Course 3– Grade 8 Science
Unit # 3 Earth Science

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Topic 6 (14 days) – History of Earth
Topic 7 (14 days) – Energy in the Atmosphere and Ocean
Topic 8 (15 days) - Climate
Topic 9 (16 days) - Earth-Sun-Moon System
Topic 10 (18 days) - Solar System and the Universe

Unit Overview:

The Earth Science unit begins with students investigating various ways to determine the relative and absolute ages of rock layers. This knowledge will then lead students into modeling the history of Earth. Students will investigate how major events in Earth's history have shaped evolution of living species and geologic features. Students will then further their studies of Earth by modeling energy transfer from the Sun to Earth's surface and air by radiation, conduction, and convection. Unequal heating of Earth's atmosphere and Earth's rotation will then be studied. The next topic is climate. Factors that influence climate (latitude, altitude, land distribution, and ocean currents) will be investigated. Students will use this information to analyze data in order to identify trends in Earth's warming and cooling patterns, and how the changes in Earth's temperature has an effect on water levels and living organisms. Students will be given the opportunity to design solutions to lessen the effect of climate changes.

The Earth-Sun-Moon system will then be explored. Students will investigate the different objects seen in the night sky and how Earth, Sun, and other planets move through space. Earth's movement in space focusing on day length and seasons will be investigated, leading up to the study of tides, eclipses, and moon phases.

The Solar System and the Universe is the final topic. Students will analyze data to compare and contrast the planets and other objects in the solar system, describe how technology is used to detect electromagnetic radiation, classify and study the formation of stars, and learn the theory behind the formation of the universe.

Unit 3 NYSSLS Performance Expectations (PE)

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 or evidence could include very recent events or evidence (such as the last Ice Age or the earliest fossils of Homo sapiens) to very old events or evidence (such as the formation of Earth or the earliest evidence of life). Examples of evidence could 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, radiometric dating using half-lives, and defining index fossils.]

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

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.

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of 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 is on the sunlight-driven latitudinal banding causing differences in density that create convection currents in the atmosphere, 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 effect and the coastlines of continents. Examples of models could include diagrams, maps and globes, or digital representations.] [Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.]

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 could include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence could 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 rise in global temperatures.]

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 possible solutions.

MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and protecting ecosystem stability.* [Clarification Statement: Examples of ecosystem protections could include water purification, waste management, nutrient recycling, prevention of soil erosion, and eradication of invasive species. Examples of design solution constraints could include scientific, economic, and social considerations.]

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 could include physical, graphical, or conceptual models.]

MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions 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 could include physical models (such as a model of the solar system scaled using various measures or computer visualizations of elliptical orbits) or conceptual models (such as mathematical proportions relative to the size of familiar objects such as students' school or state).] [Assessment Boundary: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.]

MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system. [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 could include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data could include statistical information, drawings and photographs, and models.] [Assessment Boundary: Assessment does not include recalling facts about the properties of the planets and other solar system bodies.]

Unit 3 NYSSLS Science and Engineering Practices (SEP)

- Analyzing and Interpreting Data
- Engaging in Argument from Evidence
- Constructing Explanations and Designing Solutions
- Developing and Using Models
- Asking Questions and Defining Problems

Unit 3 NYSSLS Disciplinary Core Ideas (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)**
- **Tectonic processes continually generate new ocean seafloor at ridges and destroy old sea floor at trenches. (HS. ESS1.C GBE) (secondary to MS-ESS2-3)**

ETS1.B: Developing Possible Solutions

- **A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)**
- **There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (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)**
- **Models of all kinds are important for testing solutions. (MS-ETS1-4)**

ESS2.D: Weather and Climate

- **Weather and climate are influenced by interactions involving sunlight, the ocean, 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)**
- **Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5)**
- **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)**

ESS2.C: The role 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)**
- **Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6)**

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 that are likely to limit possible solutions. (MS-ETS1-1)**

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 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)**

