Shelby County Schools Science Vision

Shelby County Schools' vision of science education is to ensure that from early childhood to the end of the 12th grade, all students have heightened curiosity and an increased wonder of science; possess sufficient knowledge of science and engineering to engage in discussions; are able to learn and apply scientific and technological information in their everyday lives; and have the skills such as critical thinking, problem solving, and communication to enter careers of their choice, while having access to connections to science, engineering, and technology.

To achieve this, Shelby County Schools has employed The Tennessee Academic Standards for Science to craft meaningful curricula that is innovative and provide a myriad of learning opportunities that extend beyond mastery of basic scientific principles.

Introduction

In 2014, the Shelby County Schools Board of Education adopted a set of ambitious, yet attainable goals for school and student performance. The District is committed to these goals, as further described in our strategic plan, Destination 2025. In order to achieve these ambitious goals, we must collectively work to provide our students with high quality standards aligned instruction. The Tennessee Academic Standards for Science provide a common set of expectations for what students will know and be able to do at the end of each grade, can be located in the Tennessee Science Standards Reference. Tennessee Academic Standards for Science are rooted in the knowledge and skills that students need to succeed in post-secondary study or careers. While the academic standards establish desired learning outcomes, the curricula provide instructional planning designed to help students reach these outcomes. The curriculum maps contain components to ensure that instruction focuses students toward college and career readiness. Educators will use this guide and the standards as a roadmap for curriculum and instruction. The sequence of learning is strategically positioned so that necessary foundational skills are spiraled in order to facilitate student mastery of the standards.

Our collective goal is to ensure our students graduate ready for college and career. Being College and Career Ready entails, many aspects of teaching and learning. We want our students to apply their scientific learning in the classroom and beyond. These valuable experiences include students being facilitators of their own learning through problem solving and thinking critically. The Science and Engineering Practices are valuable tools used by students to engage in understanding how scientific knowledge develops. These practices rest on important "processes and proficiencies" with longstanding importance in science education. The science maps contain components to ensure that instruction focuses students toward understanding how science and engineering can contribute to meeting many of the major challenges that confront society today. The maps are centered around five basic components: the Tennessee Academic Standards for Science, Science and Engineering Practices, Disciplinary Core Ideas, Crosscutting Concepts, and Phenomena.

The Tennessee Academic Standards for Science were developed using the National Research Council's 2012 publication, A Framework for K-12 Science Education as their foundation. The framework presents a new model for science instruction that is a stark contrast to what has come to be the norm in science classrooms. Thinking about science had become memorizing concepts and solving mathematical formulae. Practicing science had become prescribed lab situations with predetermined outcomes. The framework proposes a three-dimensional approach to science education that capitalizes on a child's natural curiosity. The Science Framework for K-12 Science Education provides the blueprint for developing the effective science practices. The *Framework* expresses a vision in science education that requires students to operate at the nexus of three dimensions of learning: Science and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas. The *Framework* identified a small number of disciplinary core ideas that all students should learn with increasing depth and sophistication, from Kindergarten through grade twelve. Key to the vision expressed in the *Framework* is for students to learn these disciplinary core ideas in the context of science and engineering practices. The importance of combining Science and Engineering Practices, Crosscutting Concepts and Disciplinary Core Ideas is stated in the *Framework* as follows:

Standards and performance expectations that are aligned to the framework must take into account that students cannot fully understand scientific and engineering ideas without engaging in the practices of inquiry and the discourses by which such ideas are developed and refined. At the same time, they cannot learn or show competence in practices except in the context of specific content. (NRC Framework, 2012, p. 218)

To develop the skills and dispositions to use scientific and engineering practices needed to further their learning and to solve problems, students need to experience instruction in which they use multiple practices in developing a particular core idea and apply each practice in the context of multiple core ideas. We use the term "practices" instead of a term such as "skills" to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice. Students in grades K-12 should engage in all eight practices over each grade band**.** Crosscutting concepts have application across all domains of science. As such, they are a way of linking the different domains of science. Crosscutting concepts have value because they provide students with connections and intellectual tools that are related across the differing areas of disciplinary content and can enrich their application of practices and their understanding of core ideas. There are seven crosscutting concepts that bridge disciplinary boundaries, uniting core ideas throughout the fields of science and engineering. Their purpose is to help students deepen their understanding of the disciplinary core ideas and develop a coherent and scientifically based view of the world.

