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Correlation to the
Oklahoma Academic Standards for Science
Earth & Space Science

Holt McDougal Earth Science

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CORRELATIONS WITH OKLAHOMA ACADEMIC STANDARDS

Health, Vocational Education and Computer Education/Instructional Technology and Grades PreK-12 Science, PreK-5 Science Content Reading

Grades 9–12
Earth Science

Correlation Location	Oklahoma Academic Standards: Earth Science
HS-ESS1-1 Earth's Place in the Universe	
Print or Online SE/TE: Pages 176, 824, 825, 834-835, 853	**Performance Expectation HS-EES1-1** *Students who demonstrate understanding can:* **Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.** **Clarification Statement:** Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11-year sunspot cycle, and non-cyclic variations over centuries. **Assessment Boundary:** Assessment does not include details of the atomic and sub-atomic processes involved with the sun's nuclear fusion.

Correlation Location	Oklahoma Academic Standards: Earth Science
Print or Online SE/TE: Pages 176, 824-825, 845, 852-858	**Disciplinary Core Ideas for Standard HS-ESS1-1** **The Universe and Its Stars**: • The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. **Energy in Chemical Processes and Everyday Life: (secondary to HS-ESS1-1)** • Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation.
Print or Online SE/TE: Pages 409, 738-739, 756, 794, 825, 834-835	**Science and Engineering Practice for Standard HS-ESS1-1** **Developing and using models:** Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. • Develop a model based on evidence to illustrate the relationships between systems or components of a system.
Print or Online SE/TE: Pages 722 (Math Skills and Skill Builder exercises), 824, 826 **Online Labs:** **Making Models Lab:** It's a Long Way to Neptune! (Section 27.4)	**Crosscutting Concept for Standard HS-ESS1-1** **Scale, Proportion, and Quantity:** • The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.

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Correlation Location	Oklahoma Academic Standards: Earth Science
HS-ESS1-2 Earth's Place in the Universe	
Print or Online SE/TE: Pages 756, 794 **Print or Online TE Only:** Pages 722, 755, 861, 862, 871	**Performance Expectation HS-EES1-2** *Students who demonstrate understanding can:* **Develop models to describe the sun's place in relation to the Milky Way galaxy and the distribution of galaxies and galaxy clusters in the Universe.** **Clarification Statement:** Mathematical models can focus on the logarithmic powers-of-ten relationship among the sun, its solar system, the Milky Way galaxy, the local cluster of galaxies, and the universe, these relationships can also be investigated graphically, using 2D or 3D scaled models, or through computer programs, either pre-made or student-written. **Assessment Boundary:** Details about the mapped distribution of galaxies and clusters are not assessed.
Print or Online SE/TE: Pages 722, 749-751, 755, 758	**Disciplinary Core Ideas for Standard HS-ESS1-2** **Earth and the Solar System:** • The solar system consists of the sun and a collection of objects of varying sizes and conditions – including planets and their moons – that are held in orbit around the sun by its gravitational pull on them.
Print or Online SE/TE: Pages 738-739, 756, 794, 865 **Print or Online TE Only:**	**Science and Engineering Practice for Standard HS-ESS1-2** **Developing and using models:** Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show

Correlation Location	Oklahoma Academic Standards: Earth Science
Pages 722, 755, 861, 862, 871	relationships among variables between systems and their components in the natural and designed worlds. • Develop a model based on evidence to illustrate the relationships between systems or components of a system.
Print or Online SE/TE: Pages 722 (Math Skills and Skill Builder exercises), 824, 826 **Online Labs:** **Making Models Lab:** It's a Long Way to Neptune! (Section 27.4)	**Crosscutting Concept for Standard HS-ESS1-2** **Scale, Proportion, and Quantity** • The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.
HS-ESS1-3 Earth's Place in the Universe	
Opportunities to address the Performance Expectation can be found in the following textbook pages: **Print or Online SE/TE:** Pages 845-846	**Performance Expectation HS-EES1-3** *Students who demonstrate understanding can:* **Communicate scientific ideas about the way stars, over their life cycle, produce elements.** **Clarification Statement:** Emphasis is on the way nucleosynthesis, and therefore the different elements created, depend on the mass of a star and the stage of its lifetime. **Assessment Boundary:** Details of the many different nucleosynthesis pathways for stars of differing masses are not assessed.
Print or Online SE/TE: Pages 845-850, 851-858	**Disciplinary Core Ideas for Standard HS-ESS1-3** **The Universe and Its Stars:** • The study of stars' light spectra and brightness is used to identify

