interesting to discuss prior explanations for these same observations. Students have seen that a conductor that moves through a magnetic field can create its own magnetic field (8.PS2.1). Earth's liquid, moving, iron core creates Earth's magnetic field. As new rock forms at divergent plate boundaries, iron crystals in the newly formed rock orient themselves to Earth's magnetic field. Observing changes in the orientation of the iron crystals in the rocks is evidence of seafloor spreading. When the locations of past earthquakes are plotted onto a map, a pattern emerges where the majority of earthquakes occur along coasts. Tectonic theory explains this pattern. Fossilized remains of similar organisms are found on different continents with very different present-		Explain It!, SE pp. 534-537 Extend Reinforce and Review • What Was This All About? Activity, TE p. 640 • Concept Map Graphic Organizer, TE p. 640 • Visual Summary, SE p. 538 Going Further • Physical Science Connection, TE p. 640 Evaluate Formative Assessment • Reteach, TE p. 641 • Throughout TE • Lesson Review, SE p. 539 Summative Assessment • Plate Tectonics Alternative Assessment, TE p. 641 • Lesson Quiz **Additional Resources** • Explainer: Understanding Plate Tectonics Article • Seafloor Hosts Surprising Number of Deep-Sea Vents • Earth's Tectonic Plates Won't Slide Forever

day environments (conflict with 8.LS4). Tectonic theory accounts for this disparity, explaining that the two locations were once connected and at the time they were connected, the environmental conditions would have been the same. **Suggested Science and Engineering Practice(s)** Developing and Using Models 8.ESS2.4 Students create models which are responsive and incorporate features that are not visible in the natural world, but have implications on the behavior of the modeled systems and can identify limitations of their models. Constructing Explanations and Designing Solutions 8.ESS2.5 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion. **Suggested Crosscutting Concept(s)** Energy and Matter 8.ESS2.4 Students track energy changes through transformations in a system. Scale, Proportion, and Quantity 8.ESS2.5 Students develop models to investigate scales that are beyond normal experiences.		• Shrinking Tethys Ocean Could Have Ripped Pangaea Apart Article • How Earth's Surface Morphs Article • Plate Tectonics Simulation • Dynamic Earth Interactive Website • Continental Drift Activity • Sediment Deposition Supports Seafloor Spreading Activity • Legends of Learning Game-Seafloor Spreading and Subduction • Legends of Learning Game-Plate Tectonics • Plate Tectonics • Natural Disasters Caused by Plate Tectonics Article • National Park Service Website • Exploring Our Fluid Earth • Plate Tectonics Article • Theory of Plate Tectonics cK-12 Content • Plate Tectonics National Geographic Article with Videos • Evidence for Plate Tectonics • Forces Inside Earth **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking, refer to this resource:

		WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) Students will use a t-chart to compare continental and oceanic crust using a word box and sentence stems. Use graphic organizers or concept maps to support students in description of the theory of plate tectonics. Comparing sentence stems: ________ and ________are similar in that they both ... but _______ ... while______ .... Highlight these signal words for describing: for example, for instance, in support of this, in fact, as evidence When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between….? What link do you see between…

		Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that hows….? But does your claim account for…(evidence) <u>Response Starters</u> I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

8th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback					
Quarter 1		Quarter 2		**Quarter 3**	Quarter 4
Unit 1 Motion and Forces	Unit 2 Electricity and Magnetism	Unit 3 Waves	Unit 4 Our Universe	**Unit 5** **Restless Earth**	Unit 6 Change Over Time
4 weeks	5 weeks	6 weeks	3 weeks	**9 weeks**	9 weeks

UNIT 5: Restless Earth (9 weeks)

Overarching Question(s)

How and why is Earth constantly changing?

Unit 5, Lesson 5	Lesson Length	Essential Question	Vocabulary
Mountain Building	1 week	How do mountains form?	deformation, shear stress, compression, folding, tension, fault

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) ESS2: Earth's Systems **Standard(s)** 8.ESS2.4 Gather and evaluate evidence that energy form the earth's interior drives convection cycles within the asthenosphere which create changes within the lithosphere including plate movements, plate boundaries, and sea-floor spreading. 8.ESS2.5 Construct a scientific explanation using data that explains that the gradual processes of plate tectonics accounting for A) the distribution of fossils on different continents, B) the occurrence of earthquakes, and C) continental and ocean floor	**Learning Outcomes** • Describe how tectonic plate motion can cause deformation. • Explain how folding occurs. • Compare anticline and syncline folds. • Explain how faults form and compare the three kinds of faults. • Compare the three kinds of mountains.	**Curricular Resources** HMH Tennessee Science TE, Unit 9, Lesson 3, pp. 654-666 Engage • Engage Your Brain #s1 and 2, SE p. 543 • Active Reading #s 3 and 4, SE p. 543 Deformation and Folding • Spaghetti Rocks Daily Demo, TE p. 657 • Bend and Stretch Activity, TE p. 656 Explore Mountains • Making (Delicious) Mountains Activity, TE p. 656 Explain Deformation and Folding