The map is meant to support effective planning and instruction to rigorous standards. It is *not* meant to replace teacher planning, prescribe pacing or instructional practice. In fact, our goal is not to merely "cover the curriculum," but rather to "uncover" it by developing students' deep understanding of the content and mastery of the standards. Teachers who are knowledgeable about and intentionally align the learning target (standards and objectives), topic, text(s), task, and needs (and assessment) of the learners are best-positioned to make decisions about how to support student learning toward such mastery. Teachers are therefore expected--with the support of their colleagues, coaches, leaders, and other support providers--to exercise their professional judgment aligned to our shared vision of effective instruction, the Teacher Effectiveness Measure (TEM) and related best practices. However, while the framework allows for flexibility and encourages each teacher/teacher team to make it their own, our expectations for student learning are non-negotiable. We must ensure all of our children have access to rigor—high-quality teaching and learning to grade level specific standards, including purposeful support of literacy and language learning across the content areas.

Science and Engineering Practices

1. Asking questions & defining problems
2. Developing & using models
3. Planning & carrying out investigations
4. Analyzing & interpreting data
5. Using mathematics & computational thinking
6. Constructing explanations & designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, & communicating information

Disciplinary Core Ideas

<u>Physical Science</u>
PS 1: Matter & its interactions
PS 2: Motion & stability: Forces & interactions
PS 3: Energy
PS 4: Waves & their applications in technologies for information transfer

<u>Life Sciences</u>
LS 1: From molecules to organisms: structures & processes
LS 2: Ecosystems: Interactions, energy, & dynamics
LS 3: Heredity: Inheritance & variation of traits
LS 4: Biological evaluation: Unity & diversity

<u>Earth & Space Sciences</u>
ESS 1: Earth's place in the universe
ESS 2: Earth's systems
ESS 3: Earth & human activity

<u>Engineering, Technology, & the Application of Science</u>
ETS 1: Engineering design
ETS 2: Links among engineering, technology, science, & society

Crosscutting Concepts

1. Patterns
2. Cause & effect
3. Scale, proportion, & quantity
4. Systems & system models
5. Energy & matter
6. Structure & function
7. Stability & change

Learning Progression

At the end of the elementary science experience, students can observe and measure phenomena using appropriate tools. They are able to organize objects and ideas into broad concepts first by single properties and later by multiple properties. They can create and interpret graphs and models that explain phenomena. Students can keep notebooks to record sequential observations and identify simple patterns. They are able to design and conduct investigations, analyze results, and communicate the results to others. Students will carry their curiosity, interest and enjoyment of the scientific world view, scientific inquiry, and the scientific enterprise into middle school.

At the end of the middle school science experience, students can discover relationships by making observations and by the systematic gathering of data. They can identify relevant evidence and valid arguments. Their focus has shifted from the general to the specific and from the simple to the complex. They use scientific information to make wise decision related to conservation of the natural world. They recognize that there are both negative and positive implications to new technologies.

As an SCS graduate, former students should be literate in science, understand key science ideas, aware that science and technology are interdependent human enterprises with strengths and limitations, familiar with the natural world and recognizes both its diversity and unity, and able to apply scientific knowledge and ways of thinking for individual and social purposes.

Structure of the Standards

- Grade Level/Course Overview: An overview that describes that specific content and themes for each grade level or high school course.
- Disciplinary Core Idea: Scientific and foundational ideas that permeate all grades and connect common themes that bridge scientific disciplines.
- Standard: Statements of what students can do to demonstrate knowledge of the conceptual understanding. Each performance indicator includes a specific science and engineering practice paired with the content knowledge and skills that students should demonstrate to meet the grade level or high school course standards.

Purpose of Science Curriculum Maps

This map is a guide to help teachers and their support providers (e.g., coaches, leaders) on their path to effective, college and career ready (CCR) aligned instruction and our

pursuit of Destination 2025. It is a resource for organizing instruction around the Tennessee Academic Standards for Science, which define what to teach and what students need to learn at each grade level. The map is designed to reinforce the grade/course-specific standards and content (scope) and provides *suggested* sequencing, pacing, time frames, and aligned resources. Our hope is that by curating and organizing a variety of standards-aligned resources, teachers will be able to spend less time wondering what to teach and searching for quality materials (though they may both select from and/or supplement those included here) and have more time to plan, teach, assess, and reflect with colleagues to continuously improve practice and best meet the needs of their students.