Correlation Location	Oklahoma Academic Standards: Earth Science
	compositional elements of stars, their movements, and their distances from Earth. (HS-ESS1-2),(HS-ESS1-3) • Other than the hydrogen and helium, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. • Heavier elements are produced when certain massive stars achieve a supernova stage and explode.
Print or Online SE/TE: Pages 812-813, 897-907, 940-943, 954-957 **Print or Online TE Only:** Page 847 **Additional Online Resources:** **Internet Activity:** Distribution Patterns (Section 12.1)	**Science and Engineering Practice for Standard HS-ESS1-3** **Obtaining, evaluating, and communicating information:** Obtaining, evaluating, and communicating information in 9–12 builds on K –8 and progresses to evaluating the validity and reliability of the claims, methods, and designs. • Communicate scientific (e.g. about phenomena and/or the process of development and the design and performance of a proposed process of system) in multiple formats (including orally, graphically, textually, and mathematically).
Print or Online SE/TE: Pages 824-825	**Crosscutting Concept for Standard HS-ESS1-3** **Energy and Matter** • In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.
HS-ESS1-4 Earth's Place in the Universe	
Print or Online SE/TE: Pages 756-758, 954-957	**Performance Expectation HS-EES1-4** *Students who demonstrate understanding can:* **Use mathematical or computational representations to predict the motion**

Correlation Location	Oklahoma Academic Standards: Earth Science
	of orbiting objects in the solar system. **Clarification Statement:** Emphasis is on Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as planets and moons. (e.g. graphical representations of orbits) **Assessment Boundary:** Mathematical representations for the gravitational attraction of bodies and Kepler's Laws of orbital motions should not deal with more than two bodies, nor involve calculus.
Print or Online SE/TE: Pages 756-758 **Print or Online SE/TE:** Pages 7, 17, 42, 59, 185, 186, 419, 630, 646, 714, 726, 811, 830, 867	**Disciplinary Core Ideas for Standard HS-ESS1-4** **Earth and the Solar System**: • Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. ** Connections to Engineering, Technology, and Application of Science* **Interdependence of Science, Engineering, and Technology:** • Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others
Print or Online SE/TE: Pages 757, 812 **Print or Online TE Only:** Page 263	**Science and Engineering Practice for Standard HS-ESS1-4** **Using mathematics and computational thinking:** Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear

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	functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions. • Use mathematical representations of phenomena or design solutions to support and revise explanations.
Print or Online SE/TE: Pages 65, 757, 812-813, 900 **Print or Online TE Only:** Pages 11, 263	**Crosscutting Concept for Standard HS-ESS1-4** **Scale, Proportion, and Quantity** • Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth).
HS-ESS1-5 Earth's Place in the Universe	
Print or Online SE/TE: Pages 257, 259-266, 267-274, 275-281, 282-283, 308-309 **Print or Online TE Only:** Pages 261, 269 **Online Labs:** **Making Models Lab:** Eggshell Tectonics (Section 10.2)	**Performance Expectation HS-EES1-5** *Students who demonstrate understanding can:* **Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.** **Clarification Statement:** Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages of oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust decreasing with distance away from a central ancient core (a result of past plate interactions). **Assessment Boundary:** N/A

Correlation Location	Oklahoma Academic Standards: Earth Science
Print or Online SE/TE: Pages 259-266, 267-274, 275-281	**Disciplinary Core Ideas for Standard HS-ESS1-5** **Plate Tectonics and Large-Scale System Interactions:** • Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history.
Print or Online SE/TE: Pages 18-19, 498-499 **Online Labs:** **Inquiry Lab(s):** Where Do Earthquakes Happen? (Section 10.2); Rock Deformation (Section 11.1); Simulating Earthquakes (Section 12.1); Lava Flows (Section 13.2)	**Science and Engineering Practice for Standard HS-ESS1-5** **Engaging in argument from evidence:** Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science. • Apply scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.
Print or Online SE/TE: Pages 133, 230, 233, 246, 307, 864, 865 **Online Labs:** **Inquiry Lab(s):** Got Fossils? (Section 8.3) **Making Models Lab(s):** Future Earth (Section 9.1)	**Crosscutting Concept for Standard HS-ESS1-5** **Stability and Change** • Much of science deals with constructing explanations of how things change and how they remain stable.
HS-ESS1-6 Earth's Place in the Universe	
Print or Online SE/TE: Pages 133, 246-247	**Performance Expectation HS-EES1-6** *Students who demonstrate understanding can:* **Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's**