features (including mountains, volcanoes, faults, and trenches). **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 8.ESS2.4 Convection cycles occur when fluids are heated. The heated fluid flows upward. Fluid at the surface loses heat to the atmosphere and the cooled fluid descends as a result of its increased density. The heat driving convection cycle comes from the elements found in Earth's core and lower mantle (not from residual heat from Earth's formation). The circular motion of the cycling asthenosphere drags the plates that make up Earth's floating lithospheres. The floating plates are moved together or apart at boundaries. Where plates move apart, liquid rock from earth's interior reaches the surface, and solidifies. Earth's mantle must be primarily solid, otherwise S-waves would not travel through it. This can cause confusion, when trying to explain how convection can occur within the mantle. Because students should recognize that convection does not occur in solids. The solid nature of the mantle is somewhat like considering glass a solid. Over very long periods of time, panes of glass oriented vertically become thinner at their tops and thicker at their	**Suggested Phenomenon**  From the deepest ocean trench to the tallest mountain, plate tectonics explains the features and movement of Earth's surface in the present and the past. Plate tectonics is the theory that Earth's outer shell is divided into several plates that glide over the mantle, the rocky inner layer above the core. The plates act like a hard and rigid shell compared to Earth's mantle. Allow students to watch the video without the sound and complete a See Think Wonder Template.	• Active Reading #5, SE p. 544 • Visualize It! #6, SE p. 544 • Think Outside the Book #7, SE p. 545 • Visualize It! #8, SE p. 545 Faulting • Active Reading #9, SE p. 546 • Visualize It! #10, SE p. 547 Mountains • Active Reading #12, SE p. 548 • Visualize It! #13, SE p. 548 • Identify #14, SE p. 549 Extend Reinforce and Review • Plate Boundaries Activity, TE p. 660 • Layered Book Fold Note Organizer, TE p. 660 • Visual Summary, SE p. 550 Going Further • Social Studies Connection, TE p. 660 Evaluate Formative Assessment • Reteach, TE p. 661 • Throughout TE • Lesson Review, SE p. 551 Summative Assessment • Mountain Building Alternate Assessment, TE p. 661 • Lesson Quiz **Additional Resources**

bottoms as they flow downward. Similarly, Earth's mantle exhibits liquid behaviors at geologic time scales. 8.ESS2.5 As this is one of the first scientific theories students will be exposed to by name, it is important properly communicate that theories are explanations of observations/patterns in nature. In this case, tectonic theory explains the three components of the standard. Though not part of the standard, it might be interesting to discuss prior explanations for these same observations. Students have seen that a conductor that moves through a magnetic field can create its own magnetic field (8.PS2.1). Earth's liquid, moving, iron core creates Earth's magnetic field. As new rock forms at divergent plate boundaries, iron crystals in the newly formed rock orient themselves to Earth's magnetic field. Observing changes in the orientation of the iron crystals in the rocks is evidence of seafloor spreading. When the locations of past earthquakes are plotted onto a map, a pattern emerges where the majority of earthquakes occur along coasts. Tectonic theory explains this pattern. Fossilized remains of similar organisms are found on different continents with very different present-		• What Sent Hawaii's Mountain Chain East? Article • Dynamic Earth Interactive Website **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking, refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) Students will use a t-chart to compare anticline and syncline folds using a word box and sentence stems. Use graphic organizers or concept maps to support students in description of the how mountains form. Comparing sentence stems: ________ and ________are similar in that they both ... but _______ ... while______ .... Highlight these signal words for describing: for example, for instance, in support of this, in fact, as evidence

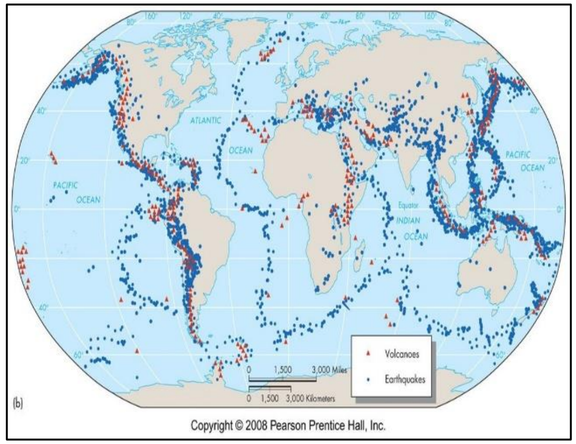
day environments (conflict with 8.LS4). Tectonic theory accounts for this disparity, explaining that the two locations were once connected and at the time they were connected, the environmental conditions would have been the same. **Suggested Science and Engineering Practice(s)** Developing and Using Models 8.ESS2.4 Students create models which are responsive and incorporate features that are not visible in the natural world, but have implications on the behavior of the modeled systems and can identify limitations of their models. Constructing Explanations and Designing Solutions 8.ESS2.5 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion. **Suggested Crosscutting Concept(s)** Energy and Matter 8.ESS2.4 Students track energy changes through transformations in a system. Scale, Proportion, and Quantity 8.ESS2.5 Students develop models to investigate scales that are beyond normal experiences.		When applicable- use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows…? But does your claim account for…(evidence) Response Starters I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

