



Grade 8 Science – Course 3
Unit 3 – Earth and Space Science
Topic 10 Solar System and the Universe – 18 Days

Unit Overview – The Earth and Space Science unit consists of five topics. In Topic 6 students investigate the history of Earth, Earth’s geologic features, and Earth’s living organisms. Topic 7 focuses on energy flow through Earth’s atmosphere and oceans. Students focus on the impact of natural and human factors on Earth’s climate in Topic 8. Topic 9 explores the effect of the sun and moon on Earth. The formation of celestial bodies, discovery of other planetary systems, and the understanding of the universe is the context of Topic 10.

Topic Essential Question What kind of data and evidence help us to understand the universe?

Lessons

- Topic Launch/Quest Kickoff
- Lesson 1 Solar System Objects
- Lesson 2 Learning About the Universe
- Lesson 3 Stars
- Lesson 4 Galaxies
- Topic Close – Assessment, Quest Findings

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.

Topic Opener

PE: MS-ESS1-2; MS-ESS1-3

Savvas

Highlighted labs are important to the understanding of the instructional concepts in this lesson and must be completed during Science instructional time.

- Topic Readiness Test
- **uConnect Lab – Planetary Measures**
- Quest Kickoff Video – How do we look for things that can't be seen?

CLRI Connections:

- Article: "[The African Americans in Air and Space](#)" (Gale database)

This article covers a wide variety of African American scientists important in air and space. Robert H Lawrence was the first African American astronaut. Katherine Johnson's data helped to make prototype spacecraft. Vance Marchbanks was one of the physicians who monitored John Glenn's vital signs as he orbited earth in 1962. Neil deGrasse Tyson researches topics like star formation, exploding stars, dwarf galaxies, and the structure of the Milky Way. These are just a few of the scientists included in the article.

Lesson 1 – Solar System Objects

PE:MS-ESS1-2; MS-ESS1-3

SEP: Developing and Using Models; Analyzing and Interpreting Data

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)

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)
- The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)

CCC: Scale; Systems and System Models

zSpace Activities (code)

Comparing Objects in our Solar System (A034)

[Comparing Objects in our Solar System - Teacher Activity Plan](#)

Students will observe the size of each planet relative to the Sun and create a comparison chart of planet sizes and compositions using information located within the planet section of this zSpace Experience.

[Comparing Objects in our Solar System - Student Worksheet 1](#)

[Comparing Objects in our Solar System - Student Worksheet 2](#)

[Comparing Objects in our Solar System - Student Worksheet 3](#)

[Comparing Objects in our Solar System - Worksheet 4](#)

[Comparing Objects in our Solar System - Student Worksheet GoogleDoc](#)

Solar System Exploration: Comparing Planets (E434)

[Solar System Exploration: Comparing Planets - Teacher Activity Plan](#)

Students will observe the size of each planet relative to the Sun and create a comparison chart of planet sizes and compositions using information located within the planet section of this zSpace Experience.

[Solar System Exploration: Comparing Planets - Student Worksheet 1](#)

[Comparing Objects in our Solar System - Worksheet 4](#)

[Solar System Exploration: Comparing Planets - Student Worksheet GoogleDoc](#)

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Guiding Objectives:

- Students will interpret data to compare and contrast solar system objects based on their characteristics (color, size, motion, ability to sustain life, geographical features, etc.).
- Students will develop and use models to: Describe the role of gravity in the motions of the planets and other objects in the solar system; describe the role of gravity in the sun’s function.
- Students will use patterns to describe the relationships between solar system objects.

Literacy Connection

- Integrate With Visuals

Vocabulary

- | | |
|---------------------|--------------|
| ● solar system | ● moon |
| ● astronomical unit | ● asteroid |
| ● sun | ● meteoroids |
| ● planet | ● comets |

Academic Vocabulary

- features

Connect - TE/SB p.472

- Connect It!
- Quest Connection
- Inquiry Warm-Up Lab – Ring Around the Sun

Investigate - TE/SB pp.473-482

- *u*Investigate Lab – Pulling Planets*
- *u*Investigate Lab – Layers of the Sun
- Video – Distances in the Solar System
- Interactivity – Distance Learning
- Interactivity – Anatomy of the Sun
- Interactivity – Solar System
- Virtual Lab – A New Home
- Literacy Connection (p.482)
- Reading Check (pp.475; 479; 481)
- Math Toolbox (p.474)
- Model It! (p.478)

Synthesize - TE/SB pp. 482-483

- Interactivity – How to Make a Solar system
- Quest Check-In Interactivity – Space Invaders
- Quest Check-In

Demonstrate – TE/SB p.482

- Lesson 1 Check
- Lesson Quiz 1

*Denotes accompanying lab video

Lesson 2 – Learning About the Universe

PE: MS-ESS1-3

SEP: Developing and Using Models

DCI:

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)

CCC: Scale, Proportion, and Quantity

Savvas

Guiding Objectives:

- Students will identify and describe: The characteristics of the electromagnetic spectrum; how scientists use the electromagnetic spectrum to learn about the universe.
- Students will evaluate and describe the role of technology in: Accessing outer space; collecting, analyzing, and communicating data.