ESS1.B: Earth and the Solar System

- **(NYSED) The solar system consists of the Sun and a collection of objects, including planets, their moons, comets, and asteroids that are held in orbit around the Sun by its gravitational pull on them. (MS-ESS1-2),(MS-ESS1-3)**
- **This model of the solar system can explain eclipses of 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)**
- **The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)**

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 and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2)**

Unit 3 NYSSLS Cross Cutting Concepts (CCC)

- **Patterns**
- **Scale, Proportion, and Quantity**
- **Cause and Effect**
- **Systems and System Models**
- **Stability and change**
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Resources

- **Pearson Elevate Science Book Chapters Topics 6-10**
- **PearsonRealize.com**
- **Pearson Lab materials**
- http://ngss.nsta.org/Classroom-Resources.aspx
- http://newyorkscienceteacher.com/sc
- Z-Space

Measurement of Student Learning

- Topic Readiness Test
- Lesson Checks
- Lesson Quiz
- Topic Review and Assessment
- Quest Rubrics
- Exam view Assessments

Step Up to Writing

SUTW Strategy

Connect, Case Studies

Easy 2-Column Notes

SUTW 4th Edition p. 31

SUTW Tools S1-17a-c

Content Vocabulary

Breaking Down Definitions

SUTW 4th Edition p. 212

SUTW Tools S3-2a-b, S3-1a

Investigate/Synthesize/Quest

IVF Summary Sentences

SUTW 4th Edition p. 43

SUTW Tools S1-23b

Investigate/Synthesize/Quest

Four Step Summary Paragraph

SUTW 4th Edition p. 44

SUTW Tools S1-24a-b

Investigate/Synthesize/Quest

Color-Coding the Elements of Informative

SUTW 4th Edition p. 2688

SUTW Tools S4-1a-b

Investigate/Synthesize/Quest

Explanatory Writing Informal Outlines
SUTW 4th Edition p. 272
SUTW Tools S4-3a-b, S4-4a,b

ELL Enhancements

Pearson Elevate Science Supports

Topic Differentiated Instruction in TE
Topic Remediation Summary in TE
ELL Support in TE
ELL Vocabulary Support in TE

Listening	**Speaking**	**Reading**	**Writing**	**Accommodations**
Build Background Knowledge Audio	Sentence Frames Academic conversation Starters	Supplementary Texts Visual Aids Video Standards-based questions	Sentence Frames Graphic Organizers Standards-based sentence stems	Extended time Directions read 3x Oral interpretation Translated version of test (may have both English and other) Responses in home language

Special Education Modifications

Pearson Elevate Science Supports

Topic Differentiated Instruction in TE
Topic Remediation Summary in TE

Instructional	**Assistive technology**	**Assessment:**	
Pre-teach vocabulary Use picture vocabulary Picture examples of safety measures posted Pictures for each category of science Scaffold Depth of Knowledge questions Provide copy of notes/notes in ”cloze” form Peer partner Extended time for written tasks/verbal response Break long tasks over multiple days Allow for multiple ways to respond (verbal, written, response board, scribe) Provide mock/model of performance task Model use of graphic organizers (fade until mastery) Modify informational text to shorter passages Provide model of exemplar lab write-up	Computer for lengthy writing tasks Audio textbook Videos to clarify concepts Recording device to record class lecture/discussions **Other** Arrange seating for maximum engagement and minimum distraction Accessible lab space (counter level)	Scaffold written assignments Individual criteria for success Provide with review packet Modify the number of questions Provide model of the task Provide multiple options for project Practice calculating density with sample problem before assessing student.	

Provide interactive notebook Present complex tasks in multiple ways Model steps to read, interpret, and construct graphs Multiple opportunities to perform to repeat labs Provide advance organizer of class tasks			

Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom

Pearson Elevate Science Supports

Pearson Elevate Science Resources

- Materials, resources, and/or discussions address diverse cultural backgrounds and real world applications
- Artifacts (posters, charts, etc.) in the science classroom are representative of the cultures of the student population
- All students are given an opportunity to engage in science discourse
- Teacher demonstrates high expectations for all students