8th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback					
Quarter 1		Quarter 2		**Quarter 3**	Quarter 4
Unit 1 Motion and Forces	Unit 2 Electricity and Magnetism	Unit 3 Waves	Unit 4 Our Universe	**Unit 5 Restless Earth**	Unit 6 Change Over Time
4 weeks	5 weeks	6 weeks	3 weeks	**9 weeks**	9 weeks

UNIT 5: Restless Earth (9 weeks)			
Overarching Question(s)			
How and why is Earth constantly changing?			
Unit 5, Lesson 6	**Lesson Length**	**Essential Question**	**Vocabulary**
Volcanoes	1 week	How do volcanoes change Earth's surface?	volcano, vent, magma, tectonic plate, lava, hot spot

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**
DCI(s) ESS2: Earth's Systems ESS3: Earth and Human Activity **Standard(s)** 8.ESS2.4 Gather and evaluate evidence that energy form the earth's interior drives convection cycles within the asthenosphere which create changes within the lithosphere including plate movements, plate boundaries, and sea-floor spreading. 8.ESS2.5 Construct a scientific explanation using data that explains that the gradual processes of plate tectonics accounting for A) the distribution of fossils on different continents, B) the occurrence of earthquakes, and C) continental and ocean floor	**Learning Outcomes** • Define volcano, magma, lava, and vent. • Describe the kinds of materials that erupt from volcanoes. • Describe the landforms formed by volcanoes. • Discuss the occurrence of volcanoes at plate boundaries and at hot spots.	**Curricular Resources** HMH Tennessee Science TE, Unit 9, Lesson 4, pp.668-683 Engage • Engage Your Brain #s 1 and 2, SE p. 553 • Active Reading #s 3 and 4, SE p. 553 Explore Volcanic Landforms • Modeling an Explosive Eruption Quick Lab, TE p. 671 Where Volcanoes Form • Volcano Mapping Quick Lab, TE p. 671 Explain Volcanoes • Visualize It! #5, SE p. 554 Volcanic Landforms

features (including mountains, volcanoes, faults, and trenches). 8.ESS3.2 Collect data, map, and describe patterns in the locations of volcanoes and earthquakes related to tectonic plate boundaries, interactions, and hotspots. **Explanation(s) and support for of Standard(s) [from TN Science Reference Guide]()** 8.ESS2.4 Convection cycles occur when fluids are heated. The heated fluid flows upward. Fluid at the surface loses heat to the atmosphere and the cooled fluid descends as a result of its increased density. The heat driving convection cycle comes from the elements found in Earth's core and lower mantle (not from residual heat from Earth's formation). The circular motion of the cycling asthenosphere drags the plates that make up Earth's floating lithospheres. The floating plates are moved together or apart at boundaries. Where plates move apart, liquid rock from earth's interior reaches the surface, and solidifies. Earth's mantle must be primarily solid, otherwise S-waves would not travel through it. This can be cause confusion, when trying to explain how convection can occur within the mantle. Because	**Suggested Phenomena**  From the deepest ocean trench to the tallest mountain, plate tectonics explains the features and movement of Earth's surface in the present and the past. Plate tectonics is the theory that Earth's outer shell is divided into several plates that glide over the mantle, the rocky inner layer above the core. The plates act like a hard and rigid shell compared to Earth's mantle. Allow students to watch the video without the sound and complete a [See Think Wonder Template]().	• Active Reading #7, SE p. 555 • Visualize It! #8, SE p. 556 Where Volcanoes Form • Active Reading #9, SE p. 557 • Visualize It! #10, SE p. 557 • Active Reading #11, SE p. 558 • Visualize It! #12, SE p. 559 • Summarize #13, SE p. 559 • Visualize It! #14, SE p. 560 • Divergent Boundary Volcanoes Activity, TE p. 670 <u>Extend</u> Reinforce and Review • Volcanic Landforms Graphic Organizer, TE p. 674 • Visual Summary, SE p. 566 Going Further • Why It Matters, SE p. 561 Extend It!, SE pp. 562-565 <u>Evaluate</u> Formative Assessment • Reteach, TE p. • Throughout TE • Lesson Review, SE p. 567 Summative Assessment • Volcanoes Alternative Assessment, TE p. 675 • Lesson Quiz **Additional Resources**

students should recognize that convection does not occur in solids. The solid nature of the mantle is somewhat like considering glass a solid. Over very long periods of time, panes of glass oriented vertically become thinner at their tops and thicker at their bottoms as they flow downward. Similarly, Earth's mantle exhibits liquid behaviors at geologic time scales. 8.ESS2.5 As this is one of the first scientific theories students will be exposed to by name, it is important properly communicate that theories are explanations of observations/patterns in nature. In this case, tectonic theory explains the three components of the standard. Though not part of the standard, it might be interesting to discuss prior explanations for these same observations. Students have seen that a conductor that moves through a magnetic field can create its own magnetic field (8.PS2.1). Earth's liquid, moving, iron core creates Earth's magnetic field. As new rock forms at divergent plate boundaries, iron crystals in the newly formed rock orient themselves to Earth's magnetic field. Observing changes in the orientation of the iron crystals in the rocks is evidence of seafloor spreading. When the locations of past earthquakes are plotted onto a map, a pattern emerges where the	 Students can complete a See Think Wonder Template after examining the map. Possible Guiding Question(s): What part of the world are most of the volcanoes occurring? Why?	• Explainer: The Volcano Basics Article • Dynamic Earth Interactive Website • Volcanoes, Earthquakes, and Plate Boundaries-UNAVCO Computer Lab Model • Plate Tectonics National Geographic Article with Videos • Patterns of Earthquakes and Volcanoes **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) Students will use a graphic organizer describe the kinds of materials that erupt from volcanoes. using a word box and sentence stems. Use graphic organizers or concept maps to support students in description of how volcanoes change the earth's surface. Highlight these signal words for describing: for example, for instance, in support of this, in fact, as evidence