Literacy Connection

- Determine Central Ideas

Vocabulary

- Electromagnetic radiation
- Visible light
- spectrum
- wavelength
- telescope

Academic Vocabulary

- complement

Connect - TE/SB p. 486

- Connect It!
- Quest Connection
- Inquiry Warm-Up Lab – How Does Distance Affect an Image?

Investigate - TE/SB pp. 487-492

- Video – Learning About the Universe
- **Investigate Lab – Space Exploration Vehicle**

- Interactivity – Space Exploration
- Interactivity – Telescopes
- Reading Check (pp. 488; 489)
- Plan It! (p. 489)
- Literacy Connection (p.487)

Synthesize - TE/SB pp. 493-494

- Interactivity – Eyes in the Sky
- Quest Check-In Interactivity – Anybody Out There?
- Reading Check (p.447)
- Quest Check-In

Demonstrate – TE/SB p. 494

- Lesson 2 Check
- Lesson 2 Quiz

CLRI Connections:

- [George Carruthers Article](#) (Gale database)
When the Apollo 16 mission landed on the Moon in 1972, astronauts set up the first space-based observatory to survey the cosmos. It was designed and built by the astronomer George Carruthers. By capturing light in a part of the spectrum inaccessible to terrestrial telescopes, Carruthers's Far Ultraviolet (FUV) lunar camera produced the first global images of Earth's upper atmosphere, a region fundamental to communications, remote sensing, and the operation of space systems. The telescope also peered into deep space, shining light on star formation and clusters and the interstellar medium.

	<p>CLRI Connections:</p> <ul style="list-style-type: none"> ● Neil deGrasse Tyson Article (Gale database) <p>Though he is a popular figure on television and social media, impassioned astrophysicist Neil deGrasse Tyson's primary job is serving as the director of the Hayden Planetarium in New York City and conducting related research. A lifelong science and astronomy enthusiast, Tyson has worked as an academic at such institutions as Princeton. He also has published numerous books for both a scientific audience and the public. In all he does, Tyson enthusiastically shares his love of science and the importance of scientific knowledge and discovery.</p>
<p><u>Lesson 3 – Stars</u> PE: MS-ESS1-2 SEP: Developing and Using Models DCI: ESS1.A – The Universe and Its Stars</p> <ul style="list-style-type: none"> ● Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2) <p>CCC: Systems and System Models</p>	<p>Savvas Guiding Objectives:</p> <ul style="list-style-type: none"> ● Students will use evidence to list and describe the physical properties of stars. ● Students will analyze and interpret data to explain how stars are classified. ● Students will use evidence to describe the role gravity plays in the formation of stars. <p>Literacy Connection</p> <ul style="list-style-type: none"> ● Determine Central Ideas <p>Vocabulary</p> <ul style="list-style-type: none"> ● nebula ● protostar ● white star ● supernova ● apparent brightness ● absolute brightness <p>Academic Vocabulary</p> <ul style="list-style-type: none"> ● analyze <p>Connect - TE/SB p. 496</p> <ul style="list-style-type: none"> ● Connect It! ● Quest Connection ● Poll – Estimate the Number of Stars <p>Investigate - TE/SB pp. 497-498; 500-503</p> <ul style="list-style-type: none"> ● uInvestigate Lab – How Far is That Star? ● Video – Birth of a Star ● Interactivity – Star Systems ● Literacy Connection (p.497) ● Reading Check (pp. 498; 500; 503) ● Model It! (p.502) <p>Synthesize - TE/SB pp. 499, 504</p> <ul style="list-style-type: none"> ● Interactivity – Lives of Stars ● Math Toolbox (p.504) <p>Demonstrate – TE/SB p.505</p>

