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Standards Map for Kindergarten Through Grade Eight
Grade 6 Discipline Specific –Next Generation Science Standards

MS-ESS1 Earth's Place in the Universe

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		Publisher Citations	Performance Expectation	Publisher Citations
SEP	**Developing and Using Models** Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. ▪ Develop and use a model to describe phenomena. (MS-ESS1-1)	***Earth's Changing Climate*** unit: ● Lesson 1.3, **Activity 3**, Instructional Guide (steps 5–9), Student View, and Teacher Support tab ("Background, Pedagogical Goals: Developing Models") ***Earth, Moon, and Sun*** unit: ● Lesson 3.1, **Activity 2**, screen 3 of 3, Instructional Guide (steps 611) and Student View ● Lesson 1.3 o **Activity 3**, screens 1–2 of 2, Instructional Guide (steps 1–6) and Student View o **Activity 4**, Instructional Guide (steps 1–8) ***Plate Motion*** unit*:* ● Lesson 2.3, **Activity 3**, screen 1 of 2, Instructional Guide (steps 1–9) and Student View ***Ocean, Atmosphere, and Climate*** unit*:* ● Lesson 1.4, **Activity 3**, Instructional Guide (steps 1–4), Student View, Modeling Tool: 1.4 Different Temperatures, and Possible Responses tab	**MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.** [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]	[DCI, SEP] ***Earth, Moon, and Sun*** unit: ● Lesson 1.3, **Activity 3**, screen 2 of 2, Instructional Guide (step 7) and On-the-Fly Assessment (hummingbird icon) [DCI, CCC] ***Earth, Moon, and Sun*** unit: ● Lesson 2.4, **Activity 3**, Instructional Guide (step 9) and On-the-Fly Assessment (hummingbird icon) [DCI] ***Earth, Moon, and Sun*** unit: ● Lesson 4.4 o **Activity 1**, Student View o **Activity 2**, Student View o **Activity 3**, Student View ● Lesson 4.3 ○ **Activity 4**, Student View and Possible Responses o **Lesson Brief**, Digital Resources, "Rubrics for Final Written Argument" [DCI] ***Earth, Moon, and Sun*** unit:

DCI	**ESS1.A: The Universe and Its Stars** ▪ Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1)	***Earth, Moon, and Sun*** unit: ● Lesson 2.3 o **Activity 2**, Instructional Guide (steps 1–6), Student View, Modeling Tool: Predict Moon Phase, and Possible Responses tab o **Activity: Seeing the Earth, Moon, and Sun from Different Angles**, Instructional Guide (steps 1–4) o **Activity 3**, screen 1 of 2, Instructional Guide (steps 1–6) and simulation o **Activity 4**, Instructional Guide (steps 1–3), Student View, Modeling Tool: Predict Moon Phase, and Possible Responses tab [Apparent motion of the moon] ***Earth, Moon, and Sun***: ● Lesson 2.2, **Activity 2**, Instructional Guide (steps 1–14) and Student View ● Lesson 1.3, **Activity 4**, Instructional Guide (step 3) [Apparent motion of the sun] ***Earth, Moon, and Sun*** unit*:* ● Lesson 1.3, **Activity 4**, Instructional Guide (step 3) [Apparent motion of the stars] ***Earth, Moon, and Sun*** unit*:* ● Lesson 4.1, **Activity 5,** Student View and Possible Responses tab		● Lesson 3.1, **Activity 5**, screen 2 of 2, Instructional Guide, Student View, Possible Responses tab, "The Endless Summer of the Arctic Tern" article, and Teacher Support tab (“Assessment, Assessment Opportunity: Student Understanding of the Cause of Earth’s Seasons”) [SEP] ***Earth’s Changing Climate*** unit: ● Lesson 1.3, **Activity 3**, Instructional Guide (steps 5–9), Student View, and Teacher Support tab (“Background, Pedagogical Goals: Developing Models”) [CCC] ***Geology on Mars*** unit: ● Lesson 1.1, **Activity: Introducing the Student Planetary Geologist Role,** Meet a Planetary Geologist video
DCI	**ESS1.B: Earth and the Solar System** ▪ This model of the solar system can explain eclipses of	[Eclipses of the moon] ***Earth, Moon, and Sun*** unit: ● Chapter 3, Chapter Overview ● Lesson 3.1 o **Activity 2**, screen 3 of 3, Instructional Guide (steps 5–11), Student View, and “An		

	the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1)	Ancient Machine for Predicting Eclipses" article o **Activity 3**, screen 2 of 2, Instructional Guide (steps 6–11), Student View, simulation and Possible Responses tab [Eclipses of the sun] ***Earth, Moon, and Sun*** unit*:* ● Lesson 3.3, **Activity 5**, Student View and Teacher Support tab ("Rationale, Pedagogical Goals: Applying an Understanding of Lunar Eclipses to Explain Solar Eclipses") [Seasons] ***Earth, Moon, and Sun*** ● Lesson 3.1 o **Activity 4**, Instructional Guide (steps 4–5) and Teacher Support tab ("Instructional Suggestion, Providing More Experience: Modeling Seasons" and "Assessment, Assessment Opportunity: Student Understanding of the Cause of Earth's Seasons") o **Activity 5**, screen 2 of 2, Instructional Guide, Student View, Possible Responses tab, and "The Endless Summer of the Arctic Tern" article [Differential intensity of sunlight] ***Ocean, Atmosphere, and Climate*** unit*:* ● Lesson 1.4, **Activity 2**, Instructional Guide and Student View		
CCC	**Patterns** ▪ Patterns can be used to identify cause-and-effect	***Earth, Moon, and Sun***: ● Lesson 2.4 o **Activity 2**, Instructional Guide (step 9–11) and Student View o **Activity 3**, Instructional Guide (steps 8–9) and On-the-Fly Assessment (hummingbird icon)		

	relationships. (MS-ESS1-1)	***Geology on Mars*** unit*:* • Lesson 1.1, **Activity: Introducing the Student Planetary Geologist Role**, Instructional Guide		
CCC	***Connections to Nature of Science*** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** ▪ Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-ESS1-1)	***Earth, Moon, and Sun*** unit*:* • Lesson 2.4, **Activity 2**, screen 3 of 3, Instructional Guide (step 12) ***Geology on Mars*** unit*:* • Lesson 1.1, **Activity: Introducing the Student Planetary Geologist Role**, Instructional Guide		

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		**Publisher Citations**	**Performance Expectation**	**Publisher Citations**
SEP	**Developing and Using Models** Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and	***Earth's Changing Climate*** unit*:* • Lesson 1.3, **Activity 3**, Instructional Guide and Teacher Support tab ***Earth, Moon, and Sun***: • Lesson 3.1, **Activity 2**, screen 3 of 3, Instructional Guide (steps 6–11) and Student View	**MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions**	[DCI] ***Geology on Mars*** unit: • Lesson 1.1, **Activity 5**, "Scale in the Solar System" article (paragraphs 1–5)

	revising models to describe, test, and predict more abstract phenomena and design systems. ▪ Develop and use a model to describe phenomena. (MS-ESS1-2)	• Lesson 1.3: o **Activity 3**, screens 1–2 of 2, Instructional Guide (steps 1–6) and Student View o **Activity 4**, Instructional Guide (steps 1–8) ***Plate Motion*** unit*:* • Lesson 2.3, **Activity 3**, screen 1 of 2, Instructional Guide ***Ocean, Atmosphere, and Climate*** unit*:* • Lesson 1.4, **Activity 3**, Instructional Guide, Student View, Modeling Tool: 1.4 Different Temperatures, and Possible Responses tab	**within galaxies and the solar system.** [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as their school or state).] [*Assessment Boundary: Assessment*	• Lesson 1.3, **Activity 4**, Instructional Guide (step 2) and On-the-Fly Assessment (hummingbird icon) [DCI, PE] ***Earth, Moon, and Sun*** unit: • Lesson 2.4, **Activity 5**, "Gravity in the Solar System" article, Student View, and Teacher Support tab ("Assessment, Assessment Opportunity: Student Understanding of Gravity in the Solar System and the Galaxy") [SEP] ***Earth, Moon, and Sun*** unit: • Lesson 1.3, **Activity 3**, screen 2 of 2, Instructional Guide (step 7) and On-the-Fly Assessment (hummingbird icon) [SEP, CCC, DCI] ***Earth, Moon, and Sun*** unit: • Lesson 2.2, **Activity 2**, Instructional Guide (steps 1–12), Student View, and On-the-Fly Assessment (hummingbird icon) [CCC] ***Earth, Moon, and Sun*** unit: • Lesson 1.3, **Activity 3**, screen 1 of 2, Instructional Guide (steps 1–5)
DCI	**ESS1.A: The Universe and Its Stars** ▪ Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2) ****Supplemental DCI PS2.B*	***Earth, Moon, and Sun*** unit*:* • Lesson 2.4, **Activity 5**, "Gravity in the Solar System" article (paragraph 6)		
DCI	**ESS1.B: Earth and the Solar System** ▪ The solar system consists of the sun and a collection of objects, including planets, their	***Earth, Moon, and Sun*** unit*:* • Lesson 2.4, **Activity 5**, Student View and "Gravity in the Solar System" article (paragraphs 1–5)		

	moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2) ***_Supplemental DCI PS2.B_ ▪ The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)		_does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.]_	
CCC	**Systems and System Models** Models can be used to represent systems and their interactions.	***Earth, Moon, and Sun***: • Lesson 1.3, **Activity 3**, screen 1 of 2, Instructional Guide (steps 1–5) • Lesson 1.2 o **Activity 3**, screen 1 of 3, Instructional Guide (steps 1–2) o **Activity 4**, Student View and "The Solar System is Huge" article ***Geology on Mars***: • Lesson 2.2 o **Activity 1**, Student View o **Activity 2**, screen 1 of 2, Instructional Guide (steps 1–5), Student View, and "Investigating Landforms on Venus" article o **Activity 3**, Instructional Guide (steps 1–12 and Student View o **Activity: Reflecting on How Scientists Use Models**, Instructional Guide (steps 1–5) o **Activity 4**, Student View		

		Earth's Changing Climate unit*:* • Lesson 4.1, **Activity: Introducing Volcanic Eruptions**, Climate Models video		
CCC	***Connections to Nature of Science*** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** ▪ Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-ESS1-2)	***Earth, Moon, and Sun*** unit*:* • Lesson 2.4, **Activity 2**, screen 3 of 3, Instructional Guide (step 12) ***Geology on Mars*** unit*:* • Lesson 1.1, **Activity: Introducing the Student Planetary Geologist Role**, Meet a Planetary Geologist video		