majority of earthquakes occur along coasts. Tectonic theory explains this pattern. Fossilized remains of similar organisms are found on different continents with very different present-day environments (conflict with 8.LS4). Tectonic theory accounts for this disparity, explaining that the two locations were once connected and at the time they were connected, the environmental conditions would have been the same. <u>8.ESS3.2</u> Tectonic theory explains the patterns that are seen in the locations where earthquakes occur. The data collected might include locations, magnitudes, and frequencies of tectonic phenomena, as well as types and significance of damage associated with the events. As humans build cities and civilizations, knowledge of natural hazards allows for intentional development. Earthquakes occur and scientists are not yet able to predict when they will happen. However, we can generally predict where they are most likely going to happen. This knowledge allows developers to build buildings and make preparations for likely events. Preparations can include both plans to minimize damage, as well as how to respond to the most likely types of damage that will occur.		When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: <u>Question Starters</u> What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows….? But does your claim account for…(evidence) <u>Response Starters</u> I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

Suggested Science and Engineering Practice(s) Developing and Using Models 8.ESS2.4 Students create models which are responsive and incorporate features that are not visible in the natural world, but have implications on the behavior of the modeled systems and can identify limitations of their models. Constructing Explanations and Designing Solutions 8.ESS2.5 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion. Using Mathematics and Computational Thinking 8.ESS3.2 Students can use computing to process large amounts of data in order to develop mathematical representations (ratios, percentages, rates) that will help evaluate a scientific explanation. **Suggested Crosscutting Concept(s)** Energy and Matter 8.ESS2.4 Students track energy changes through transformations in a system.		

Scale, Proportion, and Quantity 8.ESS2.5 Students develop models to investigate scales that are beyond normal experiences. Patterns 8.ESS3.2 Students infer and identify cause and effect relationships from patterns.		

8th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback					
Quarter 1		Quarter 2		**Quarter 3**	Quarter 4
Unit 1 Motion and Forces	Unit 2 Electricity and Magnetism	Unit 3 Waves	Unit 4 Our Universe	**Unit 5 Restless Earth**	Unit 6 Change Over Time
4 weeks	5 weeks	6 weeks	3 weeks	**9 weeks**	9 weeks

UNIT 5: Restless Earth (9 weeks)			
Overarching Question(s)			
How and why is Earth constantly changing?			
Unit 5, Lesson 7	**Lesson Length**	**Essential Question**	**Vocabulary**
Earthquakes	1 week	Why do earthquakes happen?	earthquake, fault, tectonic plate boundary, epicenter, elastic rebound, focus, deformation

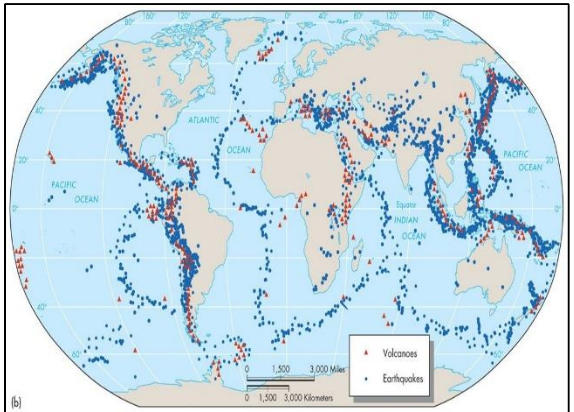
Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) ESS2: Earth's Systems ESS3: Earth and Human Activity **Standard(s)** 8.ESS2.4 Gather and evaluate evidence that energy form the earth's interior drives convection cycles within the asthenosphere which create changes within the lithosphere including plate movements, plate boundaries, and sea-floor spreading. 8.ESS2.5 Construct a scientific explanation using data that explains that the gradual processes of plate tectonics accounting for A) the distribution of fossils on different continents, B) the occurrence of	**Learning Outcomes** • Define volcano, magma, lava, and vent. • Describe the kinds of materials that erupt from volcanoes. • Describe the landforms formed by volcanoes. • Discuss the occurrence of volcanoes at plate boundaries and at hot spots.	**Curricular Resources** HMH Tennessee Science TE, Unit 9, Lesson 5, pp. 684-700 Engage • Engage Your Brain #s 1 and 2, SE p. 569 • Active Reading #s 3 and 4, SE p. 569 Explore What Earthquakes Are and Why They Happen • Earthquakes Vibrations Quick Lab, TE p. 686 Explain What Earthquakes Are and Why They Happen • Active Reading #5, SE p. 570 • Visualize It! #6, SE p. 570 • Visualize It! #7, SE p. 571 Where Earthquakes Happen