	<ul style="list-style-type: none"> ● Lesson 3 Check ● Lesson 3 Quiz
<p><u>Lesson 4 – Galaxies</u> PE: MS-ESS1-2 SEP: Developing and Using Models DCI: ESS1.A – The Universe and Its Stars</p> <ul style="list-style-type: none"> ● Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2) <p>ESS1.B – Earth and the Solar System</p> <ul style="list-style-type: none"> ● (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) ● The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2) <p>CCC: Systems and System Models</p>	<p>Savvas Guiding Objectives:</p> <ul style="list-style-type: none"> ● Students will use models to analyze the distances between objects in the universe and the methods used to measure those distances. ● Students will explain the hierarchical relationships between the various bodies in the universe. <p>Literacy Connection</p> <ul style="list-style-type: none"> ● Summarize Text <p>Vocabulary</p> <ul style="list-style-type: none"> ● galaxy ● light-year ● universe ● big bang <p>Academic Vocabulary</p> <ul style="list-style-type: none"> ● determine <p>Connect - TE/SB p. 506</p> <ul style="list-style-type: none"> ● Connect It! ● Quest Connection ● Write – Hollywood Goes to Space <p>Investigate - TE/SB pp. 507-512</p> <ul style="list-style-type: none"> ● uInvestigate Lab – Model the Milky Way ● Video – Big Bang Theory ● Interactivity – Types of Galaxies ● Reading Check (pp. 509; 511; 512) ● Model It! (p.508) ● Math Toolbox (p.511) <p>Synthesize - TE/SB pp. 512-514</p> <ul style="list-style-type: none"> ● Interactivity – Model a Galaxy ● Quest Check-In Interactivity – Searching for the Unseen ● Literacy Connection (p.512) <p>Demonstrate – TE/SB p.505</p> <ul style="list-style-type: none"> ● Lesson 4 Check ● Lesson 4 Quiz
<p><u>Topic Close</u></p> <ul style="list-style-type: none"> ● Topic 10 Assessment and Remediation TE/SB pp. 516-519 ● Quest Finding and Reflection TE/SB p. 519 	<p><u>Topic 10 Enrichment</u> Topic 10 - Lesson 1 Enrichment</p> <ul style="list-style-type: none"> ● Enrichment – Sunspot Cycles ● Case Study – Comparing Solar System Objects (pp.484-485) <p>Topic 10 - Lesson 2 Enrichment</p> <ul style="list-style-type: none"> ● Enrichment – Eyes in the Sky ● uEngineer It – Blast Off! <p>Topic 10 - Lesson 3 Enrichment</p> <ul style="list-style-type: none"> ● Enrichment – The Closest Stars <p>Topic 10 - Lesson 4 Enrichment</p> <ul style="list-style-type: none"> ● Colliding Galaxies ● Extraordinary Science – Traveling Through the Milky Way

	<p>Topic 10 Close</p> <ul style="list-style-type: none"> • <i>u</i>Demonstrate Lab – Scaling Down the Solar System (pp.520-523)
<p>English Language Learners (ELL) Enhancements</p> <p>To access hyperlinked material, you must be logged into your BPS Google Drive</p>	<p><u>Listening</u></p> <ul style="list-style-type: none"> • <u>Cross- Linguistic Practices</u>: 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). • <u>Activating Prior Knowledge</u> 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. • <u>Visuals</u> - GIFs, pictures- will assist students in understanding what they are listening to. Use <u>visual thinking strategies</u> to set the lens for learning. • Video to review or introduce a topic – use <u>closed captioning</u> to help students see the words and pronunciations while they listen to the content. • <u>Word stretching / Vowel stretching</u> when instructing allows students to listen closely to the pronunciation of the word. • <u>Performance Level Descriptors</u> 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. Scroll for grade 8. <hr/> <p><u>Speaking</u></p> <ul style="list-style-type: none"> • <u>Sentence Stems/Frames</u> - to begin a sentence - such as <i>Evolution is...</i> or <i>I think that evolution is...</i> • <u>Academic Conversation Starters</u>: Have a visual of a list of academic sentence starters that students can refer to in a discussion. • <u>Choral Reading</u> - To build fluency, self-confidence and motivation with <u>reading/speaking</u>. • Create <u>movement</u> 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. • <u>Performance Level Descriptors</u> 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. Scroll for grade 8. <hr/> <p><u>Reading</u></p> <ul style="list-style-type: none"> • Supplementary Text to help reinforce concepts. • <u>Visual Aids</u> - Pictures or models to support vocabulary words and concepts • Video to review or introduce a topic - use <u>closed captioning</u> to help students read along while they listen to the content. • <u>4 Square / Frayer models</u> to help students gain a deeper understanding of vocabulary. • <u>Highlighting</u> important text to assist students in answering questions after the reading. • <u>Chunking</u>-Break reading of text into chunks or paragraphs • <u>Vocabulary Morphology</u>- 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. • <u>Performance Level Descriptors</u> 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. Scroll for grade 8. <hr/> <p><u>Instructional Accommodations (depending on the student’s needs)</u></p> <ul style="list-style-type: none"> • 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

<p>Special Education Modifications</p> <p>Special Education students must have accommodations as per Individual Educational Plan (IEP)</p>	<ul style="list-style-type: none"> ● Use of approved bilingual glossaries from NYS in each subject <p><u>Instructional</u></p> <ul style="list-style-type: none"> ● 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 interactive notebook ● Present complex tasks in multiple ways ● Provide mnemonic strategies for scientific concepts <p><u>Technology:</u></p> <ul style="list-style-type: none"> ● 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 <p><u>In Class Assessments</u></p> <ul style="list-style-type: none"> ● Provide multiple options for projects ● Use of timer in class ● Break all complex tasks into chunks
<p>Step Up to Writing</p> <p>Step Up to Writing Materials can be found in BPS Science K-12 Schoology Folder □ Grade 8 Resources □ Grade 8 SUTW materials</p>	<ul style="list-style-type: none"> ● Easy Two-Column Notes ● 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. Scroll for grade 8.
<p>Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom</p>	<ul style="list-style-type: none"> ● 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