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		**Publisher Citations**	**Performance Expectation**	**Publisher Citations**
SEP	**Analyzing and Interpreting Data** Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to	***Weather Patterns*** unit: • Lesson 3.2 o **Activity 3**, Instructional Guide (steps 1–8) and Student View o **Lesson Brief**, Digital Resources, "Storm Evidence Cards A–G copymaster" ***Geology on Mars***:	**MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.**	[DCI] ***Geology on Mars*** unit*:* • Lesson 1.3, **Activity 4**, Instructional Guide (step 2) and On-the-Fly Assessment (hummingbird icon) [DCI, CCC] ***Geology on Mars*** unit*:*

	investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. ▪ Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3)	• Lesson 1.1, **Activity 3**, screen 2 of 2, Instructional Guide (steps 6–16) and Student View • **Printable Resources, "**Print Materials (8.5" x 11"), Comparing Rocky Planets Cards, pages 15–19 ***Earth's Changing Climate*** unit*:* • Lesson 1.5, **Activity 2**, screens 1–6 of 7, Instructional Guide (steps 1–16) and Student View ***Ocean, Atmosphere, and Climate*** unit: • Lesson 4.1 o **Activity 2**, Instructional Guide (steps 1–8) and Student View o **Activity 3**, Instructional Guide (steps 1–4) and Student View o **Activity 4**, Instructional Guide (steps 1–3) and Student View o **Lesson Brief**, Digital Resources, "Science Seminar Evidence Cards A–E" ***Plate Motion Engineering Internship*** unit: • Ch.1, Day 5 o **Activity: Testing Warning System Designs**, Instructional Guide (steps 1–3) and TsunamiAlert Design Tool o **Lesson Brief,** Digital Resources, "TsunamiAlert Data copymaster" o **Activity: Analyzing Designs**, Instructional Guide (steps 1–5)	[Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.] [*Assessment Boundary: Assessment*	• Lesson 1.1, **Activity 5**, screen 2 of 2, Teacher Support tab ("Assessment, Assessment Opportunity: Student Understanding of the Scale Properties of Objects in the Solar System") [CCC] ***Plate Motion*** unit*:* • Lesson 3.2, **Activity 5**, screens 1–2, Student View, Possible Responses tab, Sorting Tool activity: Earth's History, "Steno and the Shark" article, and Teacher Support tab ("Opportunity: Student Understanding of Rock Strata and Geologic Time") [SEP] ***Earth's Changing Climate*** unit*:* • Lesson 1.5, **Activity 2**, screen 6 of 7, Instructional Guide (step 14) and On-the-Fly Assessment (hummingbird icon) [SEP] ***Weather Patterns*** unit: • Lesson 3.2 o **Activity 3**, Instructional Guide (steps 1–8) and Student View o **Lesson Brief**, Digital Resources, "Storm Evidence Cards A–G copymaster"
DCI	**ESS1.B: Earth and the Solar System** ▪ The solar system consists of the sun and a collection of objects, including planets, their	***Earth, Moon, and Sun*** unit*:* • Lesson 2.4, **Activity 5**, Student View and "Gravity in the Solar System" article (paragraphs 1–5) ***Geology on Mars*** unit: • Lesson 1.1, **Activity 5**, "Scale in the Solar System" article, paragraphs 1–5		

	moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-3) ***Supplemental DCI PS2.B	• Lesson 1.3, **Activity 4**, Instructional Guide (step 2) and On-the-Fly Assessment (hummingbird icon)	*does not include recalling facts about properties of the planets and other solar system bodies.]*	
CCC	**Scale, Proportion, and Quantity** ▪ Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3)	***Plate Motion*** unit: • Lesson 3.2, **Activity 5**, screens 1–2, Student View, Possible Responses tab, Sorting Tool activity: Earth's History, and "Steno and the Shark" article • Lesson 3.1, **Activity 2**, screen 3 of 3, Instructional Guide (steps 6–16), Student View, and Teacher Support tab ("Background, Crosscutting Concept: Scale, Proportion, and Quantity") ***Earth, Moon, and Sun*** unit: • Lesson 1.2, **Activity 4**, Instructional Guide, Student View, and "The Solar System is Huge" article • Lesson 1.3 o **Activity 1**, Student View o **Activity 2**, Instructional Guide (steps 1–8) o **Activity 3**, screens 1–2 of 2, Instructional Guide (steps 1–7) and Student View ***Earth's Changing Climate*** unit: • Lesson 1.3, **Activity 2**, screen 2 of 4, Instructional Guide (steps 4–10) and simulation • Lesson 4.1, **Activity: Introducing Volcanic Eruptions**, Climate Models video ***Geology on Mars*** unit*:* • Lesson 2.1, **Activity 3**, "Investigating Landforms on Venus" article		

CCC	***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** ▪ Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. (MS-ESS1-3)	***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 1 o **Activity 1,** Teacher Support tab ("Instructional Suggestion, Nature of Science, Connecting to Engineering, Technology, and Applications of Science") o **Activity: Introducing Futura**, Instructional Guide (step 3) o **Activity 2**, Instructional Guide (steps 4–7), Teacher Support tab ("Rationale, Pedagogical Goals: Understanding the Nature of Science"), and *Futura Civil Engineer's Dossier,*" article ● **Unit Guide,** Unit Overview ● Ch.1, Day 2, **Activity 3**, "Meet an Engineer Who Designs City Streets" article ***Plate Motion Engineering Internship*** unit: ● **Unit Guide,** Unit Overview ● Ch.1, Day 1, **Activity: Introducing Futura**, Instructional Guide (step 3) ***Plate Motion*** unit*:* ● Lesson 3.1, **Activity: Plate Motion and GPS**, Plate Motion and GPS video ***Ocean, Atmosphere, and Climate*** unit*:* ● Lesson 1.2, **Activity: Chasing El Niño**, Chasing El Niño video ***Earth's Changing Climate*** unit*:* ● Lesson 1.2, **Activity: Introduction to Climatologist Role**, Ice Scientist video		

Science and Engineering Practices **Disciplinary Core Ideas** **Crosscutting Concepts**	**Publisher Citations**	**Performance Expectation**	**Publisher Citations**

SEP	**Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. ▪ Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the	***Plate Motion*** unit: ● **Unit Guide**, Unit Overview ● Lesson 3.2, **Activity 3**, "A Continental Puzzle" article and Teacher Support tab ● Lesson 3.4 o **Activity 3**, Instructional Guide o **Activity 4**, Student View and Possible Responses tab ● Lesson 4.1 o **Activity 3**, screens 1–3 of 3, Instructional Guide (steps 1–11) and Student View o **Lesson Brief**, Digital Resources, "Science Seminar Evidence Cards" ***Rock Transformations*** unit: ● Lesson 3.4 o **Activity 2**, Instructional Guide (steps 1–8) and Student View o **Activity 3**, Instructional Guide (steps 1–9) and Student View o **Lesson Brief,** Digital Resources, "Modeling Tool: How the Great Plains and Rocky Mountains Formed copymaster" and "Write and Share Routine Student 1–3"	**MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.** [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the	[DCI] ***Plate Motion*** unit*:* ● Lesson 3.2, **Activity 5**, Teacher Support tab ("Assessment, Assessment Opportunity: Student Understanding of Rock Strata and Geologic Time") [DCI] ***Plate Motion*** unit*:* ● Lesson 4.2, **Activity 2**, Instructional Guide (step 6) and On-the-Fly Assessment (hummingbird icon) ● Lesson 3.1, **Activity 3**, Instructional Guide (step 6) and On-the-Fly Assessment (hummingbird icon) [CCC] ***Plate Motion*** unit*:* ● Lesson 3.2, **Activity 5**, Student View, Possible Responses tab, Sorting Tool activity: Earth's History, "Steno and the Shark" article, and Teacher Support tab ("Assessment, Assessment Opportunity: Student Understanding of Rock Strata and Geologic Time") [CCC] ***Earth, Moon, and Sun*** unit*:* ● Lesson 1.3, **Activity 3**, Instructional Guide (steps 1–7,) Student View, and On-the-Fly Assessment (hummingbird icon) [SEP] ***Earth, Moon, and Sun*** unit: ● Lesson 2.4 o **Activity 3**, Instructional Guide (steps 1–9), Student View, and On-the-Fly Assessment (hummingbird icon) o **Lesson Brief,** Digital Resources, "Write and Share

	past and will continue to do so in the future. (MS-ESS1-4)		formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [*Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them*.]	Routine: #1, #2 and #3 copymaster" ***Plate Motion*** unit: • Lesson 3.4 o **Activity 3**, Instructional Guide o **Activity 4**, Student View and Possible Responses tab
DCI	**ESS1.C: The History of Planet Earth** ▪ The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4) ****Supplemental DCI LS4.A*	***Plate Motion*** unit: • Lesson 3.2 o **Activity 5**, screens 1–2, Student View, Possible Responses tab, Sorting Tool activity: Earth's History, and "Steno and the Shark" article o **Activity 3**, Student View and "A Continental Puzzle" article		
CCC	**Scale, Proportion, and Quantity** ▪ Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-4)	***Plate Motion*** unit • Lesson 3.2, **Activity 5**, screens 1–2, Student View, Possible Responses tab, Sorting Tool activity: Earth's History, and "Steno and the Shark" article • Lesson 3.1, **Activity 2**, screens 3 of 3, Instructional Guide and Teacher Support tab ("Background, Crosscutting Concept: Scale, Proportion, and Quantity") ***Earth, Moon, and Sun*** unit • Lesson 1.2, **Activity 4**, Student View and "The Solar System is Huge" article • Lesson 1.3 o **Activity 1**, Student View o **Activity 2**, Instructional Guide (steps 1–8)		

		○ **Activity 3**, screens 1–2 of 2, Instructional Guide (steps 1–7) and Student View ***Earth's Changing Climate*** unit: ● Lesson 1.3, **Activity 2**, screens 1–2 of 4, Instructional Guide (steps 4–10) and simulation ● Lesson 4.1, **Activity: Introducing Volcanic Eruptions**, Climate Models video ***Geology on Mars*** unit*:* ● Lesson 2.1, **Activity 3**, "Investigating Landforms on Venus" article		

MS-ESS2 Earth's Systems

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		Publisher Citations	Performance Expectation	Publisher Citations
SEP	**Developing and Using Models** Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. ▪ Develop and use a model to describe phenomena. (MS-ESS2-1)	***Earth's Changing Climate*** unit*:* ● Lesson 1.3, **Activity 3**, Instructional Guide (steps 5–9), Student View, and Teacher Support tab ("Background, Pedagogical Goals: Developing Models") ***Earth, Moon, and Sun*** unit: ● Lesson 3.1, **Activity 2**, screen 3 of 3, Instructional Guide (steps 6–11) and Student View ● Lesson 1.3, **Activity 3**, Instructional Guide and Student View ***Plate Motion*** unit*:* ● Lesson 2.3, **Activity 3**, Instructional Guide (steps 1–9) and Student View ***Ocean Atmosphere and Climate*** unit: ● Lesson 1.4, **Activity 3**, Instructional Guide, Student View, and Modeling Tool: 1.4 Different Temperatures	**MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.** [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering,	[DCI] ***Rock Transformations*** unit: ● Lesson 3.4 ○ **Activity 2**, Instructional Guide (steps 1–8), Student View, and On-the-Fly Assessment (hummingbird icon) ○ **Lesson Brief,** Digital Resources, "Write and Share Routine: Student 1–3 copymaster" ● Lesson 4.3: ○ **Activity 2**, Instructional Guide (steps 1–13) ○ **Activity: Introducing the Homework Assignment**, Instructional Guide (steps 1–5) ○ **Activity 3,** Student View ○ **Lesson Brief,** Digital Resources, "Rubrics for Final Written Arguments"

DCI	**ESS2.A: Earth's Materials and Systems** ▪ All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1)	***Rock Transformations*** unit: ● Chapter 2, Chapter Overview ● Lesson 2.1 o **Activity 2**, screens 2–3 of 4, Instructional Guide (steps 8–13) o **Activity 3**, Instructional Guide (steps 1–5), Student View, and Sorting Tool activity: Weathering and Melting ● Lesson 3.4 o **Activity 2**, Instructional Guide (steps 1–8) and Student View o **Lesson Brief,** Digital Resources, "Write and Share Routine: Student 1–3 copymaster" ***Earth's Changing Climate*** unit*:* ● Lesson 2.2, **Activity 2**, Instructional Guide (steps 1–3, 6), Student View, and "Past Climate Changes on Earth" article ***Ocean, Atmosphere, and Climate*** unit*:* ● Lesson 3.1, **Activity 3**, Student View and "The Gulf Stream: A Current That Helped Win a War" article ***Weather Patterns*** unit*:* ● Lesson 1.2, **Activity 3**, Instructional Guide (steps 1–7), Student View, and simulation	deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] [*Assessment Boundary: Assessment does not include the identification and naming of minerals*.]	[SEP] ***Plate Motion*** unit: ● Lesson 2.4 o **Activity 4**, Instructional Guide (steps 1–5), Student View, and On-the-Fly Assessment (hummingbird icon) o **Lesson Brief,** Digital Resources, "Modeling Tool: Modeling Convergent and Divergent Plate Boundaries copymaster " ***Earth's Changing Climate*** unit*:* ● Lesson 1.3, **Activity 3**, Instructional Guide (steps 5–9), Student View, and Teacher Support tab ("Background, Pedagogical Goals: Developing Models") [CCC] ***Earth's Changing Climate*** unit*:* ● Lesson 2.3, **Activity 1**, Instructional Guide (steps 1–2), Student View, and On-the-Fly Assessment (hummingbird icon)
CCC	**Stability and Change** ▪ Explanations of stability and change in natural or designed systems can be	***Earth's Changing Climate*** unit: ● Lesson 2.3 o **Activity 2**, Instructional Guide (steps 2–7), Student View, and "Past Climate Changes on Earth" article o **Activity 3**, Instructional Guide (steps 1–7), Student View, and Modeling Tool: Carbon Dioxide/Methane		

	constructed by examining the changes over time and forces at different scales. (MS-ESS2-1)	• Lesson 1.2, **Activity 4**, Instructional Guide (steps 1–6) and Student View ***Rock Transformations*** unit*:* • Lesson 3.1, **Activity 2**, Student View and "The Oldest Rock Formations on Earth" article ***Weather Patterns*** unit*:* • Lesson 2.4, **Activity 3**, Instructional Guide (steps 8–12) and Student View		