earthquakes, and C) continental and ocean floor features (including mountains, volcanoes, faults, and trenches). 8.ESS3.2 Collect data, map, and describe patterns in the locations of volcanoes and earthquakes related to tectonic plate boundaries, interactions, and hotspots. **Explanation(s) and support for of Standard(s) [from TN Science Reference Guide]()** 8.ESS2.4 Convection cycles occur when fluids are heated. The heated fluid flows upward. Fluid at the surface loses heat to the atmosphere and the cooled fluid descends as a result of its increased density. The heat driving convection cycle comes from the elements found in Earth's core and lower mantle (not from residual heat from Earth's formation). The circular motion of the cycling asthenosphere drags the plates that make up Earth's floating lithospheres. The floating plates are moved together or apart at boundaries. Where plates move apart, liquid rock from earth's interior reaches the surface, and solidifies. Earth's mantle must be primarily solid, otherwise S-waves would not travel through it. This can be cause confusion, when trying to explain how	**Suggested Phenomenon**  From the deepest ocean trench to the tallest mountain, plate tectonics explains the features and movement of Earth's surface in the present and the past. Plate tectonics is the theory that Earth's outer shell is divided into several plates that glide over the mantle, the rocky inner layer above the core. The plates act like a hard and rigid shell compared to Earth's mantle. Allow students to watch the video without the sound and complete a [See Think Wonder Template]().	• Active Reading #8, SE p. 572 • Visualize It! #9, SE p. 572 • Correlate #10, SE p. 573 • Living with Quakes Discussion, TE p. 686 Effects of Earthquakes • Think Outside the Book #11, SE p. 574 • Identify #12, SE p. 574 Explain It!, SE pp. 580-583 <u>Extend</u> Reinforce and Review • Earthquake Review Game Activity, TE p. 690 • Mind Map Graphic Organizer, TE p. 690 • Visual Summary, SE p. 584 Going Further • Geography Connection, TE p. 690 • Fine Arts Connection, TE p. 690 • Why It Matters, SE p. 575 Extend It!, SE pp. 5776-579 <u>Evaluate</u> Formative Assessment • Reteach, TE p. 691 • Throughout TE • Lesson Review, SE p. 585 Summative Assessment • Earthquakes Alternative Assessment, TE p. 691 • Lesson Quiz

convection can occur within the mantle. Because students should recognize that convection does not occur in solids. The solid nature of the mantle is somewhat like considering glass a solid. Over very long periods of time, panes of glass oriented vertically become thinner at their tops and thicker at their bottoms as they flow downward. Similarly, Earth's mantle exhibits liquid behaviors at geologic time scales.

8.ESS2.5 As this is one of the first scientific theories students will be exposed to by name, it is important properly communicate that theories are explanations of observations/patterns in nature. In this case, tectonic theory explains the three components of the standard. Though not part of the standard, it might be interesting to discuss prior explanations for these same observations.

Students have seen that a conductor that moves through a magnetic field can create its own magnetic field (8.PS2.1). Earth's liquid, moving, iron core creates Earth's magnetic field. As new rock forms at divergent plate boundaries, iron crystals in the newly formed rock orient themselves to Earth's magnetic field. Observing changes in the orientation of the iron crystals in the rocks is evidence of seafloor spreading.



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Students can complete a See Think Wonder Template after examining the map.

Possible Guiding Question(s):
What part of the world are most of the earthquakes occurring? Why?

Additional Resources

- Earthquakes STUDY JAMS! Video and Quiz
- Major New Quake Rattles Nepal Article
- Dynamic Earth Interactive Website
- Hot Spot Activity
- Volcanoes, Earthquakes, and Plate Boundaries- UNAVCO Computer Lab Model
- Real Time Earthquake Data
- Strange Waves Rippled Around the World, and Nobody Knows Why National Geographic Article
- Plate Tectonics National Geographic Article with Videos
- Patterns of Earthquakes and Volcanoes

ESL Supports and Scaffolds

WIDA Standard 4 - The Language of Science

To support students in speaking, refer to this resource:
WIDA Doing and Talking Science

Sample Language Objectives: (language domain along with a scaffold)

Students will use a graphic organizer describe where earthquakes happen using a word box and sentence stems.