Correlation Location	Oklahoma Academic Standards: Earth Science
	formation and early history. **Clarification Statement:** Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth. Examples of evidence include materials obtained through space exploration, radiometric dating of meteorites and Earth's oldest minerals, the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.
Print or Online SE/TE: Pages 136, 721, 752, 762, 782, 787, 789, 810	**Disciplinary Core Ideas for Standard HS-ESS1-6** **The History of Planet Earth**: • Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history.
Print or Online SE/TE: Pages 18-19, 498-499 **Online Labs:** **Inquiry Lab(s):** Where Do Earthquakes Happen? (Section 10.2); Rock Deformation (Section 11.1); Simulating Earthquakes (Section 12.1); Lava Flows (Section 13.2)	**Science and Engineering Practice for Standard HS-ESS1-6** **Constructing explanations (for science) and designing solutions (for engineering):** Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories. • Apply scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.
Print or Online SE/TE: Pages 133, 230, 233, 246, 307, 864, 865	**Crosscutting Concept for Standard HS-ESS1-6**

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Online Labs: **Inquiry Lab:** Got Fossils? (Section 8.3) **Making Models Lab:** Future Earth (Section 9.1)	**Stability and Change:** • Much of science deals with constructing explanations of how things change and how they remain stable.
HS-ESS2-1 Earth's Systems	
Print or Online SE/TE: Pages 262-263, 269-272, 273 (Quick Lab), 282-283, 308-309 **Print or Online TE Only:** Pages 275, 280, 305, 306 **Online Labs:** **Inquiry Lab:** Rock Deformation (Section 11.1) **Making Models Labs:** Melted Glacier Formations (Section 17.2); Erosion of a Submerging Coastal Profile (Section 18.3); Island to Guyot (Section 23.2)	**Performance Expectation HS-EES2-1** *Students who demonstrate understanding can:* **Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.** **Clarification Statement:** Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, erosion, and mass wasting). **Assessment Boundary:** Assessment does not include memorization of the details of the formation of specific geographic features of Earth's surface.
Print or Online SE/TE: Pages 259-266, 267-274, 275-281	**Disciplinary Core Ideas for Standard HS-ESS2-1** **Earth Materials and Systems**: • Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes.

Correlation Location	Oklahoma Academic Standards: Earth Science
Print or Online SE/TE: Pages 33-34, 36-40, 42-44, 136, 293-294, 418, 493, 617-619	**Plate Tectonics and Large-Scale System Interactions:** • Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. • Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust.
Print or Online SE/TE: Pages 74-75, 262-263, 269-272, 273, 282-283, 308-309 **Print or Online TE Only:** Pages 275, 280, 305, 306 **Online Labs:** **Inquiry Lab(s):** Modeling Types of Deformation; Rock Deformation (Section 11.1); Sediment Loading (Section 23.3) **Making Models Lab(s):** Melted Glacier Formations (Section 17.2); Erosion of a Submerging Coastal Profile (Section 18.3); Island to Guyot (Section 23.2)	**Science and Engineering Practice for Standard HS-ESS2-1** **Developing and using models:** Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. • Develop a model based on evidence to illustrate the relationships between systems or components of a system.
Print or Online SE/TE: Pages 133, 230, 233, 246-247, 307, 864, 865 (Quick Lab) **Online Labs:** **Inquiry Lab:** Got Fossils?	**Crosscutting Concept for Standard HS-ESS2-1** **Stability and Change:** • Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are

Correlation Location	Oklahoma Academic Standards: Earth Science
Making Models Lab: Future Earth (Section 9.1)	irreversible.
HS-ESS2-2 Earth's Systems	
Online Labs: **Inquiry Lab:** Soil Erosion (Section 10.2)	**Performance Expectation HS-EES2-2** *Students who demonstrate understanding can:* **Analyze geoscience data to make the claim that** one change to Earth's surface can create feedbacks and interactions that cause changes to other Earth's systems. **Clarification Statement:** Examples could be taken from system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion, which limits additional vegetation patterns; how dammed rivers increase ground-water recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent. Examples could also include climate feedbacks that increase surface temperatures through geologic time. **Assessment Boundary:** N/A

Correlation Location	Oklahoma Academic Standards: Earth Science
Print or Online SE/TE: Pages 33-34, 36-40, 42-44, 136, 293-294, 418, 493, 521-526, 606-609, 617-619	**Disciplinary Core Ideas for Standard HS-ESS2-2** **Earth Materials and Systems**: • Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. **Weather and Climate:** • The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.
Print or Online SE/TE: Pages 18-19, 246-247	**Science and Engineering Practice for Standard HS-ESS2-2** **Analyzing and interpreting data:** Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. • Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
Print or Online SE/TE: Pages 615-616, 618	**Crosscutting Concept for Standard HS-ESS2-2** **Stability and Change:** • Feedback (negative or positive) can stabilize or destabilize a system.