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		**Publisher Citations**	**Performance Expectation**	**Publisher Citations**
SEP	**Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. ▪ Construct a scientific explanation based on valid	***Plate Motion*** unit: • **Unit Guide**, Unit Overview • Lesson 3.2, **Activity 3**, "A Continental Puzzle" article and Teacher Support tab ("Rationale, Pedagogical Goals: Understanding the Nature of Science") • Lesson 3.4 o **Activity 3**, Instructional Guide o **Activity 4**, Student View and Possible Responses tab • Lesson 4.1 o **Activity 3**, screens 1–3 of 3, Instructional Guide (steps 1–11) and Student View o **Lesson Brief,** Digital Resources, "Science Seminar Evidence Cards copymaster" ***Rock Transformations*** unit: • Lesson 3.4 o **Activity 2**, Instructional Guide (steps 1–8) and Student View o **Lesson Brief,** Digital Resources, o **Activity 3**, Instructional Guide (steps 1–9) and Student View o **Lesson Brief,** Digital Resources, "Write and Share Routine Student	**MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.** [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such	[DCI, SEP] ***Rock Transformations*** unit: • Lesson 3.4 o **Activity 2,** Instructional Guide (steps 1–8), Student View, and On-the-Fly Assessment (hummingbird icon) o **Lesson Brief,** Digital Resources, "Write and Share Routine: Student 1–3 copymaster" [DCI, SEP] ***Plate Motion*** unit: • Lesson 4.2, **Activity 2,** Instructional Guide (steps 1–7), Student View, and On-the-Fly Assessment (hummingbird icon) • Lesson 4.1, **Lesson Brief,** Digital Resources, "Science Seminar Evidence Cards copymaster" [CCC] ***Plate Motion*** unit*:* • Lesson 3.2, **Activity 5**, Student View, Possible Responses tab, Sorting Tool

	and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future. (MS-ESS2-2)	1–3 copymaster" and "Modeling Tool: How the Great Plains and Rocky Mountains Formed copymaster"	as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]	activity: Earth's History, "Steno and the Shark" article and Teacher Support tab ("Assessment, Assessment Opportunity: Student Understanding of Rock Strata and Geologic Time") ***Earth, Moon, and Sun*** unit*:* ● Lesson 1.3, **Activity 3**, Instructional Guide (steps 1–7), Student View, and On-the-Fly Assessment (hummingbird icon)
DCI	**ESS2.A: Earth's Materials and Systems** ▪ The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history	***Rock Transformations*** unit: ● Lesson 1.3, **Activity 2**, Instructional Guide (steps 1–11), Student View, and simulation ● Lesson 2.1: o **Activity 2**, Instructional Guide (steps 1–16), Student View, and simulation o **Activity: Playing Understanding Weathering**, Instructional Guide (steps 1–5), and Understanding Weathering video ● Lesson 2.2, **Activity 2**, Instructional Guide (steps 1–2, 7) and "Devils Tower" article ● Lesson 2.4 o **Activity 3**, Instructional Guide (steps 1–8), Student View, and On–the–Fly Assessment (hummingbird icon) o **Lesson Brief,** Digital Resources, "Modeling Tool: How Rocks Form copymaster" ***Plate Motion*** unit:		

	and will determine its future. (MS-ESS2-2)	• Lesson 3.1
		  o **Activity: Video: Plate Motion and GPS**, Instructional Guide
		  o **Activity 2**, Instructional Guide
		
		Earth's Changing Climate unit:
		• Lesson 4.3
		  o **Activity 2**, Instructional Guide (steps 1–11)
		  o **Activity: Introducing the Homework Assignment**, Instructional Guide (steps 1–4)
		  o **Activity 3**, Student View
		  o **Lesson Brief,** Digital Resources, "Rubrics for Assessing Students' Final Written Arguments"
		• Lesson 1.2, **Activity: Introduction to Climatologist Role**, Ice Scientist video
		
		Ocean, Atmosphere, and Climate unit:
		• Lesson 4.3
		  o **Activity 4**, Instructional Guide (steps 1–4) and Student View
		  o **Lesson Brief,** Digital Resources, "Rubrics for Assessing Students' Final Written Arguments"		

DCI	**ESS2.C: The Roles of Water in Earth's Surface Processes**
	▪ Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.
		Rock Transformations unit:
		• Lesson 2.1
		  o **Activity 2**, Instructional Guide (steps 1–16), Student View, and simulation
		  o **Activity: Playing Understanding Weathering**, Instructional Guide (steps 1–7), Understanding Weathering video, and Teacher Support tab ("Background, Going Further: Water and Underground Weathering")
		• Lesson 2.2, **Activity 2**, Instructional Guide (steps 1–2, 7) and "Devils Tower" article
		• Lesson 2.4
		  o **Activity 3**, Instructional Guide (steps 1–8), Student View, and On-the-Fly Assessment (hummingbird icon)		

	(MS-ESS2-2)	○ **Lesson Brief,** Digital Resources, "Modeling Tool: How Rocks Form copymaster"		
CCC	**Scale Proportion and Quantity** ▪ Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS2-2)	***Plate Motion*** unit: ● Lesson 3.2, **Activity 5**, Student View, Possible Responses tab, Sorting Tool activity: Earth's History, and "Steno and the Shark" article ● Lesson 3.1, **Activity 2**, screen 3 of 3, Instructional Guide (steps 6–16), Student View, and Teacher Support tab ("Background, Crosscutting Concept: Scale, Proportion, and Quantity") ***Earth, Moon, and Sun*** unit: ● Lesson 1.2, **Activity 4**, Student View and "The Solar System is Huge" article ● Lesson 1.3 ○ **Activity 1**, Student View ○ **Activity 2**, Instructional Guide (steps 1–8) ○ **Activity 3**, screens 1–2 of 2, Instructional Guide (steps 1–7) and Student View ***Earth's Changing Climate*** unit: ● Lesson 1.3, **Activity 2**, screens 1–2 of 4, Instructional Guide (steps 4–10) and simulation ● Lesson 4.1, **Activity: Introducing Volcanic Eruptions**, Climate Models video ***Geology on Mars*** unit*:* ● Lesson 2.1, **Activity 3**, "Investigating Landforms on Venus" article		

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		**Publisher Citations**	**Performance Expectation**	**Publisher Citations**
SEP	**Analyzing and Interpreting Data**	***Ocean, Atmosphere, and Climate*** unit: ● Lesson 1.3, **Activity 3**, Instructional Guide (steps 1–5), Student View, and simulation	**MS-ESS2-3.**	[DCI, SEP] ***Plate Motion*** unit:

	Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. ▪ Analyze and interpret data to provide evidence for phenomena. (MS-ESS2-3)	• Lesson 2.2, **Activity 3**, Instructional Guide (steps 1–10), and Student View • Lesson 4.1 o **Activity 3**, Instructional Guide (steps 1–4) and Student View o **Lesson Brief,** Digital Resources, "Science Seminar Evidence Cards" o **Activity 4**, Instructional Guide (steps 1–4) and Student View ***Plate Motion*** unit: • Lesson 3.1, **Activity 2**, Instructional Guide (steps 1–16), Student View, and simulation • Lesson 4.1 o **Activity 3**, Instructional Guide (steps 1–11) and Student View o **Lesson Brief,** Digital Resources, "Science Seminar Evidence Cards" o **Activity 4**, Instructional Guide (steps 1–7) and Student View	**Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.** [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] [*Assessment Boundary: Paleomagnetic*	• Lesson 4.3 o **Activity 3**, Instructional Guide (steps 1–5), Student View, and On-the-Fly Assessment (hummingbird icon) o **Activity 4**, Instructional Guide (steps 1–6) and Student View o **Activity 6**, Student View o **Lesson Brief,** Digital Resources, "Rubrics for Final Written Argument" and "Science Seminar Reasoning Tool copymaster" [DCI, CCC] ***Plate Motion*** unit*:* • Lesson 3.3, **Activity 3**, Instructional Guide (steps 1–17), Student View, and On-the-Fly Assessment (hummingbird icon) • Lesson 2.5, **Activity 2**, Instructional Guide (steps 1–10), Student View and On-the-Fly Assessment (hummingbird icon) [SEP] ***Plate Motion*** unit*:* • Lesson 3.1, **Activity 2**, Instructional Guide and simulation
SEP	***Connections to Nature of Science*** **Scientific Knowledge is Open to Revision in Light of New Evidence** ▪ Science findings are frequently revised and/or reinterpreted based on new evidence. (MS-ESS2-3)	***Plate Motion*** unit*:* • Lesson 3.2, **Activity 3**, "A Continental Puzzle" article ***Ocean, Atmosphere, and Climate*** unit: • Lesson 4.3, **Activity 6**, Student View • Lesson 3.4 o **Activity 3**, Instructional Guide (steps 1–8) and Student View o **Lesson Brief,** Digital Resources, "Evidence Cards copymaster" ***Earth's Changing Climate*** unit*:* • Lesson 3.1, **Activity 4**, Student View and "Global Warming: A History of a Hot Debate" article ***Geology on Mars*** unit*:* • Lesson 3.4, **Activity: Rover on Mars Video**, Instructional Guide (steps 1–4) and Rover on Mars video		

DCI	**ESS1.C: The History of Planet Earth** ▪ Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE) (secondary to MS-ESS2-3)	***Plate Motion*** unit: ● Chapter 2, Chapter Overview ● Lesson 2.2, **Activity 2**, Instructional Guide (steps 1–3, 8–9) and "Listening to Earth" article ● Lesson 2.3, **Activity 3**, Instructional Guide (steps 1–11) and Student View ● Lesson 2.4, **Activity 3**, Instructional Guide and simulation ***Plate Motion Engineering Internship*** unit*:* ● Ch.1, Day 3, **Activity: Researching Plate Boundaries**, Instructional Guide (steps 1–7), and *Futura Geohazards Engineer's Dossier,* "Plate Motion and Tsunamis" article	*anomalies in oceanic and continental crust are not assessed.*]	
DCI	**ESS2.B: Plate Tectonics and Large-Scale System Interactions** ▪ Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)	***Plate Motion*** unit: ● Lesson 3.3: o **Activity 2**, Instructional Guide (steps 1–6), Student View, and "A Continental Puzzle" article o **Activity 3**, Instructional Guide (steps 1–16) and Student View o **Lesson Brief,** Digital Resources, "Gondwanaland Puzzle copymaster" ● Lesson 3.4: o **Activity 2**, Instructional Guide (steps 1–10) and Student View o **Activity: Video: Indian Plate Motion unit:** Instructional Guide (steps 1–3), and Indian Plate Motion video ● Lesson 3.1, **Activity 2**, Instructional Guide (steps 1–16), Student View, and simulation ***Ocean, Atmosphere, and Climate*** unit*:* ● Lesson 4.1, **Activity 2**, Instructional Guide (steps 1–4)		

	****Supplemental DCI LS4.A*	***Rock Transformations*** unit: ● Lesson 3.1, **Activity 2**, Student View and "The Oldest Rock Formations on Earth" article		
CCC	**Patterns** ▪ Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems. (MS-ESS2-3)	***Plate Motion*** unit: ● Lesson 3.1 o **Activity: Plate Motion and GPS**, Instructional Guide (steps 1–6), and Plate Motion and GPS video o **Activity 2**, Instructional Guide (steps 1–16), Student View and simulation o **Activity 3**, Instructional Guide (steps 1–5) and Student View ● Lesson 3.4, **Activity 2**, Instructional Guide (steps 1–10) and Student View ***Plate Motion Engineering Internship*** unit*:* ● Ch.1, Day 5, **Activity: Testing Warning System Designs**, Instructional Guide (steps 1–3) and TsunamiAlert Design Tool ***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 4 o **Activity: Performing Iterative Tests**, Instructional Guide (steps 1–7) o **Lesson Brief,** Digital Resources, "RoofMod Data copymaster" ***Earth's Changing Climate*** unit*:* ● Lesson 1.2, **Activity: Introduction to Climatologist Role**, Ice Scientist video		