When the locations of past earthquakes are plotted onto a map, a pattern emerges where the majority of earthquakes occur along coasts. Tectonic theory explains this pattern. Fossilized remains of similar organisms are found on different continents with very different present-day environments (conflict with 8.LS4). Tectonic theory accounts for this disparity, explaining that the two locations were once connected and at the time they were connected, the environmental conditions would have been the same. 8.ESS3.2 Tectonic theory explains the patterns that are seen in the locations where earthquakes occur. The data collected might include locations, magnitudes, and frequencies of tectonic phenomena, as well as types and significance of damage associated with the events. As humans build cities and civilizations, knowledge of natural hazards allows for intentional development. Earthquakes occur and scientists are not yet able to predict when they will happen. However, we can generally predict where they are most likely going to happen. This knowledge allows developers to build buildings and make preparations for likely events. Preparations can include both plans to minimize damage, as well as how to respond to the most likely types of damage that will occur.		Use graphic organizers or concept maps to support students in their explanation of why earthquakes happen. Highlight these signal words for describing: for example, for instance, in support of this, in fact, as evidence Visuals for earthquakes When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows…? But does your claim account for…(evidence) Response Starters I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that…

Suggested Science and Engineering Practice(s) Developing and Using Models 8.ESS2.4 Students create models which are responsive and incorporate features that are not visible in the natural world, but have implications on the behavior of the modeled systems and can identify limitations of their models. Constructing Explanations and Designing Solutions 8.ESS2.5 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion. Using Mathematics and Computational Thinking 8.ESS3.2 Students can use computing to process large amounts of data in order to develop mathematical representations (ratios, percentages, rates) that will help evaluate a scientific explanation. **Suggested Crosscutting Concept(s)** Energy and Matter 8.ESS2.4 Students track energy changes through transformations in a system.		Your explanation makes me think about …..

Scale, Proportion, and Quantity 8.ESS2.5 Students develop models to investigate scales that are beyond normal experiences. Patterns 8.ESS3.2 Students infer and identify cause and effect relationships from patterns.		

8th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback					
Quarter 1		Quarter 2		**Quarter 3**	Quarter 4
Unit 1 Motion and Forces	Unit 2 Electricity and Magnetism	Unit 3 Waves	Unit 4 Our Universe	**Unit 5 Restless Earth**	Unit 6 Change Over Time
4 weeks	5 weeks	6 weeks	3 weeks	**9 weeks**	9 weeks

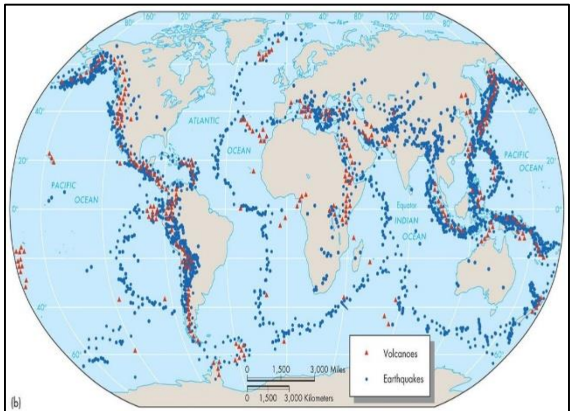
UNIT 5: Restless Earth (9 weeks)

Overarching Question(s)

How and why is Earth constantly changing?

Unit 5, Lesson 8	Lesson Length	Essential Question	Vocabulary
Measuring Earthquake Waves	1 week	How are seismic waves used to study earthquakes?	focus, epicenter, seismic waves, seismogram, magnitude, intensity

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) ESS2: Earth's Systems ESS3: Earth and Human Activity **Standard(s)** 8.ESS2.2 Evaluate data collected from seismographs to create a model of Earth's structure. 8.ESS2.4 Gather and evaluate evidence that energy from the earth's interior drives convection cycles within the asthenosphere which create changes within the lithosphere including plate movements, plate boundaries, and sea-floor spreading.	**Learning Outcomes** • Describe an earthquake. • Compare an earthquake's epicenter. • Explain how energy from an earthquake is released. • Describe the properties of body and surface waves. • Explain how seismometers and seismograms are used. • Compare magnitude and intensity. • Explain how different scales are used to measure magnitude and intensity. • List and explain factors that determine the effects of an earthquake.	**Curricular Resources** HMH Tennessee Science TE, Unit 9, Lesson 6, pp. 702-716 Engage • Earthquake Recall Activity, TE p. 704 • Engage Your Brain #s 1 and 2, SE p. 587 • Active Reading #s 3 and 4, SE p. 587 Explore Factors Determining the Effects of Earthquakes • Earthquake Proof? Activity, TE p. 704 • Earthquakes and Buildings Quick Lab, TE p. 705 • How Can We Study Earthquakes? Virtual Lab, TE p. 705 Explain The Causes of Earthquakes • Active Reading #5, SE p. 588