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HS-ESS2-3 Earth's Systems	
<u>Print or Online TE Only:</u> Pages 37, 40 **<u>Online Lab:</u>** **Making Models Lab:** Global Air Movement (Section 19.3)	**Performance Expectation HS-EES2-3** *Students who demonstrate understanding can:* **<u>Develop a model based on evidence of</u> Earth's interior <u>to describe</u> the cycling of matter by thermal convection.** **Clarification Statement:** Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of the Earth's surface features as well as three-dimensional structure in the subsurface, obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and prediction of the composition of Earth's layers from high-pressure laboratory experiments. **Assessment Boundary:** N/A
<u>Print or Online SE/TE:</u> Pages 30-31, 37, 209-211, 263-266, 267, 272-274, 752, 762	**Disciplinary Core Ideas for Standard HS-ESS2-3** **Earth Materials and Systems**: • Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. • Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward

Correlation Location	Oklahoma Academic Standards: Earth Science
	flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. **Plate Tectonics and Large-Scale System Interactions:** • The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. • Plate tectonics can be viewed as the surface expression of mantle convection. **Wave Properties:** **(secondary to HS-ESS2-3)** • Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet.
Print or Online SE/TE: Pages 38-39, 272, 409, 738-739, 756, 794, 825, 834-835	**Science and Engineering Practice for Standard HS-ESS2-3** **Developing and using models:** Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. • Develop a model based on evidence to illustrate the relationships between systems or components of a system.
Print or Online SE/TE: Pages 33-34, 38-40, 334-335, 495, 593, 866 **Print or Online TE Only:** Page 36	**Crosscutting Concept for Standard HS-ESS2-3** **Energy and Matter:** • Energy drives the cycling of matter within and between systems.
HS-ESS2-4 Earth's Systems	
Online Labs:	**Performance Expectation HS-EES2-4**

Correlation Location	Oklahoma Academic Standards: Earth Science
Inquiry Labs: Particulates in the Atmosphere (Section 22.3); Factors That Affect Climate (Section 22.1) **Making Models Lab:** Future Earth (Section 9.1)	*Students who demonstrate understanding can:* **Analyze and interpret data to explore how variations in the flow of energy into and out of Earth's systems result in changes in atmosphere and climate.** **Clarification Statement:** Changes differ by timescale, from sudden (large volcanic eruption, ocean circulation); to intermediate (ocean circulation, solar output, human activity) and long-term (Earth's orbit and the orientation of its axis and changes in atmospheric composition). Examples of human activities could include fossil fuel combustion, cement production, or agricultural activity and natural processes such as changes in incoming solar radiation or volcanic activity. Examples of data can include tables, graphs, maps of global and regional temperatures, and atmospheric levels of gases. **Assessment Boundary:** N/A
Print or Online SE/TE: Pages 469-470, 617	**Disciplinary Core Ideas for Standard HS-ESS2-4** **Earth and the Solar System**: **(secondary to HS-ESS2-4)** • Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes. **Earth Materials and Systems**:

Correlation Location	Oklahoma Academic Standards: Earth Science
Print or Online SE/TE: Pages 469-470, 608-609, 615-618	• The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles.
Print or Online SE/TE: Pages 36-37, 521-526, 606-609	**Weather and Climate:** • The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.
Print or Online SE/TE: Pages 946-949	**Science and Engineering Practice for Standard HS-ESS2-4** **Analyzing and interpreting data:** Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. • Analyze data using computational models in order to make valid and reliable scientific claims.
Print or Online SE/TE: Pages 444-445	**Crosscutting Concept for Standard HS-ESS2-4** **Cause and Effect:** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.
HS-ESS2-5 Earth's Systems	
Print or Online SE/TE:	**Performance Expectation HS-EES2-5**