MS-ESS2 Earth's Systems

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts	Publisher Citations	Performance Expectation	Publisher Citations

SEP	**Developing and Using Models** Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. ▪ Develop a model to describe unobservable mechanisms. (MS-ESS2-4)	***Earth's Changing Climate***: ● Lesson 1.3, **Activity 3**, Instructional Guide (steps 5–9) and Student View ● Lesson 2.7, **Activity 2**, Instructional Guide (steps 1–8), Student View, and Modeling Tool: Energy Path Open Use ***Plate Motion*** unit*:* ● Lesson 2.3, **Activity 3**, Instructional Guide (steps 1–11) and Student View ***Rock Transformations*** unit: ● Lesson 2.4 o **Activity 3**, Instructional Guide (steps 1–8), Student View, and Possible Responses tab o **Lesson Brief,** Digital Resources, "Modeling Tool: How Rocks Form copymaster" ● Lesson 3.4 o **Activity 3**, screen 2 of 2, Instructional Guide (steps 4–11), Student View and Possible Responses tab o **Lesson Brief,** Digital Resources, "Modeling Tool: How the Great Plains and Rocky Mountains Formed copymaster"	**MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.** [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] [*Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed*.]	[DCI, CCC] ***Weather Patterns*** unit*:* ● Lesson 2.3, **Activity 3**, Instructional Guide (steps 1–12), Student View, simulation, and On-the-Fly Assessment (hummingbird icon) [SEP] ***Plate Motion*** unit: ● Lesson 2.4 o **Activity 4,** Instructional Guide (steps 1–5), Student View, and On-the-Fly Assessment (hummingbird icon) o **Lesson Brief,** Digital Resources, "Modeling Tool: Modeling Convergent and Divergent Plate Boundaries copymaster" ***Earth's Changing Climate*** unit*:* ● Lesson 1.3, **Activity 3**, Instructional Guide (steps 5–9) and Student View [CCC] ***Weather Patterns*** unit*:* ● Lesson 2.1, **Activity 3,** Instructional Guide (steps 1–9,) Student View, and Teacher Support tab [DCI] ***Weather Patterns*** unit*:*
DCI	**ESS2.C: The Roles of Water in Earth's Surface Processes** ▪ Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation	***Weather Patterns*** unit: ● Lesson 1.2, **Activity 1**, Instructional Guide (steps 1–5) and Student View ● Lesson 1.3 o **Activity 1**, Student View o **Activity 2**, Instructional Guide and Student View o **Activity 3**, Instructional Guide, Student View, and simulation o **Activity 4**, Instructional Guide (steps 1–10) and Student View o **Activity 5**, Student View and "What Makes Water Move?" article ● Lesson 1.4, **Activity 2**, "What Are Clouds?" article ● Lesson 1.5, **Activity 3**, Instructional Guide (steps 1–8), Student View and simulation		

	and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4) ***_Supplemental DCI PS1.A_ ▪ Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4)	● Lesson 4.1, **Activity 4**, Student View and "Hail, Snow, and Sleet" article ***Rock Transformations*** unit: ● Lesson 2.1 o **Activity: Playing Understanding Weathering**, Instructional Guide (steps 1–5) and Understanding Weathering video o **Activity 2**, Instructional Guide (steps 1–16), Student View, and simulation o **Activity 3**, Instructional Guide (steps 1–5), Student View, and Sorting Tool: Weathering and Melting		● Lesson 1.2, **Activity 1**, Instructional Guide (steps 1–5) and Student View
CCC	**Energy and Matter** ▪ Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4)	***Weather Patterns*** unit*:* ● Lesson 2.1, **Activity 3**, Instructional Guide (steps 1–9), Student View, and Teacher Support tab ("Instructional Suggestion, Crosscutting Concepts: Making Connections Across Science Topics") ***Ocean, Atmosphere, and Climate*** unit: ● Lesson 3.2, **Activity 4**, "What Causes Prevailing Winds?" article ● Lesson 3.3, **Activity 4**, "Deep Ocean Currents: Driven by Density" article ***Rock Transformations*** unit: ● Lesson 2.1, **Activity 2**, Instructional Guide (steps 8–14), Student View, and simulation ● Lesson 2.4 o **Activity 2**, Instructional Guide (steps 1–9) and Student View		

		○ **Lesson Brief,** Digital Resources, "Write and Share Routine: Student 1–4 copymaster"		
Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		**Publisher Citations**	**Performance Expectation**	**Publisher Citations**
SEP	**Planning and Carrying Out Investigations** Planning and carrying out investigations in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions. ▪ Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. (MS-ESS2-5)	***Ocean, Atmosphere, and Climate*** unit: ● Lesson 2.3 ○ **Activity 2**, Instructional Guide (steps 1–8) and Student View ○ **Activity 3**, Instructional Guide (steps 1–7), Student View, and simulation ○ **Activity 4**, Instructional Guide (steps 1–5) and Student View ***Earth's Changing Climate*** unit: ● Lesson 1.4: ○ **Activity 2**, Instructional Guide (steps 1–3) ○ **Activity 3**, Instructional Guide (steps 1–10), Student View, and simulation ***Weather Patterns*** unit*:* ● Lesson 2.3, **Activity 3**, Instructional Guide (steps 1–11), Student View, and simulation ***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 4 ○ **Activity: Performing Iterative Tests**, Instructional Guide (steps 1–6) and RoofMod Design Tool ○ **Lesson Brief,** Digital Resources, "RoofMod Data copymaster"	**MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.** [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how	[DCI, SEP] ***Weather Patterns*** unit*:* ● Lesson 2.3, **Activity 3**, Instructional Guide (steps 1–12), Student View, simulation, and On-the-Fly Assessment (hummingbird icon) [DCI, CCC] ***Ocean, Atmosphere, and Climate*** unit*:* ● Lesson 3.3, **Activity 2**, Instructional Guide (steps 1–7), Student View, Modeling Tool: 3.3 Christchurch Model and On-the-Fly Assessment (hummingbird icon) ● Lesson 4.3 ○ **Activity 4**, Instructional Guide (steps 1–7) and Student View ○ **Lesson Brief,** Digital Resources, "Rubrics for Assessing Students' Final Written Arguments" ○ **Activity 6**, Student View [SEP]

DCI	**ESS2.C: The Roles of Water in Earth's Surface Processes** ▪ The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5)	***Weather Patterns*** unit: • Lesson 3.1 o **Activity: Modeling Wind and Air Parcels,** Instructional Guide (steps 1–6) o **Activity 3**, Instructional Guide (steps 1–12), Student View, and simulation o **Activity 4**, Student View and "Types of Rain" article ***Ocean, Atmosphere, and Climate*** unit: • Lesson 1.2 o **Activity: Chasing El Niño**, Chasing El Niño video o **Activity 4**, "Effects of El Niño Around the World" article • Lesson 2.1, **Activity 2**, "The Ocean in Motion" article • Lesson 2.3 o **Activity 2**, Instructional Guide (steps 1–8) and Student View o **Activity 3**, Instructional Guide (steps 1–7), Student View, and simulation o **Activity 4**, Instructional Guide (steps 1–5) and Student View • Lesson 3.2 o **Activity: Gulf Stream Video**, Instructional Guide (steps 1–3) and Gulf Stream video o **Activity 2**, Instructional Guide (steps 1–6,) Student View and "The Gulf Stream: A Current That Helped Win a War" article o **Activity 3**, Instructional Guide	sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).] [*Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.*]	***Ocean, Atmosphere, and Climate*** unit: • Lesson 2.3: o **Activity 2,** Instructional Guide (steps 1–8) and Student View o **Activity 3**, Instructional Guide (steps 1–7), Student View, and simulation o **Activity 4**, Instructional Guide (steps 1–5) and Student View [DCI] ***Weather Patterns*** unit*:* • Lesson 3.2, **Activity 4**, Student View, "How We Predict the Weather" article and Possible Responses tab
DCI	**ESS2.D: Weather and Climate** ▪ Because these patterns are so complex, weather can only be	***Weather Patterns*** unit*:* • Lesson 3.2, **Activity 4,** Student View, "How We Predict the Weather" article, and Possible Responses tab		

	predicted probabilistically. (MS-ESS2-5)			
CCC	**Cause and Effect** ● Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5)	***Rock Transformations*** unit*:* ● Lesson 3.2, **Activity 3**, Instructional Guide (steps 1–8), Student View, and simulation ***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 2 o **Activity 2**, Instructional Guide and *Futura Civil Engineer's Dossier*, "Roof Modification Technical Notes" article o **Lesson Brief,** Digital Resources, "Roof Modification Details copymaster" ***Weather Patterns*** unit: ● Lesson 3.2, **Activity 4**, Student View and "How We Predict the Weather" article ● Lesson 2.1, **Activity 3**, Instructional Guide (step 3) ***Earth's Changing Climate*** unit*:* ● Lesson 1.2, **Activity: Introduction to Climatologist Role**, Ice Scientist video		

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		**Publisher Citations**	**Performance Expectation**	**Publisher Citations**
SEP	**Developing and Using Models** Modeling in 6–8 builds on K–5 experiences and progresses to developing, using,	***Earth's Changing Climate*** unit*:* ● Lesson 1.3, **Activity 3**, Instructional Guide (steps 5–9), Student View, and Teacher Support tab ("Background, Pedagogical Goals: Developing Models") ***Earth, Moon, and Sun***:	**MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the**	[PE] ***Ocean, Atmosphere, and Climate*** unit*:* ● Lesson 3.2, **Activity 4**, Student View, "What Causes Prevailing Winds?" article, and "The Coriolis Effect" article [DCI, SEP]

	and revising models to describe, test, and predict more abstract phenomena and design systems. ▪ Develop and use a model to describe phenomena. (MS-ESS2-6)	• Lesson 3.1, **Activity 2**, screen 3 of 3, Instructional Guide (steps 6–11) and Student View • Lesson 1.3, **Activity 3**, Instructional Guide and Student View ***Plate Motion*** unit*:* • Lesson 2.3, **Activity 3**, Instructional Guide (steps 1–9) and Student View ***Ocean Atmosphere and Climate*** unit: • Lesson 1.4, **Activity 3**, Instructional Guide, Student View, and Modeling Tool: 1.4 Different Temperatures	**Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.** [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis	***Ocean, Atmosphere, and Climate*** unit*:* • Lesson 3.3, **Activity 2**, Instructional Guide (steps 1–7), Student View, Modeling Tool: 3.3 Christchurch Model, and On-the-Fly Assessment (hummingbird icon) • Lesson 1.4,**Activity 3**, Instructional Guide (steps 1–6), Student View, Modeling Tool: 1.4 Different Temperatures, and On-the-Fly Assessment (hummingbird icon) [DCI] ***Ocean, Atmosphere, and Climate***: • Lesson 4.3 o **Activity 4**, Instructional Guide (steps 1–7) and Student View o **Lesson Brief,** Digital Resources, “Rubrics for Assessing Students’ Final Written Arguments” o **Activity 6**, Student View [CCC] ***Geology on Mars*** unit: • Lesson 3.5 o **Activity 1**, Student View o **Lesson Brief**, Digital Resources, “End-of-Unit Assessment Scoring Guide” ***Earth’s Changing Climate*** unit*:* • Lesson 2.3, **Activity 3**, Instructional Guide (steps 1–6), Student View, and Modeling Tool: Carbon Dioxide/Methane
DCI	**ESS2.C: The Roles of Water in Earth’s Surface Processes** ▪ Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6) ****Supplemental DCI PS3.B, PS4.B*	***Ocean, Atmosphere, and Climate***: • Lesson 3.3, **Activity 4**, Student View and “Deep Ocean Currents: Driven by Density” article • Lesson 3.2 o **Activity 4**, Student View and "What Causes Prevailing Winds?" article o **Activity: Gulf Stream Video**, Instructional Guide (steps 1–3) and Gulf Stream video o **Activity 2**, Instructional Guide (steps 1–6), Student View, and “The Gulf Stream: A Current That Helped Win a War” article o **Activity 3**, Instructional Guide (steps 1–15) and Student View		
DCI	**ESS2.D: Weather and Climate** ▪ Weather and climate are influenced by interactions	***Ocean, Atmosphere, and Climate*** unit: • Lesson 1.4 o **Activity 1**, Student View, and Sorting Tool: 1.4 Warm–Up o **Activity 2**, Instructional Guide (steps 1–14) and Student View		

	involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6) ▪ The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6)	o **Activity 3**, Instructional Guide (steps 1–6), Student View, and Modeling Tool: 1.4 Different Temperatures o **Activity 4**, Student View and simulation ● Lesson 2.3 o **Activity 2**, Instructional Guide (steps 1–8) and Student View o **Activity 3**, Instructional Guide (steps 1–7), Student View, and simulation o **Activity 4**, Instructional Guide (steps 1–5) and Student View ● Lesson 3.2 o **Activity: Gulf Stream Video**, Instructional Guide (steps 1–3) and Gulf Stream video o **Activity 2**, Instructional Guide (steps 1–6), Student View, and “The Gulf Stream: A Current That Helped Win a War” article o **Activity 3**, Instructional Guide (steps 1–15) and Student View ● Lesson 4.1 o **Activity 2**, Instructional Guide (steps 1–8) and Student View o **Activity 3**, Instructional Guide (steps 1–4) and Student View o **Lesson Brief,** Digital Resources, “Science Seminar Evidence Cards A–E” o **Activity 4**, Instructional Guide (steps 1–3) and Student View ● Chapter 2, Chapter Overview ● Lesson 2.4 o **Activity 1**, Student View o **Activity 2**, Instructional Guide (steps 1–5) and Student View o **Activity 3**, Instructional Guide (steps 1–7), Student View, and Modeling Tool: 2.4 Currents and Temperature o **Activity 4**, Instructional Guide (steps 1–6) and Student View o **Activity 5**, Student View and "How the Ocean Keeps Climates Stable” article	effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.] [*Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.*]	

		Weather Patterns unit: ● Lesson 2.3 o **Activity 2**, Instructional Guide (steps 1–8), Student View and “Disaster in California!” article o **Activity 3**, Instructional Guide (steps 1–11), Student View, and simulation ***Earth’s Changing Climate*** unit: ● Lesson 1.2, **Activity 5**, “The Effects of Climate Change” article (Warming and Extreme Weather” chapter) ● Lesson 4.2 o **Activity 2**, Instructional Guide (steps 6–11) and Student View o **Lesson Brief,** Digital Resources, “Volcano Evidence Cards D–F” and “Volcano Evidence Cards G–J”		
CCC	**Systems and System Models** ▪ Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6)	***Earth’s Changing Climate*** unit: ● Lesson 2.3, **Activity 3**, Instructional Guide (steps 1–6), Student View, and Modeling Tool: Carbon Dioxide/Methane ● Lesson 2.7, **Activity 2**, Instructional Guide (steps 1–8), Student View, and Modeling Tool: Energy Path Open Use ● Lesson 4.1, **Activity: Introducing Volcanic Eruptions**, Climate Models video ***Ocean, Atmosphere, and Climate*** unit*:* ● Lesson 2.4, **Activity 3**, Instructional Guide (steps 1–7), Student View, and Modeling Tool: 2.4 Currents and Temperature ***Geology on Mars*** unit*:* ● Lesson 2.1, **Activity 3**, “Investigating Landforms on Venus” article ***Plate Motion Engineering Internship*** unit*:* ● Ch.1, Day 1, **Activity: Exploring TsunamiAlert**, Instructional Guide (steps 1–2) and TsunamiAlert Design Tool		

MS-ESS3 Earth and Human Activity

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		Publisher Citations	Performance Expectation	Publisher Citations
SEP	**Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. ▪ Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the	***Plate Motion*** unit: ● **Unit Guide**, Unit Overview ● Lesson 3.2, **Activity 3**, "A Continental Puzzle" article and Teacher Support tab ("Rationale, Pedagogical Goals: Understanding the Nature of Science") ● Lesson 3.4 o **Activity 3**, Instructional Guide (step 7) o **Activity 4**, Student View and Possible Responses tab ● Lesson 4.1 o **Activity 3**, screens 1–3 of 3, Instructional Guide (steps 1–11) and Student View o **Lesson Brief,** Digital Resources, "Science Seminar Evidence Cards copymaster" ***Rock Transformations*** unit: ● Lesson 3.4 o **Activity 2**, Instructional Guide (steps 1–8) and Student View o **Activity 3**, Instructional Guide (steps 1–9) and Student View o **Lesson Brief,** Digital Resources, "Write and Share Routine Student 1–3 copymaster" and "Modeling Tool: How the Great Plains and Rocky Mountains Formed copymaster"	**MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.** [Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a	[DCI] ***Rock Transformations*** unit: ● Lesson 2.3, **Activity 4**, Teacher Support tab ("Assessment, Assessment Opportunity: Student Understanding of Renewable and Nonrenewable Resources ") [SEP] ***Rock Transformations*** unit: ● Lesson 2.4 o **Activity 2**, Instructional Guide (steps 1–9), Student View, and On-the-Fly Assessment (hummingbird icon) o **Lesson Brief,** Digital Resources, "Write and Share Routine Student 1–4 copymaster" ***Plate Motion*** unit: ● Lesson 3.2, **Activity 3**, "A Continental Puzzle" article and Teacher Support tab (" Rationale, Pedagogical Goals: Understanding the Nature of Science") [CCC] ***Ocean, Atmosphere, and Climate*** unit: ● Lesson 2.4, **Activity 3**, Instructional Guide (steps 1–9), Student View, Modeling Tool: 2.4 Currents and Temperature, and On-the-Fly Assessment

	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. (MS-ESS3-1)		result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]	[CCC] ***Rock Transformations*** unit*:* ● Lesson 3.2, **Activity 3**, Instructional Guide (steps 1–8), Student View, and simulation
DCI	**ESS3.A: Natural Resources** ▪ Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed	***Rock Transformations*** unit*:* ● Lesson 2.3, **Activity 4**, Student View and "Why Can't I Find Gold in My Backyard?" article ***Earth's Changing Climate*** unit: ● Lesson 1.4, **Activity 5**, "A Hole in Earth's Ozone Layer" article ● Lesson 1.2, **Activity 5**, Student View and "The Effects of Climate Change" article		

	unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)			
CCC	**Cause and Effect** ▪ Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-1)	***Rock Transformations*** unit*:* ● Lesson 3.2, **Activity 3**, Instructional Guide (steps 1–8), Student View, and simulation ***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 2 o **Activity 2**, Instructional Guide (steps 1–7) o **Lesson Brief,** Digital Resources, "Roof Modification Details copymaster" ***Weather Patterns*** unit: ● Lesson 3.2, **Activity 4**, Student View. and "How We Predict the Weather" article ● Lesson 2.1, **Activity 3**, Instructional Guide (step 3) ***Earth's Changing Climate*** unit*:* ● Lesson 1.2, **Activity: Introduction to Climatologist Role**, Ice Scientist video		
CCC	***Connections to Engineering, Technology, and Applications of Science*** **Influence of Science, Engineering, and Technology on Society and the**	***Earth's Changing Climate*** unit: ● Lesson 1.2, **Activity 5**, Student View and "The Effects of Climate Change" article ● Lesson 3.3 o **Activity 2**, Instructional Guide (steps 2–8,) Student View, and "Climate Change Solutions" article o **Activity 3**, Instructional Guide (steps 1–7), Student View, and Modeling Tool: Climate Change Solution ***Earth's Changing Climate Engineering Internship*** unit:		

	Natural World ▪ All human activity draws on natural resources and has both short and long-term consequences , positive as well as negative, for the health of people and the natural environment. (MS-ESS3-1)	• Ch.1, Day 1, **Activity 1,** Teacher Support tab (“Instructional Suggestion, Nature of Science, Connecting to Engineering, Technology, and Applications of Science”) • Ch.1, Day 2 o **Activity 2**, Instructional Guide (steps 1–7) o **Lesson Brief,** Digital Resources, “Roof Modification Details copymaster”		

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		**Publisher Citations**	**Performance Expectation**	**Publisher Citations**
SEP	**Analyzing and Interpreting Data** Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.	***Weather Patterns*** unit: • Lesson 3.2 o **Activity 3**, Instructional Guide (steps 1–8) and Student View o **Lesson Brief,** Digital Resources, “Storm Evidence Cards A–G copymaster” ***Geology on Mars*** unit: • Lesson 1.1, **Activity 3**, screen 2 of 2, Instructional Guide (steps 6–16) and Student View • **Printable Resources, “**Print Materials (8.5” x 11”), Comparing Rocky Planets Cards, pages 15–19 ***Earth’s Changing Climate*** unit*:*	**MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.** [Clarification	[DCI] ***Plate Motion Engineering Internship*** unit: • Ch.1, Day 9 o **Activity: Finalizing the Proposal**, Possible Responses tab o **Lesson Brief,** Digital Resources, “Printable Proposal Rubric” [CCC, DCI] ***Plate Motion*** unit: • Lesson 1.3, **Activity 3**, Instructional Guide (steps 1–24), Student View, and On-the-Fly Assessment (hummingbird icon)

	▪ Analyze and interpret data to determine similarities and differences in findings. (MS-ESS3-2)	● Lesson 1.5, **Activity 2**, screens 1–6 of 7, Instructional Guide (steps 1–16) and Student View ***Ocean, Atmosphere, and Climate*** unit: ● Lesson 4.1 o **Activity 2**, Instructional Guide (steps 1–8) and Student View o **Activity 3**, Instructional Guide (steps 1–4) and Student View o **Lesson Brief,** Digital Resources, "Science Seminar Evidence Cards A–E" o **Activity 4**, Instructional Guide (steps 1–3) and Student View ***Plate Motion Engineering Internship*** unit: ● Ch.1, Day 5 o **Activity: Testing Warning System Designs**, Instructional Guide (steps 1–3) and TsunamiAlert Design Tool o **Lesson Brief,** Digital Resources, "TsunamiAlert Data copymaster" o **Activity: Analyzing Designs**, Instructional Guide (steps 1–5)	Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of	● **Printable Resources,** Print Materials (8.5" x 11"), Earthquake Map and Plate Boundary Map, pages 24–27 [SEP] ***Plate Motion*** unit: ● Lesson 4.3 o **Activity 3**, Instructional Guide (steps 1–5), Student View, and On-the-Fly Assessment (hummingbird icon) o **Lesson Brief,** Digital Resources, "Science Seminar Reasoning Tool copymaster" ***Ocean, Atmosphere, and Climate*** unit*:* ● Lesson 2.3, **Activity 3**, Instructional Guide (steps 1–7), Student View, simulation, and On-the-Fly Assessment (hummingbird icon)
DCI	**ESS3.B: Natural Hazards** ▪ Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations	***Plate Motion Engineering Internship*** unit: ● Ch.1, Day 3 o **Activity: Researching Plate Boundaries**, Instructional Guide and *Futura Geohazards Engineer's Dossier*, "Tsunamis: Rare But Dangerous" article and "Plate Motion and Tsunamis" article o **Activity: Investigating Earthquakes with TsunamiAlert**, Instructional Guide (steps 1–6) and TsunamiAlert Design Tool o Lesson 2, **Activity 2**, Instructional Guide and *Futura Geohazards Engineer's Dossier,* "Plate Motion and Tsunamis" article ● Ch.1, Day 1, **Activity 2**, Instructional Guide (steps 4–6) and *Futura Geohazards*		

	and likelihoods of future events. (MS-ESS3-2)	*Engineer's Dossier,* "Tsunamis: Rare But Dangerous" article ● Ch.1, Day 5, **Activity: Testing Warning System Designs**, Instructional Guide (steps 1–3) and TsunamiAlert Design Tool ***Plate Motion*** unit: ● Lesson 1.3, **Activity 3**, Instructional Guide (steps 1–24) and Student View ● Lesson 1.4, **Activity 2**, Instructional Guide (steps 1–9) and simulation	data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]	
CCC	**Patterns** ▪ Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2)	***Plate Motion*** unit*:* ● Lesson 1.3, **Activity 3**, Instructional Guide (steps 1–24) and Student View ● **Printable Resources, "**Print Materials (8.5" x 11"), Earthquake Map and Plate Boundary Map, pages 24–27 ***Plate Motion Engineering Internship*** unit: ● Ch.1, Day 3 o **Activity: Researching Plate Boundaries**, Instructional Guide (steps 1–7) and *Futura Geohazards Engineer's Dossier,* "Plate Motion and Tsunamis" article o **Activity: Investigating Earthquakes with TsunamiAlert**, Instructional Guide (steps 1–6) and TsunamiAlert Design Tool ***Earth's Changing Climate*** unit: ● **Printable Resources, "**Print Materials (8.5" x 11"), Melting Ice Evidence Cards A–C, pages 34–35 ● Lesson 1.2 o **Activity: Introduction to Climatologist Role**, Ice Scientist video o **Activity 3**, Instructional Guide (steps 1–9) and Student View o **Activity 4**, Instructional Guide (steps 1–6) and Student View ***Geology on Mars*** unit*:*		