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5th Grade Quarter 1 Curriculum Map Quarter 1 Curriculum Map Feedback							
Quarter 1		Quarter 2		Quarter 3		Quarter 4	
Structure and Routine	**Unit 1** **The Solar System and Beyond**	Unit 2 Structure and Functions of Living Things	Unit 3 Traits and Heredity	Unit 4 Learn from the Past	Unit 5 Matter	Unit 6 Physical and Chemical Changes	Unit 7 Forces and Motion
1 week	**8 weeks**	3 weeks	6 weeks	4 weeks	5 weeks	5 weeks	4 weeks

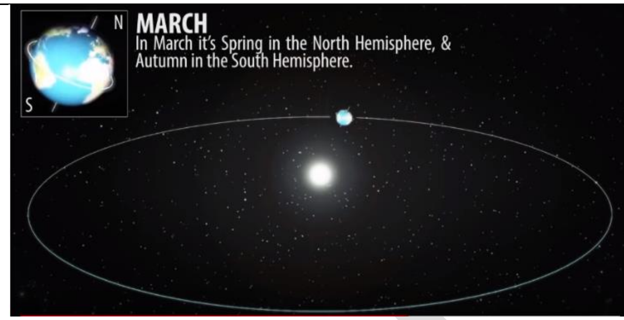
UNIT 1: The Solar System and Beyond (8 weeks)

Overarching Question(s)

What is the universe, and what is Earth's place in it?

Unit 1: Lesson 1	Lesson Length	Essential Question	Vocabulary
Movements of the Sun, Earth, and the Moon	1.5 weeks	How do the Sun, Earth, and the Moon interact?	orbit, gravity, inertia, revolution, rotation

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 5.ESS1 Earth's Place in the Universe **Standard(s)** 5.ESS1.4: Explain the cause and effect relationship between the positions of the sun, earth, and moon and resulting eclipses, position of constellations, and appearance of the moon. 5.ESS1.5: Relate the tilt of the Earth's axis, as it revolves around the sun, to the varying intensities of sunlight at different latitudes.	**Learning Outcomes** Students will be able to show how changes in Earth's position affect conditions at different locations on its surface. **Suggested Phenomenon** *Click on the phenomenon picture to view the video.* *Below* ↓	**Curricular Resources** Engage TE, p. 107-108 TE, p.107, Science in My World, Phenomenon TE, p. 108, Essential Question: TE, p. 108, Science and Engineering Practices Explore TE, pp. 109-110 *(LAB)* Be a Scientist Notebook, p. 109, Inquiry Activity: Shadow Measurements Explain

Evaluate how this causes changes in day-length and seasons. **Explanation and Support of Standard** 5.ESS1.4 In 4.ESS1.2, students create models to explain patterns observable in the time scale of single days. 5.ESS1.4 calls for explanation of patterns occurring at larger scales. Student models should include the components, relationships between the components and connection between the models and the observable phenomenon. For example, a model demonstrating the cause of an eclipse should include the components: Sun, Earth, Moon. The student should be able to express how these components move relative to each other, and finally, how the model itself can be used to explain an eclipse. *(Students in 1.ESS1.1 observe patterns, but are not expected to explain the mechanism causing the patterns.)* 5.ESS1.5 Student models should include appropriate components (e.g., Sun and Earth with tilted	 Phenomenon Explanation: The tilt of the Earth's axis as it revolves around the sun causes varying intensities of sunlight at different latitudes. This results in changes in day-length and seasons.	TE, pp. 111-118 Science File: Space *(LAB)* Be a Scientist Notebook, p. 118, Inquiry Activity: The Role of Gravity Science File: What is Gravity; Earth in Space Simulation: Earth's Movement Elaborate TE, pp. 118-119 *(LAB)* Be a Scientist Notebook, p. 123, Inquiry Activity: Midnight Sun and Polar Night Evaluate TE, pp. 119-121 *(LAB)* Be A Scientist Notebook, p. 125 Performance Task: Three Cities eAssessment Additional Resources Lesson: Investigating Star Brightness & Distance Article: Our Sun is a Special Star Lexile 900L - 1000L Video: Star gazing Basics 5:32 minute **ESL Supports and Scaffolds** WIDA Standard 4: **The Language of Science** To support students in speaking, refer to this resource: WIDA Doing and Talking Science

