Grade 8 Science – Course 3
Unit # 3 Earth and Space Science

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

Unit 1 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 2 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-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-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-ESS1-2. 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.]

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-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.

Unit 1 NYSSLS Science and Engineering Practices (SEP)

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

Unit 1 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)

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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)

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)

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. (MSETS1-1)

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)

Unit 1 NYSSLS Cross Cutting Concepts (CCC)

- Patterns
- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Stability and Change

Resources

- Savvas Elevate Science Book NY Edition Course 3 Topics 6-10
- Savvas Easybridge (access via BPS Staff Resources or Clever)
- Savvas Lab materials
- http://ngss.nsta.org/Classroom-Resources.aspx

Measurement of Student Learning

- Lesson Quiz
- Topic Assessment and Remediation
- Evidence-Based Assessment
- Quest Rubrics
- Exam view Assessments

Savvas Elevate Science Supports

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

English Language Learners (ELL) Enhancements

To access hyperlinked material, you must be logged into your BPS Google Drive

Listening

- **Cross- Linguistic Practices:** Gives students opportunities to make connections between what they hear and their home language (For example, allow students to listen to a passage and identify cognates).
- **Activating Prior Knowledge** Activating prior knowledge means both eliciting from students what they already know and building initial knowledge that they need in order to access upcoming content**.**
- **Visuals** - GIFs, pictures- will assist students in understanding what they are listening to. Use **visual thinking strategies** to set the lens for learning.
- Video to review or introduce a topic – use **closed captioning** to help students see the words and pronunciations while they listen to the content.
- **Word stretching / Vowel stretching** when instructing allows student to listen closely to the pronunciation of the word.
- **Performance Level Descriptors** this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of listening.

Speaking

- **Sentence Stems/Frames** - to begin a sentence - such as *Evolution is…* or *I think that evolution is…*
- **Academic Conversation Starters:** Have a visual of a list of academic sentence starters that students can refer to in a discussion.
- **Choral Reading** - To build fluency, self-confidence and motivation with reading/speaking.
- Create **movement** to go with the word. Movement can be a motivating factor, as well as a kinesthetic tool for conceptualizing the rhythm and flow of fluent reading while triggering brain function for optimal learning.
- **Performance Level Descriptors** This document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of speaking.

Reading

	●—Supplementary Text to help reinforce concepts. ●—**Visual Aids** - Pictures or models to support vocabulary words and concepts • Video to review or introduce a topic - use **closed captioning** to help students read along while they listen to the content. • **4 Square / Frayer models** to help students gain a deeper understanding of vocabulary. • **Highlighting** important text to assist students in answering questions after the reading. • **Chunking**-Break reading of text into chunks or paragraphs • **Vocabulary Morphology**- Morphology relates to the segmenting of words into affixes (prefixes and suffixes) and roots or base words, and the origins of words. Understanding that words connected by meaning can be connected by spelling can be critical to expanding a student's vocabulary. • **Performance Level Descriptors** this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of reading.
	Instructional Accommodations (depending on the student's needs) • **Extended time** for tests in class, projects and assignments • **Directions read.** Broken down as necessary • **Model** how to complete the activity in the lesson • **Oral simplification** of directions or questions • **Translated version** of test when available. Student may have both version English and native language version • Use of **approved bilingual glossaries** from NYS in each subject
Special Education Modifications Special Education students must have accommodations as per Individual Educational Plan (IEP)	**Instructional** • **Pre-teach** vocabulary • Use **picture vocabulary** • Scaffold **Depth of Knowledge** questions • Provide copy of notes/**notes in "cloze"** form • Use of **Think, Pair, and Share** strategy to help process information • **Scaffold** written assignments with the use of **graphic organizers** • Allow for **multiple ways to respond** (verbal, written, response board) • Provide **model of performance task** • **Modify informational text** to fit the needs of the students • Provide a digital or paper i**nteractive notebook** • Present complex **tasks in multiple ways** • Provide **mnemonic strategies** for scientific concepts
	Technology: • **Audio** reading of text • **Text to type** functions • **Videos** to clarify/visualize science concepts • **Record class lecture/discussions** and make accessible to student • **Nearpod**- interactive presentations of notes
	In Class Assessments • Provide **multiple options** for projects • **Use of timer** in class • Break all complex tasks into chunks
Step Up to	• Easy Two-Column Notes

Writing Step Up to Writing Materials can be found in BPS Science K-12 Schoology Folder Grade 8 Resources Grade 8 SUTW materials	• Breaking Down Definitions • Paragraph Frame- What I Learned • **Performance Level Descriptors** this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of writing.
Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom	• 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