		● Lesson 1.1, **Activity: Introducing the Student Planetary Geologist Role**, Meet a Planetary Geologist video		
CCC	***Connections to Engineering, Technology, and Applications of Science*** **Influence of Science, Engineering, and Technology on Society and the Natural World** ▪ The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural Resources, "and economic conditions. Thus technology	***Plate Motion Engineering Internship*** unit: ● Ch.1, Day 1, **Activity: Introducing Futura**, Instructional Guide (steps 2–6) and Introducing Futura video ● Ch.1, Day 10, **Activity: Applying Engineering Skills**, Instructional Guide (steps 1–10) ***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 1, **Activity 1,** Teacher Support tab ("Instructional Suggestion, Nature of Science, Connecting to Engineering, Technology, and Applications of Science") ● Ch.1, Day 1, **Activity: Introducing Futura**, Instructional Guide (steps 2–5) and Introducing Futura video ● Ch.1, Day 10, **Activity: Defining an Engineering Problem**, Instructional Guide (steps 1–12)		

	use varies from region to region and over time. (MS-ESS3-2)			

MS-ESS3 Earth and Human Activity

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		Publisher Citations	Performance Expectation	Publisher Citations
SEP	**Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. ▪ Apply scientific principles to design an	***Earth's Changing Climate Engineering Internship*** unit: • **Unit Guide**, Unit Overview • Ch.1, Day 1, **Activity: Exploring Albedo**, Instructional Guide (steps 1–17) • Ch.1, Day 2, **Activity 2**, Instructional Guide and *Futura Civil Engineer's Dossier,* "Roof Modification Technical Notes" article • Ch.1, Day 4 o **Activity: Performing Iterative Tests**, Instructional Guide (steps 1–6) and RoofMod Design Tool o **Lesson Brief,** Digital Resources, "RoofMod Data copymaster" ***Plate Motion Engineering Internship*** unit: • **Unit Guide,** Unit Overview • Ch.1, Day 2, **Activity 2**, Instructional Guide and *Futura Geohazard Engineer's Dossier,* "Plate Motion and Tsunamis" article • Ch.1, Day 5 o **Activity: Testing Warning System Designs**, Instructional Guide (steps 1–3) and TsunamiAlert Design Tool o **Lesson Brief,** Digital Resources, "TsunamiAlert Data Sheet" copymaster	**MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*** [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of	[DCI, SEP] ***Earth's Changing Climate Engineering Internship*** unit: • Ch.1, Day 9 o **Activity: Writing the Conclusion**, Possible Responses tab o **Lesson Brief,** Digital Resources, "Printable Proposal Rubric" ***Earth's Changing Climate*** unit: • Lesson 3.3, **Activity 2**, Instructional Guide (steps 1–8), Student View, "Climate Change Solutions" article, and On-the-Fly Assessment (hummingbird icon) [DCI] ***Earth's Changing Climate*** unit: • Lesson 1.2, **Activity 5**, Student View and "The Effects of Climate Change" article [CCC]

	object, tool, process or system. (MS-ESS3-3)		solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]	***Ocean, Atmosphere, and Climate*** unit*:* • Lesson 2.4, **Activity 3**, Instructional Guide (steps 1–9), Student View, Modeling Tool: 2.4 Currents and Temperature, and On-the-Fly Assessment (hummingbird icon) ***Earth's Changing Climate*** unit*:* • Lesson 2.1, **Activity 2**, Instructional Guide (steps 1–2)
DCI	**ESS3.C: Human Impacts on Earth Systems** ▪ Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3)	***Earth's Changing Climate*** unit: • Lesson 1.2, **Activity 5**, Student View and "The Effects of Climate Change" article • Lesson 1.3, **Activity 2**, screen 1 of 4, Instructional Guide (step 2) • Lesson 3.1 o **Activity 2**, Instructional Guide (steps 1–10), Student View, and simulation o **Activity: Video About Combustion**, Instructional Guide (steps 1–3) and Combustion video o **Activity 3**, Instructional Guide (steps 1–19) and Student View o **Activity 4**, Student View and Modeling Tool: Climate Change Cause • **Printable Resources, "**Print Materials (8.5" x 11"), Human Activities Evidence Cards, page 36–37 • Lesson 1.4, **Activity 5**, "A Hole in Earth's Ozone Layer" article		
CCC	**Cause and Effect** ▪ Relationships can be classified as	***Earth's Changing Climate*** unit*:* • Lesson 2.1, **Activity 2**, Instructional Guide (steps 1–2)		

	causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3)			
CCC	***Connections to Engineering, Technology, and Applications of Science*** **Influence of Science, Engineering, and Technology on Society and the Natural World** ▪ The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate,	***Earth's Changing Climate*** unit: ● Lesson 3.1, **Activity 4,** screen 2 of 2, "Global Warming: A History of a Hot Debate" article and Teacher Support tab ("Rationale, Pedagogical Goals: Understanding the Nature of Science") ***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 1, o **Activity 1,** Teacher Support tab ("Instructional Suggestion, Nature of Science, Connecting to Engineering, Technology, and Applications of Science") o **Activity: Introducing Futura**, Instructional Guide (steps 2–5) and Introducing Futura video ● Ch.1, Day 10, **Activity: Defining an Engineering Problem**, Instructional Guide (steps 1–12) ***Plate Motion Engineering Internship*** unit: ● Ch.1, Day 5 o **Lesson Brief,** Lesson Overview o **Activity: Testing Warning System Designs**, Teacher Support tab ("Rationale, Pedagogical Goals: Understanding the Nature of Science") ● Ch.1, Day 1, **Activity: Introducing Futura**, Instructional Guide (steps 2–6) and Introducing Futura video		

	natural Resources, "and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-3)	• Ch.1, Day 10, **Activity: Applying Engineering Skills**, Instructional Guide (steps 1–10)		

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		**Publisher Citations**	**Performance Expectation**	**Publisher Citations**
SEP	**Engaging in Argument from Evidence** Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). ▪ Construct, use, and/or	***Earth, Moon, and Sun*** unit: • Lesson 4.1 o **Activity 2**, Instructional Guide (steps 1–2) and Student View o **Activity 3**, Instructional Guide (steps 1–5) and Student View o **Lesson Brief,** Digital Resources, "Science Seminar Evidence Cards copymaster" o **Activity 4**, Instructional Guide (steps 1–7) and Student View o **Activity 5**, Student View • Lesson 4.2 o **Activity 1**, Student View o **Activity 2**, Instructional Guide (steps 1–5) and Student View o **Activity: Introducing the Science Seminar**, Instructional Guide (steps 1–4) o **Activity 3**, Instructional Guide (steps 1–11) and Student View o **Activity 4**, Student View • Lesson 4.3 o **Activity 2**, Instructional Guide (steps 1–11) and Student View	**MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.** [Clarification Statement: Examples of evidence	[DCI] ***Earth's Changing Climate***: • Lesson 3.1 o **Activity 3**, Instructional Guide (steps 1–10), Student View, and On-the-Fly Assessment (hummingbird icon) o **Printable Resources,** Print Materials (8.5" x 11"), Human Activities Evidence cards, page 36–37 [DCI, SEP] ***Earth's Changing Climate***: • Lesson 4.3 o **Activity 3**, Student View and Possible Responses tab o **Lesson Brief,** Digital Resources, "Rubrics for Final Written Argument" [CCC] ***Ocean, Atmosphere, and Climate*** unit:

	present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-ESS3-4)	○ **Activity 3**, Instructional Guide (steps 1–5) and Student View ○ **Activity 4**, Instructional Guide (steps 1–5) and Student View ○ **Activity 5**, Student View ***Ocean, Atmosphere, and Climate*** unit: ● Lesson 4.1 ○ **Activity 2**, Instructional Guide (steps 1–8) and Student View ○ **Activity 3**, Instructional Guide (steps 1–4) and Student View ○ **Lesson Brief**, Digital Resources, "Science Seminar Evidence Cards copymaster" ○ **Activity 4**, Instructional Guide (steps 1–6) and Student View ● Lesson 4.2 ○ **Activity 1**, Student View ○ **Activity 2**, Instructional Guide (steps 1–5) and Student View ○ **Activity: Introducing the Science Seminar**, Instructional Guide (steps 1–6) ○ **Activity 3**, Instructional Guide (steps 1–11) and Student View ○ **Activity 4**, Student View ● Lesson 4.3 ○ **Activity 2**, Instructional Guide (steps 1–11) and Student View ○ **Activity 3**, Instructional Guide (steps 1–5) and Student View ○ **Activity 4**, Instructional Guide (steps 1–6) and Student View ○ **Activity 5**, Student View	include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural	● Lesson 2.4, **Activity 3**, Instructional Guide (steps 1–9), Student View, Modeling Tool: 2.4 Currents and Temperature, and On-the-Fly Assessment (hummingbird icon) ***Rock Transformations*** unit*:* ● Lesson 3.2, **Activity 3**, Instructional Guide (steps 1–8), Student View, and simulation [SEP] ***Earth, Moon, and Sun***: ● Lesson 4.3 ○ **Activity 4**, Instructional Guide (steps 1–5), Student View, and Possible Responses tab ○ **Lesson Brief,** Digital Resources, "Rubrics for Final Written Argument"
DCI	**ESS3.C: Human Impacts on Earth Systems** ▪ Typically as human populations and per-capita	***Earth's Changing Climate*** unit: ● Lesson 3.1 ○ **Activity 2**, Instructional Guide (steps 1–10), Student View, and simulation ○ **Activity 3**, Instructional Guide (steps 1–10) ● **Printable Resources, "**Print Materials (8.5" x 11"), Human Activities Evidence Cards, page 36–37		

	consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MS-ESS3-4)	• Lesson 3.3, **Activity 4**, Student View, and simulation • Lesson 3.2, **Activity 2**, Student View, and "Climate Change Solutions" article ***Earth's Changing Climate Engineering Internship*** unit: • Lesson 1.1 o **Activity: Introducing Futura**, Introducing Futura video o **Activity 2,** Instructional Guide (steps 4–7) and *Futura Civil Engineer's Dossier,* "Futura Engineering's Work on Rooftops" article	resources are described by science, but science does not make the decisions for the actions society takes.]	
CCC	**Cause and Effect** ▪ Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-4)	***Rock Transformations*** unit*:* • Lesson 3.2, **Activity 3**, Instructional Guide (steps 1–8), Student View, and simulation ***Earth's Changing Climate Engineering Internship*** unit: • Ch.1, Day 2 o **Activity 2**, Instructional Guide and *Futura Civil Engineer's Dossier*, "Roof Modification Technical Notes" article o **Lesson Brief,** Digital Resources, "Roof Modification Details copymaster" ***Weather Patterns*** unit: • Lesson 3.2, **Activity 4**, Student View and "How We Predict the Weather" article • Lesson 2.1, **Activity 3**, Instructional Guide (step 3) ***Earth's Changing Climate*** unit*:* • Lesson 1.2, **Activity: Introduction to Climatologist Role**, Ice Scientist video		