axis), relationships within the model (e.g. the Earth rotates once daily, and revolves around the Sun once yearly) and connections (e.g. the model can be used to show how the northern hemisphere faces the sun for a longer period at some times than other). The cause of the seasons is rooted in the tilt of the earth's axis combined with the effects of variations in the sun's intensity based on the angle that the sun's rays strike the earth. Due to the tilt of the Earth's axis, the duration of daylight hours and intensity of sunlight changes over the course of the year. Rotating a sphere about a tilted axis in front of a fixed light source can begin to demonstrate the effect of the tilt on daylight hours. If this demonstration is carried out at four different positions (90-degree progressions through a circle relative to the first position), it is possible to track and record the differences in the amount of time that a position on the earth receives sunlight based on the location of the sphere relative to the light source. This same activity can be carried out as an investigation where students record the percentage of daylight time that would be		Provide students with sentence frames to compare the sun brightness to other stars: The sun is brighter because….. Other stars are brighter because…. Provide pictures for students to sort attributes of the sun into categories. Partner students during labs to support with understanding. Provide visual models to help students understand the concept of how distance helps us perceive size.

illuminated at varying positions throughout a "year" on the model. **Suggested Science and Engineering Practice(s)** Constructing Explanations and Designing Solutions **Suggested Crosscutting Concept(s)** Patterns Cause and Effect Scale, Proportion, and Quantity **Teacher Overview** Earth makes one revolution in its orbit around the Sun during a year. Revolution is different from rotation. Day and night is a result of the rotation of Earth on its axis. It takes about 24 hours for Earth to complete one rotation. As Earth rotates, part of its surface faces the Sun and experiences daytime. The part facing away from the Sun experiences nighttime. Because Earth's axis is tilted, the lengths of days and nights vary. The hemisphere that is tilted toward the Sun experiences longer days and warmer temperatures, and the hemisphere tilted away from the Sun experiences longer nights and cooler temperatures.		

Misconceptions Students might think that the seasons are caused by Earth's distance from the Sun. Many students believe that Earth experiences winter when Earth is farthest away from the Sun in its orbit and that summer occurs when Earth is closest to the Sun. In reality, Earth is closer to the Sun in January than in July. However, in January, the Northern Hemisphere is tilted away from the Sun; in July it is tilted toward the Sun. This means that the Northern Hemisphere receives more direct rays in July than in January. Thus, it is Earth's tilt, not its distance from the Sun, that causes the seasons.		

5th Grade Quarter 1 Curriculum Map							
Quarter 1 Curriculum Map Feedback							
Quarter 1		Quarter 2		Quarter 3		Quarter 4	
Structure and Routine	**Unit 1** **The Solar System and Beyond**	Unit 2 Structure and Functions of Living Things	Unit 3 Traits and Heredity	Unit 4 Learn from the Past	Unit 5 Matter	Unit 6 Physical and Chemical Changes	Unit 7 Forces and Motion
1 week	**8 weeks**	3 weeks	6 weeks	4 weeks	5 weeks	5 weeks	4 weeks

UNIT 1: The Solar System and Beyond (8 weeks)
Overarching Question(s)
What is the universe, and what is Earth's place in it?

Unit 1: Lesson 2	**Lesson Length**	**Essential Question**	**Vocabulary**
Patterns of the Moon	1.5 weeks	What causes the repeating patterns of the Moon's appearance?	Satellite, phase, tide, solar eclipse, lunar eclipse

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**
DCI(s) ESS1 Earth's Place in the Universe **Standard(s)** 5.ESS1.3: Use data to categorize different bodies in our solar system including moons, asteroids, comets, and meteoroids according to their physical properties and motion. 5.ESS1.4: Explain the cause and effect relationship between the positions of the sun, earth, and moon and resulting eclipses, position of constellations, and appearance of the moon.	**Learning Outcomes** Students will be able to explain the repeating patterns of the appearance of the Moon by analyzing its movements. **Suggested Phenomenon** *Click on the phenomenon picture to view the video.* 	**Curricular Resources** Engage TE, pp. 123-124 TE, p.123, Phenomenon TE, p. 124 Essential Questions TE, p.124, Science and Engineering Practices Explore TE, pp. 125-126 *(LAB)* Be a Scientist Notebook, p. 131 Inquiry Activity: Moon Phases Explain TE, pp. 127-134