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Pages 432 **Online Labs:** **Inquiry Lab:** Glacial Deposition (Section 17.2) **Making Models Labs:** Erosion of a Submerging Coastal Profile (Section 18.3); Melted Glacier Formations (Section 17.2)	*Students who demonstrate understanding can:* **Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.** **Clarification Statement:** Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids). **Assessment Boundary:** N/A
Print or Online SE/TE: Pages 40, 373-374, 376-378, 407-409, 411-412, 415, 439-442, 544, 607-608, 661-668	**Disciplinary Core Ideas for Standard HS-ESS2-5** **The Roles of Water in Earth's Surface Processes**: • The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks.
Print or Online SE/TE:	**Science and Engineering Practice for Standard HS-ESS2-5**

Correlation Location	Oklahoma Academic Standards: Earth Science
Pages 246-247, 432, 547 (Quick Labs) **Online Labs:** **Inquiry Lab(s):** Got Fossils? (Section 8.3); Dinosaur Hunt (Section 9.3) **Making Models Lab(s):** Future Earth (Section 9.1); Eggshell Tectonics (Section 10.2)	**Planning and carrying out investigations:** Planning and carrying out investigations in 9-12 builds on 6-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
Print or Online SE/TE: Pages 88, 93, 99, 330, 909 **Online Labs:** **Inquiry Lab:** Ionic and Covalent Conductivity (Section 4.2) **Making Models Lab:** Island to Guyot (Section 23.2)	**Crosscutting Concept for Standard HS-ESS2-5** **Structure and Function** • The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.
HS-ESS2-6 Earth's Systems	
Online Lab: **Making Models Lab:** The Water Cycle (Section 2.2)	**Performance Expectation HS-EES2-6** *Students who demonstrate understanding can:* **Develop a quantitative model to describe the cycling of carbon among the**

Correlation Location	Oklahoma Academic Standards: Earth Science
	hydrosphere, atmosphere, geosphere, and biosphere. **Clarification Statement:** Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.
Print or Online SE/TE: Pages 39, 618, 661-662, 754 **Print or Online TE Only:** Page 663	**Disciplinary Core Ideas for Standard HS-ESS2-6** **Biogeology:** • Organisms ranging from bacteria to human beings are a major driver of the global carbon and they influence global climate by modifying the chemical makeup of the atmosphere. • The abundance of carbon in the atmosphere is reduced through the ocean floor accumulation of marine sediments and the accumulation of plant biomass.
Print or Online SE/TE: Pages 37, 43 (Quick Labs) **Print or Online TE Only:** Pages 42, 44 **Online Labs:** **Inquiry Lab:** Energy Transfer (Section 2.3) **Making Models Lab:** The Water Cycle (Section 2.2); Crater Eraser (Section 28.1)	**Science and Engineering Practice for Standard HS-ESS2-6** **Developing and using models:** Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds. • Develop a model based on evidence to illustrate the relationships between systems or components of a system.
Print or Online SE/TE: Pages 34, 36, 46-47 **Online Labs:** **Inquiry Lab:** Energy Transfer (Section 2.3)	**Crosscutting Concept for Standard HS-ESS2-6** **Energy and Matter** • The total amount of energy and matter in closed systems is conserved.

Correlation Location	Oklahoma Academic Standards: Earth Science
Making Models Lab: The Water Cycle (Section 2.2)	
HS-ESS2-7 Earth's Systems	
Print or Online SE/TE: Pages 233-234, 753	**Performance Expectation HS-EES2-7** *Students who demonstrate understanding can:* **Construct an argument based on evidence about the simultaneous co-evolution of Earth's systems and life on Earth.** **Clarification Statement:** Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors influence conditions for life, which in turn continuously alters Earth's surface. Examples include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and affected animal life; how microbial life on land increased the formation of soil, which in turn allowed for the development of land plant species; or how the changes in coral species created reefs that altered patterns of erosion and deposition along coastlines and provided habitats to support biodiversity. Geologic timescale should be considered with the emphases above. **Assessment Boundary:** Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems.
Print or Online SE/TE:	**Disciplinary Core Ideas for Standard HS-ESS2-7**