CCC	***Connections to Engineering, Technology, and Applications of Science*** **Influence of Science, Engineering, and Technology on Society and the Natural World** ▪ All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ESS3-4)	***Earth's Changing Climate*** unit: • Lesson 1.2, **Activity 5**, Student View and "The Effects of Climate Change" article • Lesson 3.3 o **Activity 2**, Instructional Guide (steps 2–8), Student View, and "Climate Change Solutions" article o **Activity 3**, Instructional Guide (steps 1–7), Student View, and Modeling Tool: Climate Change Solution ***Earth's Changing Climate Engineering Internship*** unit: • Ch.1, Day 1, **Activity 1,** Teacher Support tab ("Instructional Suggestion, Nature of Science, Connecting to Engineering, Technology, and Applications of Science") • Ch.1, Day 2 o **Activity 2**, Instructional Guide and *Futura Civil Engineer's Dossier*, "Roof Modification Technical Notes" article" o **Lesson Brief,** Digital Resources, "Roof Modification Details copymaster"		
CCC	***Connections to Nature of Science*** **Science Addresses Questions About the Natural and Material World** ▪ Science	***Earth's Changing Climate***: unit: • Lesson 3.1 o **Lesson Brief,** Lesson Overview o **Activity 4**, Student View, "Global Warming: A History of a Hot Debate" article, and Teacher Support tab • Lesson 3.3 o **Activity 2**, Instructional Guide (step 9) o **Activity 6**, Student View		

	knowledge can describe consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-ESS3-4)			

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		Publisher Citations	Performance Expectation	Publisher Citations
SEP	**Asking Questions and Defining Problems** Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, clarifying arguments and models. ▪ Ask questions to identify and clarify evidence of an	***Ocean, Atmosphere, and Climate*** unit: ● Lesson 4.2 o **Activity 2**, Instructional Guide (steps 1–5) and Student View o **Activity: Introducing the Science Seminar**, Instructional Guide (steps 1–6) o **Activity 3**, Instructional Guide (steps 1–11) and Student View ● Lesson 4.1 o **Activity 2**, Instructional Guide (step 8) and Student View o **Activity 3**, Instructional Guide (steps 1–4) and Student View o **Lesson Brief,** Digital Resources, “Science Seminar Evidence Cards copymaster” ***Weather Patterns*** unit: ● Lesson 4.3 o **Activity: Introducing the Science Seminar**, Instructional Guide (steps 1–7) o **Activity 2**, Instructional Guide (steps 1–11) and Student View ● Lesson 4.2	**MS-ESS3–5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.** [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion,	[DCI, CCC] ***Earth’s Changing Climate***: ● Lesson 4.3 o **Activity 3**, Student View and Possible Responses tab o **Lesson Brief,** Digital Resources, “Rubrics for Final Written Argument” [SEP] ***Ocean, Atmosphere, and Climate*** unit*:* ● Lesson 2.1, **Activity 2**, Instructional Guide (step 12), Student View, "The Ocean in Motion" article, and On-the-Fly Assessment (hummingbird icon) ● Lesson 4.2 o **Activity 2**, Instructional Guide (steps 1–5) and Student View o **Activity: Introducing the Science Seminar**, Instructional Guide (steps 1–6) o **Activity 3**, Instructional Guide (steps 1–11) and Student View [DCI]

	argument. (MS-ESS3-5)	○ **Activity 2**, Instructional Guide (steps 1–6) and Student View ○ **Lesson Brief,** Digital Resources, "Carson Wilderness Education Center Evidence Cards Set 2" • Lesson 4.1, **Lesson Brief,** Digital Resources, "Carson Wilderness Education Center Evidence Cards Set 1" ***Earth's Changing Climate*** unit: • Lesson 4.2 ○ **Activity 2**, Instructional Guide (steps 1–11) and Student View ○ **Lesson Brief,** Digital Resources, "Volcano Evidence D–F" and "Volcano Evidence G-J Cards copymaster"	cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the	***Earth's Changing Climate*** unit: • Lesson 3.3, **Activity 3**, Instructional Guide (steps 1–7), Modeling Tool: Climate Change Solution, Possible Responses tab, and On-the-Fly Assessment (hummingbird icon) [CCC] ***Earth's Changing Climate*** unit: • Lesson 4.3, **Activity 2**, Instructional Guide (step 11)
DCI	**ESS3.D: Global Climate Change** • Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the	***Earth's Changing Climate*** unit: • **Unit Guide**, Unit Overview • Lesson 3.1: ○ **Activity 1**, Instructional Guide (steps 1–2) and Student View ○ **Activity 2**, Instructional Guide (steps 1–10), Student View, and simulation ○ **Activity: Video About Combustion**, Instructional Guide (steps 1–3) and Combustion video ○ **Activity 3**, Instructional Guide (steps 1–19) and Student View ○ **Activity 4**, Student View and Modeling Tool: Climate Change Cause • **Printable Resources, "**Print Materials (8.5" x 11"), Human Activities Evidence Cards, page 36–37 • Lesson 3.2 ○ **Activity 1**, Student View ○ **Activity 2**, Student View and "Climate Change Solutions" article ○ **Activity 4**, Instructional Guide (steps 1–5) and Student View ○ **Activity 5**, Student View and simulation • Lesson 3.3		

	understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3–5)	○ **Activity 1**, Student View ○ **Activity 2**, Instructional Guide (steps 1–8), Student View, and "Climate Change Solutions" article ○ **Activity 3**, Instructional Guide (steps 1–9), Student View, and Modeling Tool: Climate Change Solution ○ **Activity 4**, Student View and simulation ○ **Activity 5**, Student View and "What Are We Doing About Sea Level Rise?" article ***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 1 ○ **Activity: Introducing Futura**, Introducing Futura video ○ **Activity 2,** Instructional Guide (steps 4–7), and *Futura Civil Engineer's Dossier,* "Futura Engineering's Work on Rooftops" article ● Ch.1, Day 4 ○ **Activity: Performing Iterative Tests**, Instructional Guide (steps 1–6) and RoofModDesign Tool ○ **Lesson Brief,** Digital Resources, "RoofMod Data copymaster" ● Ch.1, Day 8, **Activity: Processing Outline Feedback**, Instructional Guide (step 1)	rise in global temperatures.]	
CCC	**Stability and Change** ▪ Stability might be disturbed either by sudden events or gradual changes that	***Earth's Changing Climate*** unit: ● Lesson 4.3, **Activity 2**, Instructional Guide (step 11) ● Lesson 1.5, **Activity 2**, Instructional Guide (steps 1–11) and Student View ● Lesson 2.2, **Activity 2**, "Past Climate Changes on Earth" article ● Lesson 4.1, **Activity: Introducing Volcanic Eruptions**, Instructional Guide (steps 1–5) and Climate Models video		

	accumulate over time. (MS-ESS3-5)			

MS-ETS1 Engineering Design

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		Publisher Citations	Performance Expectation	Publisher Citations
SEP	**Asking Questions and Defining Problems** Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, clarifying arguments and models. ▪ Define a design problem that can be solved through the development of an object, tool, process or system and	***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 10, **Activity: Defining an Engineering Problem**, Instructional Guide (steps 1–12) and Teacher Support tab ("Instructional Suggestion, Engineering Note: Ideas for Engineering Design Criteria") ● Ch.1, Day 1, **Activity: Introducing Futura**, Instructional Guide (steps 2–5, 9–10) and Welcome to Futura video ***Plate Motion Engineering Internship*** unit: ● Ch.1, Day 10, **Activity: Applying Engineering Skills**, Instructional Guide (steps 1–10) and Teacher Support tab ("Instructional Suggestion, Going Further: Engineering Note: Considering Constraints in the Design Process") ● Ch.1, Day 1, **Activity: Introducing Futura**, Instructional Guide (steps 2–7, 11, 12), Welcome to Futura video, and Teacher Support tab ("Instructional Suggestion, Pedagogical Goals: Pre-thinking about Criteria")	**MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit**	***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 9 o **Activity: Writing the Conclusion**, Possible Responses tab o **Lesson Brief,** Digital Resources, "Printable Proposal Rubric" ***Plate Motion Engineering Internship*** unit: ● Ch.1, Day 9 o **Activity: Finalizing the Proposal**, Possible Responses tab o **Lesson Brief,** Digital Resources, "Printable Proposal Rubric"

	includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1)		**possible solutions.**	
DCI	**ETS1.A: Defining and Delimiting Engineering Problems** ▪ The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge	***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 10, **Activity: Defining an Engineering Problem**, Instructional Guide (steps 1–12) and Teacher Support tab ("Instructional Suggestion, Engineering Note: Ideas for Engineering Design Criteria") ● Ch.1, Day 1, **Activity: Introducing Futura**, Instructional Guide (steps 2–5, 9–10) and Welcome to Futura video ***Plate Motion Engineering Internship*** unit: ● Ch.1, Day 10, **Activity: Applying Engineering Skills**, Instructional Guide (steps 1–10) and Teacher Support tab ("Instructional Suggestion, Going Further: Engineering Note: Considering Constraints in the Design Process") ● Ch.1, Day 1, **Activity: Introducing Futura**, Instructional Guide (steps 2–7, 11–12), Welcome to Futura video, and Teacher Support tab ("Instructional Suggestion, Pedagogical Goals: Pre-thinking about Criteria")		

	that are likely to limit possible solutions. (MS-ETS1-1)			
CCC	**Influence of Science, Engineering, and Technology on Society and the Natural World** ▪ All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1) ▪ The uses of technologies and limitations on their use are driven by individual or societal	***Earth's Changing Climate*** unit: ● Lesson 1.2 **Activity 5**, Student View and "The Effects of Climate Change" article ● Lesson 3.3 o **Activity 2**, Instructional Guide (steps 2–8), Student View, and "Climate Change Solutions" article o **Activity 3**, Instructional Guide (steps 1–7), Student View, and Modeling Tool: Climate Change Solution ***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 10, **Activity: Defining an Engineering Problem**, Instructional Guide (steps 1–12) ● Ch.1, Day 2 o **Activity 2**, Instructional Guide (steps 1–7) and *Futura Civil Engineer's Dossier*, "Roof Modification Technical Notes" article o **Lesson Brief,** Digital Resources, "Roof Modification Details copymaster" ● Ch.1, Day 1, **Activity: Introducing Futura**, Instructional Guide ***Plate Motion Engineering Internship*** unit: ● Ch.1, Day 1, **Activity: Introducing Futura**, Instructional Guide (steps 2–6) and Introducing Futura video ● Ch.1, Day 10, **Activity: Applying Engineering Skills**, Instructional Guide (steps 1–10)		

	needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural Resources, “and economic conditions. (MS-ETS1-1)			

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		Publisher Citations	Performance Expectation	Publisher Citations
SEP	**Engaging in Argument from Evidence** Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either	***Plate Motion Engineering Internship*** unit: • Ch.1, Day 5 o **Activity: Analyzing Designs**, Instructional Guide (steps 1–6) and TsunamiAlert Design Tool o **Lesson Brief,** Digital Resources, “TsunamiAlert Data copymaster • Ch.1, Day 6 o **Activity: Testing Final Designs**, Instructional Guide (steps 1–3) and TsunamiAlert Design Tool o **Lesson Brief,** Digital Resources, “TsunamiAlert Data copymaster” • Ch.1, Day 7, **Activity: Outlining Design Decisions**, Instructional Guide (steps 1–6) and Possible Responses tab	**MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints**	***Earth’s Changing Climate Engineering Internship*** unit: • Ch.1, Day 9 o **Activity: Writing the Conclusion**, Possible Responses tab o **Lesson Brief,** Digital Resources, “Printable Proposal Rubric “ ***Plate Motion Engineering Internship*** unit: • Ch.1, Day 9 o **Activity: Finalizing the Proposal**, Possible Responses tab

	explanations or solutions about the natural and designed world. ▪ Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)	***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 4, **Activity: Submitting an Optimal Design**, Instructional Guide (steps 1–8) ● Ch.1, Day 6 o **Activity: Choosing a Design and Analyzing Data**, Instructional Guide (steps 1–10) o **Lesson Brief,** Digital Resources, "Design Analysis sheet copymaster"	**of the problem.**	o **Lesson Brief,** Digital Resources, "Printable Proposal Rubric"
DCI	**ETS1.B: Developing Possible Solutions** ▪ There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2)	***Earth's Changing Climate Engineering Internship*** unit: ● **Unit Guide**, Unit Overview ● Ch.1, Day 8, **Activity: Processing Outline Feedback**, Instructional Guide (step 1) ● Ch.1, Day 10, **Activity: Defining an Engineering Problem**, Instructional Guide (steps 1–12) ● Ch.1, Day 1, **Lesson Brief,** Digital Resources, "Video: Engineering Tips: Analyzing Data " ***Plate Motion Engineering Internship*** unit: ● **Unit Guide**, Unit Overview ● Ch.1, Day 6 o **Activity: Testing Final Designs**, Instructional Guide (steps 1–3, TsunamiAlert Design Tool o **Lesson Brief,** Digital Resources, " TsunamiAlert Data copymaster ● Ch.1, Day 7, **Activity: Outlining Design Decisions**, Instructional Guide (steps 1–6) and Possible Responses tab		