8.ESS3.2 Collect data, map, and describe patterns in the locations of volcanoes and earthquakes related to tectonic plate boundaries, interactions, and hotspots. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 8.ESS2.2 Seismic waves are mechanical waves that transfer energy just like other mechanical waves. The source of their energy is usually from Earth's shifting plates. Like other mechanical waves, seismic waves interact with the medium through which they travel. Interactions include changes in the wave's speed as the medium changes, absorption, reflection, or refraction. For example, seismic waves traveling through the Earth's mantle will be refracted as the density of the material changes due to heating from Earth's core. Student models of Earth's structure should account for recorded wave behaviors. Earthquakes produce two different waves visible on seismographs: pressure waves (P-waves) and shear waves (S-waves). These two waves travel at different speeds, their relative positions on a recorded seismogram will be further apart as the distance from the epicenter to seismograph increases.	• Explain how damage relates to earthquake magnitude, geology, distance from the epicenter, and structure type. **Suggested Phenomenon**  Copyright © 2008 Pearson Prentice Hall, Inc. Students can complete a See Think Wonder Template after examining the map. Possible Guiding Question(s): What part of the world are most of the earthquakes occurring? Why?	• Sequence #6, SE pp. 588-589 • Visualize It! #7, SE p. 589 Seismic Waves and Their Measurement • Active Reading #8, SE p. 590 • Visualize It! #9, SE p. 590 • Compare #10, SE p. 591 • Do the Math #11, SE p. 592 • Visualize It! #12, SE p. 593 • Active Reading #13, SE p. 593 • Think Outside the Book #14, SE p. 593 Earthquake Magnitude and Intensity • Active Reading #15, SE p. 594 • Identify #16, SE p. 594 • Visualize It! #17, SE p. 595 Factors Determining the Effects of Earthquakes • Apply #18, SE p. 596 • Visualize It! #19, SE p. 597 Extend Reinforce and Review • Reviewing Earthquake Measurements Activity, TE p. 708 • Cluster Diagram Graphic Organizer, TE p. 708 • Visual Summary, SE p. 598 Going Further • Social Studies Connection, TE p. 708 • Math Connection, TE p. 708 Evaluate Formative Assessment • Reteach, TE p. 709

The P-waves are longitudinal waves. They are able to compress both liquid and solid and therefore we expect them to travel through any matter in Earth's interior, regardless of its state. S-waves are a transverse wave. Student should explore models of s-waves to explain why s-waves cannot travel through liquids. On seismograms, both p and s waves are observable, unless an imaginary line connecting the location of the recording seismograph and the epicenter of the earthquake also passes through earth's outer core. When the waves from a seismic event pass through the outer core, only the p-waves are transmitted. The absence of s-waves is evidence for the liquid outer core. 8.ESS2.4 Convection cycles occur when fluids are heated. The heated fluid flows upward. Fluid at the surface loses heat to the atmosphere and the cooled fluid descends as a result of its increased density. The heat driving convection cycle comes from the elements found in Earth's core and lower mantle (not from residual heat from Earth's formation). The circular motion of the cycling asthenosphere drags the plates that make up Earth's floating lithospheres. The floating plates are moved together or apart at boundaries. Where plates		• Throughout TE • Lesson Review, SE p. 599 Summative Assessment • Measuring Earthquake Waves Alternative Assessment, TE p. 709 • Lesson Quiz **Additional Resources** • Phoning in Earthquakes Article **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) Students will use a graphic organizer to describe the properties of body and surface waves using a word box and sentence stems. Use graphic organizers or concept maps to support students in their explanation of why seismic waves are used to measure earthquakes. Highlight these signal words for describing: for example, for instance, in support of this, in fact, as evidence

move apart, liquid rock from earth's interior reaches the surface, and solidifies. Earth's mantle must be primarily solid, otherwise S-waves would not travel through it. This can be cause confusion, when trying to explain how convection can occur within the mantle. Because students should recognize that convection does not occur in solids. The solid nature of the mantle is somewhat like considering glass a solid. Over very long periods of time, panes of glass oriented vertically become thinner at their tops and thicker at their bottoms as they flow downward. Similarly, Earth's mantle exhibits liquid behaviors at geologic time scales. 8.ESS3.2 Tectonic theory explains the patterns that are seen in the locations where earthquakes occur. The data collected might include locations, magnitudes, and frequencies of tectonic phenomena, as well as types and significance of damage associated with the events. As humans build cities and civilizations, knowledge of natural hazards allows for intentional development. Earthquakes occur and scientists are not yet able to predict when they will happen. However, we can generally predict where they are most likely going to happen. This knowledge allows developers to build buildings and make		Visuals for earthquakes When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows…? But does your claim account for…(evidence) Response Starters I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

preparations for likely events. Preparations can include both plans to minimize damage, as well as how to respond to the most likely types of damage that will occur. **Suggested Science and Engineering Practice(s)** Developing and Using Models 8.ESS2.2, 8.ESS2.4 Students create models which are responsive and incorporate features that are not visible in the natural world, but have implications on the behavior of the modeled systems and can identify limitations of their models. Using Mathematics and Computational Thinking 8.ESS3.2 Students can use computing to process large amounts of data in order to develop mathematical representations (ratios, percentages, rates) that will help evaluate a scientific explanation. **Suggested Crosscutting Concept(s)** Energy and Matter 8.ESS2.2, 8.ESS2.4 Students track energy changes through transformations in a system. Patterns 8.ESS3.2 Students infer and identify cause and effect relationships from patterns.		