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Correlation Location	Oklahoma Academic Standards: Earth Science
Pages 233-238, 239-244, 514, 752-753, 762	**Weather and Climate:** • Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. **Biogeology:** • The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it.
Print or Online SE/TE: Page 419	**Science and Engineering Practice for Standard HS-ESS2-7** **Engaging in argument from evidence:** Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science. • Construct an oral and written argument or counter-arguments based on data and evidence.
Print or Online SE/TE: Pages 27, 227, 230, 233-238, 239-244, 246-247, 514 **Online Labs:** **Making Models Lab:** Future Earth (Section 9.1)	**Crosscutting Concept for Standard HS-ESS2-7** **Stability and Change** • Much of science deals with constructing explanations of how things change and how they remain stable.
HS-ESS3-1 Earth and Human Activities	
Print or Online SE/TE: Pages 330, 395, 580-581, 582 **Print or Online TE Only:** Pages 347, 352 **Online Labs:** **Inquiry Lab:** Tsunami! (Section 25.2)	**Performance Expectation HS-EES3-1** *Students who demonstrate understanding can:* **Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.**

Correlation Location	Oklahoma Academic Standards: Earth Science
	Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Natural hazards and other geologic events exhibit some non-random patterns of occurrence. Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.
Print or Online SE/TE: Pages 357, 496, 497, 580-581	**Disciplinary Core Ideas for Standard HS-ESS3-1** **Natural Resources:** • Resource availability has guided the development of human society. **Natural Hazards:** • Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations.
Print or Online SE/TE: Pages 308-309, 317, 326, 355, 358-359 **Print or Online TE Only:** Pages 320, 324, 353 **Online Labs:**	**Science and Engineering Practice for Standard HS-ESS3-1** **Constructing explanations (for science) and designing solutions (for engineering):** Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories.

Correlation Location	Oklahoma Academic Standards: Earth Science
Inquiry Labs: Where Do Earthquakes Happen? (Section 10.2); Tsunami! (Section 25.2) **Making Models Lab:** Crater Eraser (Section 28.1)	• Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
Print or Online SE/TE: Pages 178, 186-187 **Print or Online TE Only:** Page 184	**Crosscutting Concept for Standard HS-ESS3-1** **Cause and Effect** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.
HS-ESS3-2 Earth and Human Activities	
Print or Online SE/TE: Pages 186-187 **Print or Online TE Only:** Page 184	**Performance Expectation HS-EES3-2** *Students who demonstrate understanding can:* **Evaluate competing design solutions for developing, managing, and utilizing natural resources based on cost-benefit ratios.*** **Clarification Statement:** Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural, soil use, forestry, and mining.
Print or Online SE/TE: Pages 164, 169, 175-176, 181-184, 185, 419	**Disciplinary Core Ideas for Standard HS-ESS3-2** **Natural Resources:** • All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social

Correlation Location	Oklahoma Academic Standards: Earth Science
	regulations can change the balance of these factors. **Developing Possible Solutions:** **(secondary to HS-ESS3-2)** • When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.
Print or Online SE/TE: Pages 186-187, 419 **Print or Online TE Only:** Page 184	**Science and Engineering Practice for Standard HS-ESS3-2** **Engaging in argument from evidence:** Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science. • Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations).
HS-ESS3-5 Earth and Human Activities	
Print or Online SE/TE: Page 165 **Print or Online TE Only:** Pages 168, 169, 172	**Performance Expectation HS-EES3-5** *Students who demonstrate understanding can:* **Construct a scientific explanation from evidence for how geological processes lead to uneven distribution of natural resources.** **Clarification Statement:**

Correlation Location	Oklahoma Academic Standards: Earth Science
	Emphasis is on how geological processes have led to geological sedimentary basins that provide significant accumulations of crude oil and natural gas in some areas and not others and how geological processes lead to diverse soil profiles that support a diversity and range of agricultural crops and how plate tectonics leads to concentrations of mineral deposits. **Assessment Boundary:** N/A
Print or Online SE/TE: Pages 173, 181-182 **Print or Online TE Only:** Pages 165, 173	**Disciplinary Core Ideas for Standard HS-ESS3-5** **Natural Resources:** • Most elements exist in Earth's crust at concentrations too low to be extracted, but in some locations—where geological processes have concentrated them—extraction is economically viable.
Print or Online SE/TE: Pages 182, 187 (Extension) **Print or Online TE Only:** Page 169	**Science and Engineering Practice for Standard HS-ESS3-5** **Constructing explanations (for science) and designing solutions (for engineering):** Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student- generated sources of evidence consistent with scientific ideas, principles, and theories. • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the

Correlation Location	Oklahoma Academic Standards: Earth Science
	future.
Print or Online SE/TE: Pages 181-182 **Online Labs:** **Inquiry Lab:** What's Before Your Eyes? (Section 1.2)	**Crosscutting Concept for Standard HS-ESS3-5** **Cause and Effect** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.