		• Ch.1, Day 10, **Activity: Applying Engineering Skills**, Instructional Guide (steps 1–10)		

Science and Engineering Practices Disciplinary Core Ideas Crosscutting Concepts		Publisher Citations	Performance Expectation	Publisher Citations
SEP	**Analyzing and Interpreting Data** Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. ▪ Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)	***Weather Patterns*** unit: • Lesson 3.2 o **Activity 3**, Instructional Guide (steps 1–8) and Student View o **Lesson Brief,** Digital Resources, "Storm Evidence Cards A–G" ***Geology on Mars*** unit: • Lesson 1.1, **Activity 3**, screen 2 of 2, Instructional Guide (steps 6–16) and Student View • **Printable Resources, "**Print Materials (8.5" x 11"), Comparing Rocky Planets Cards, pages 15–19 ***Earth's Changing Climate*** unit*:* • Lesson 1.5, **Activity 2**, screens 1–6 of 7, Instructional Guide (steps 1–16) and Student View ***Ocean, Atmosphere, and Climate*** unit: • Lesson 4.1 o **Activity 2**, Instructional Guide (steps 1–8) and Student View o **Activity 3**, Instructional Guide (steps 1–4) and Student View o **Lesson Brief,** Digital Resources, "Science Seminar Evidence Cards A–E" o **Activity 4**, Instructional Guide (steps 1–3) and Student View ***Plate Motion Engineering Internship*** unit: • Ch.1, Day 5	**MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.**	***Earth's Changing Climate Engineering Internship*** unit: • Ch.1, Day 9 o **Activity: Writing the Conclusion**, Possible Responses tab o **Lesson Brief,** Digital Resources, "Printable Proposal Rubric" ***Plate Motion Engineering Internship*** unit: • Ch.1, Day 9 o **Activity: Finalizing the Proposal**, Possible Responses tab o **Lesson Brief,** Digital Resources, "Printable Proposal Rubric"

		○ **Activity: Testing Warning System Designs**, Instructional Guide (steps 1–3) and TsunamiAlert Design Tool ○ **Lesson Brief,** Digital Resources, "TsunamiAlert Data copymaster" ○ **Activity: Analyzing Designs**, Instructional Guide (steps 1–5)		
DCI	**ETS1.B: Developing Possible Solutions** ▪ There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-3) ▪ Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)	***Earth's Changing Climate Engineering Internship*** unit: ● **Unit Guide**, Unit Overview ● Ch.1, Day 1, **Lesson Brief,** Digital Resources, "Video: Engineering Tips: Analyzing Data" and "Video: Engineering Tips: Optimal Designs" ● Ch.1, Day 4 ○ **Activity: Performing Iterative Tests**, Instructional Guide (steps 1–6) ○ **Lesson Brief,** Digital Resources, "RoofMod Data copymaster" ● Ch.1, Day 6 ○ **Activity: Choosing a Design and Analyzing Data**, Instructional Guide (steps 1–10) ○ **Lesson Brief,** Digital Resources, "Design Analysis sheet copymaster" ● Ch.1, Day 8, **Activity: Processing Outline Feedback**, Instructional Guide (step 1) ***Plate Motion Engineering Internship*** unit: ● **Unit Guide**, Unit Overview ● Ch.1, Day 6 ○ **Activity: Testing Final Designs**, Instructional Guide (steps 1–3 ○ **Lesson Brief,** Digital Resources, "TsunamiAlert Data copymaster" ● Ch.1, Day 5 ○ **Activity: Testing Warning System Designs**, Instructional Guide (steps 1–3) ○ **Activity: Analyzing Designs**, Instructional Guide (steps 1–5) ● Ch.1, Day 7, **Activity: Outlining Design Decisions**, Instructional Guide (steps 1–6) and Possible Responses tab		

DCI	**ETS1.C: Optimizing the Design Solution** ▪ Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3)	***Plate Motion Engineering Internship*** unit: ● **Unit Guide**, Unit Overview ● Ch.1, Day 5 o **Activity: Analyzing Designs**, Instructional Guide (steps 1–5) o **Lesson Brief,** Digital Resources, "TsunamiAlert Data copymaster" ***Earth's Changing Climate Engineering Internship*** unit: ● **Unit Guide**, Unit Overview ● Ch.1, Day 4 o **Activity: Submitting an Optimal Design**, Instructional Guide (steps 1–10) o **Lesson Brief,** Digital Resources, "Roofmod Data copymaster" ● Ch.1, Day 1, **Lesson Brief,** Digital Resources, "Video: Engineering Tips: Optimal Designs"		

Science and Engineering Practices Disciplinary Core Ideas	**Publisher Citations**	**Performance Expectation**	**Publisher Citations**

Crosscutting Concepts				
SEP	**Developing and Using Models** Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. ▪ Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)	***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 4 o **Activity: Submitting an Optimal Design**, Teacher Support tab ("Instructional Suggestion, Going Further: Developing Models") o **Activity: Performing Iterative Tests**, Instructional Guide (steps 1–6) and RoofMod Design Tool o **Lesson Brief,** Digital Resources, "RoofMod Data copymaster" ***Plate Motion Engineering Internship*** unit: ● Ch.1, Day 5 o **Activity: Testing Warning System Designs**, Instructional Guide (steps 1–3) and TsunamiAlert Design Tool o **Lesson Brief,** Digital Resources, "TsunamiAlert Data copymaster"	**MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**	[PE] ***Earth's Changing Climate Engineering Internship*** unit: ● Ch.1, Day 9 o **Activity: Writing the Conclusion**, Possible Responses tab o **Lesson Brief,** Digital Resources, "Printable Proposal Rubric" ***Plate Motion Engineering Internship*** unit: ● Ch.1, Day 9 o **Activity: Finalizing the Proposal**, Possible Responses tab o **Lesson Brief,** Digital Resources, " Printable Proposal Rubric " [SEP] ***Earth's Changing Climate Engineering Internship*** unit: ● Lesson 1.4 o **Activity: Submitting an Optimal Design**, Teacher Support tab ("Instructional Suggestion, Going Further: Developing Models") o **Activity: Performing Iterative Tests**, Instructional Guide (steps 1–6) and RoofMod Design Tool o **Lesson Brief,** Digital Resources, "RoofMod Data copymaster" ***Plate Motion Engineering Internship*** unit: ● Ch.1, Day 5 o **Activity: Testing Warning System Designs**, Instructional
DCI	**ETS1.B: Developing Possible Solutions**	***Earth's Changing Climate Engineering Internship*** unit: ● **Unit Guide**, Unit Overview ● Ch.1, Day 4 o **Activity: Introducing the Design Cycle**, Instructional Guide (step 2) o **Activity: Submitting an Optimal Design**, Teacher Support tab		

	▪ A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4) ▪ Models of all kinds are important for testing solutions. (MS-ETS1-4)	(“Instructional Suggestion, Going Further: Developing Models”) o **Activity: Performing Iterative Tests**, Instructional Guide (steps 1–6) o **Lesson Brief,** Digital Resources, “RoofMod Data sheet copymaster” ● Ch.1, Day 5 o **Activity: Engaging in Targeted Redesign**, Instructional Guide (steps 1–4) o **Lesson Brief,** Digital Resources, “RoofMod Data copymaster” ● Ch.1, Day 3, **Activity: Learning About RoofMod**, Instructional Guide (steps 1–5), RoofMod Demo video, and RoofMod Design Tool ***Plate Motion Engineering Internship*** unit: ● **Unit Guide,** Unit Overview ● Ch.1, Day 1, **Activity: Exploring TsunamiAlert**, Instructional Guide (steps 1–5) ● Ch.1, Day 5 o **Activity: Testing Warning System Designs**, Instructional Guide (steps 1–3) o **Activity: Analyzing Designs**, Instructional Guide (steps 1–5) o **Lesson Brief,** Digital Resources, “TsunamiAlert Data copymaster” ● Ch.1, Day 6 o **Activity: Testing Final Designs**, Instructional Guide (steps 1–3) o **Lesson Brief,** Digital Resources, “TsunamiAlert Data copymaster”		Guide (steps 1–3) and TsunamiAlert Design Tool o **Lesson Brief,** Digital Resources, “TsunamiAlert Data copymaster” [DCI] ***Earth’s Changing Climate Engineering Internship*** unit: ● **Unit Guide**, Unit Overview ● Ch.1, Day 4 o **Activity: Introducing the Design Cycle**, Instructional Guide (step 2) o **Activity: Performing Iterative Tests**, Instructional Guide (steps 1–6) o **Activity: Submitting an Optimal Design**, Teacher Support tab (“Instructional Suggestion, Going Further: Developing Models”) o **Lesson Brief,** Digital Resources, “RoofMod Data sheet copymaster” ● Ch.1, Day 5 o **Activity: Engaging in Targeted Redesign**, Instructional Guide (steps 1–4) o **Lesson Brief,** Digital Resources, “RoofMod Data copymaster” ● Ch.1, Day 3, **Activity: Learning About RoofMod**, Instructional Guide (steps 1–5), RoofMod Demo video, and RoofMod Design Tool ***Plate Motion Engineering Internship*** unit: ● **Unit Guide,** Unit Overview ● Ch.1, Day 1, **Activity: Exploring TsunamiAlert**, Instructional Guide (steps 1–5) ● Ch.1, Day 5
DCI	**ETS1.C: Optimizing the Design Solution** ▪ The iterative process of testing the most promising	***Earth’s Changing Climate Engineering Internship*** unit: ● **Unit Guide,** Unit Overview ● Ch.1, Day 4 o **Activity: Performing Iterative Tests**, Instructional Guide (steps 1–6) o **Lesson Brief,** Digital Resources, “RoofMod Data sheet copymaster” ● Ch.1, Day 5		

	solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)	○ **Activity: Engaging in Targeted Redesign**, Instructional Guide (steps 1–4) ○ **Lesson Brief,** Digital Resources, “RoofMod Data copymaster” ***Plate Motion Engineering Internship*** unit: ● **Unit Guide,** Unit Overview ● Ch.1, Day 5 ○ **Activity: Testing Warning System Designs**, Instructional Guide (steps 1–3) ○ **Activity: Analyzing Designs**, Instructional Guide (steps 1–5) ○ **Lesson Brief,** Digital Resources, “TsunamiAlert Data copymaster” ● Ch.1, Day 6 ○ **Activity: Testing Final Designs**, Instructional Guide (steps 1–3) ○ **Lesson Brief,** Digital Resources, “TsunamiAlert Data copymaster” ● Ch.1, Day 1, **Lesson Brief,** Digital Resources, “Video: Engineering Tips: Optimal Designs”		○ **Activity: Testing Warning System Designs**, Instructional Guide (steps 1–3) ○ **Activity: Analyzing Designs**, Instructional Guide (steps 1–5) ○ **Lesson Brief,** Digital Resources, “TsunamiAlert Data copymaster” ● Ch.1, Day 6 ○ **Activity: Testing Final Designs**, Instructional Guide (steps 1–3) ○ **Lesson Brief,** Digital Resources, “TsunamiAlert Data copymaster”