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UNIT 5: Restless Earth (9 weeks)			
Overarching Question(s)			
How do the Earth's surface processes and human activities affect each other?			
Unit 5, Lesson 9	**Lesson Length**	**Essential Question**	**Vocabulary**
Distribution of Earth's Resources	1 week	How are Earth's natural resources distributed?	natural resource, nonrenewable resource, aquifer, renewable resource, groundwater, fossil fuel, mineral resource, water table

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) ESS3: Earth and Human Activity **Standard(s)** 8. ESS3.1 Interpret data to explain that Earth's mineral, fossil fuel, and groundwater resources are unevenly distributed as a result of tectonic processes. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 8.ESS3.1 The formation and/or accumulation of resources occurs as a result of tectonic and natural processes. Data should connect natural resources locations to such processes. Mineral accumulations	**Learning Outcomes** • Define natural resource. • Define groundwater. • List types of natural resources. • Define fossil fuel. • Compare ways minerals form underground. • Describe how fossil fuels are extracted. • List the different minerals found in Tennessee.	**Curricular Resources** HMH Tennessee Science TE, Unit 9, Lesson 7, pp. 722-738 Engage • Engage Your Brain #s 1 and 2, SE p. 605 • Active Reading #s 3 and 4, SE p. 605 • Aquifers Daily Demo, TE p. 725 Explore Beneath the Surface • The Impact of Resource Extraction Quick Lab, TE p. 725 Explain

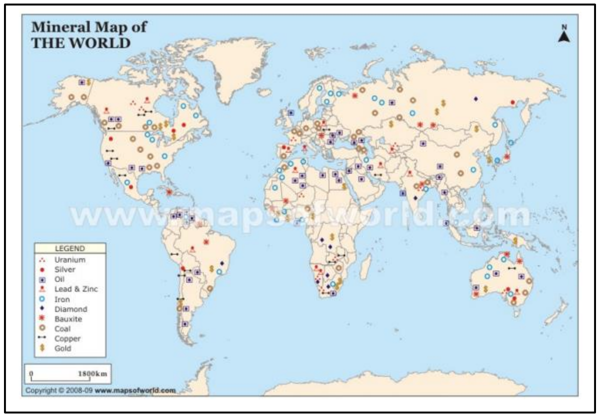
connect to processes such as water transport and ash spread by volcanoes.

Fossil fuels form the remains of plants and algae that filled that once filled swampy areas. Students can observe data to show that swampy areas are found in low lying regions, and that these areas undergo processes of sedimentation. As sedimentation and decomposition occur, the heavy layers being deposited trap heat and permit chemical reactions that transform the remains of decaying organisms into petroleum. Data analysis can include connecting the locations of areas that were low-lying swamps in pre-historic times to sites of present-day extraction of fossil fuels.

The processes that form different rock types have created non-uniform distribution of rock types. Granite and other metamorphic rocks are impermeable to water and layers of such metamorphic rock serve as enormous “bowls” trapping water. These areas fill with porous sediment, which does not prevent accumulation of water. Students can observe data about the types of rock in areas where aquifers are located, connecting this to general events that would have created necessary conditions for aquifer formation.

Suggested Science and Engineering Practice(s)
Analyzing and Interpreting Data 8.ESS3.1

Suggested Phenomenon



Minerals are unevenly distributed around the world due to geologic processes. Students can complete a See Think Wonder Template after examining the maps.

Possible Guiding Question(s):
What part of the world is each mineral located?
Are the locations associated with high volcanic activity or other processes related to plate boundaries, etc.?

Earth’s Bounty

- Active Reading #5, SE p. 606
- Active Reading #6, SE p. 607
- Visualize It! #7, SE p. 608
- Active Reading #8, SE p. 609
- Explain #9, SE p. 609

Beneath the Surface

- Describe #10, SE p. 611
- Active Reading #11, SE p. 612
- Compare #12, SE p. 613
- Active Reading #13, SE p. 614
- Apply #14, SE p. 616
- Think Outside the Book #15, SE p. 617
- Synthesize #16, SE p. 617

Natural Resources in Tennessee

- Infer #13, SE p. 618

Extend

Reinforce and Review

- What Was This All About? Activity, TE p. 728
- Natural Resources Graphic Organizer, TE p. 728
- Visual Summary, SE p. 620

Going Further

- Life Science Connection, TE p. 728

Evaluate

Formative Assessment

Students should create and analyze graphical presentations of data to identify linear and nonlinear relationships, consider statistical features within data and/or evaluate multiple data sets for a single phenomenon. **Suggested Crosscutting Concept(s)** Cause and Effect 8.ESS3.1 Students infer and identify cause and effect relationships from patterns.		• Reteach, TE p. 729 • Throughout TE • Lesson Review, SE p. 621 Summative Assessment • The Restless Earth Alternative Assessment, TE p. 729 • Lesson Quiz • Unit 9 Big Idea, SE p. 622 • Unit 9 Review, SE pp. 623-628 **Additional Resources** • Legends of Learning Game-Natural Resources • Explainer: Where Fossil Fuels Come From Article • Many of Earth's Ground Water Basins are Drying Out Article • Minerals on the Edge • Dig Into Mining-The Story of Copper: Patterns of Natural Resources • Mineral Resources & Waste Disposal • Distribution of Natural Resources National Geographic Collection **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource:

		WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) Students will talk with a partner to define natural resource using 2-3 complete sentences. Use graphic organizers or concept maps to support students in their explanation of how earth's natural resources are distributed. Highlight these signal words for describing: for example, for instance, in support of this, in fact, as evidence When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows….? But does your claim account for…(evidence)

		<u>Response Starters</u> I agree with you because of (evidence or reasoning) I don’t agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about..