Explanation and Support of Standard 5.ESS1.3 The circular motion of objects within the solar system is maintained by the force of gravity. Students should recognize that a central force is needed to create circular patterns in motion (5.PS1.5). The circular motion of the planets is maintained by the Sun's gravitational pull on the planets, while the circular motion of moons is exerted by the planet they orbit. Students might relate to the difference in force needed to twirl a baseball vs a tennis ball on the end of a string in order to help make sense of the amount of central force (gravity) needed. Data on the orbital motion of the rotating bodies can confirm that the influence of mass and distance on the force and gravity (5.PS1.4). 5.ESS1.4 In 4.ESS1.2, students create models to explain patterns observable in the time scale of single days. 5.ESS1.4 calls for explanation of patterns occurring at larger scales. Student models should include the components, relationships between the components and connection between the models and the observable phenomenon. For example, a model demonstrating the cause of an eclipse should include the components: Sun, Earth, Moon. The student should be able to express how these	Phenomenon Explanation: The moon is the brightest object in the night sky. It appears to change shape depending on the position of the Earth and the Sun. The moon orbits the Earth every 29.5 days. As it orbits the Earth, it appears to be getting bigger (waxing) or smaller (waning). There are five phases of the moon: new, crescent, quarter, gibbous and full.	Be a Scientist notebook, p. 133: Vocabulary Science Handbook/eBook: Earth's Moon Science Handbook/eBook: Tides and Eclipses *(LAB)* Be a Scientist Notebook, p. 136, Inquiry Activity: Tide Research Digital Interactive: Energy Flow in a Food Chain Elaborate TE, pp. 134-135 *(LAB)* Be a Scientist Notebook, p. 138: Other Moons Evaluate TE, pp. 135-137 *(LAB)* Be a Scientist Notebook, p. 139, Performance Task: Phases of the Moon eAssessment **Additional Resources** Lesson: Moon Phases Demonstration: Moon Phases

components move relative to each other, and finally, how the model itself can be used to explain an eclipse.

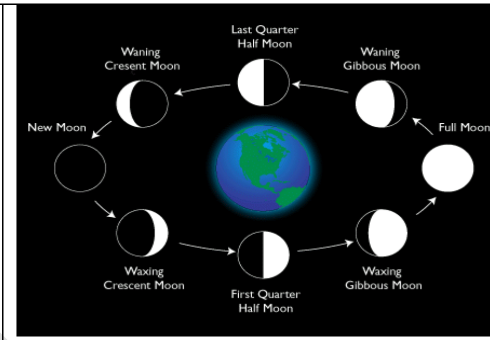
(Students in 1.ESS1.1 observe patterns, but are not expected to explain the mechanism causing the patterns.)

Suggested Science and Engineering Practice(s)
Analyzing and Interpreting Data

Suggested Crosscutting Concept(s)
Patterns
Cause and Effect
Scale, Proportion, and Quantity

Teacher Overview
The Moon is held in its orbit around Earth by mutual gravitational attraction. More specifically, Earth and the Moon revolve around the common center of gravity of the Earth-Moon system, which is located inside Earth. Because of Earth's rotation, the Moon appears to rise in the east and set in the west. The gravitational pull of the Moon on Earth is best expressed by the semi-diurnal tides. Earth's rotation and the Moon's revolution around Earth have the same direction. As Earth rotates, the Moon passes over every line of longitude once every 24 hours and 50 minutes. Therefore, the average time between indirect and direct high tides at any one location is about 12 hours and 25 minutes.

Misconceptions



Moon Phase Observatory Chart

Teaching Moon Phases

ESL Supports and Scaffolds
WIDA Standard 4**:**

The Language of Science

To support students in speaking, refer to this resource:

WIDA Doing and Talking Science

Students might have heard the phrase "dark side of the Moon" and think that one specific part of the Moon is always in sunlight and the other part is always in darkness. In reality, as the Moon rotates on its axis, all points on its surface spend some time in the Sun and some time in darkness. The "dark side" is actually the "far side," the part of the Moon's surface that is never visible from Earth. Another possible misconception is that the Moon produces its own light. Students might think that all objects visible in the sky are like the Sun, producing light that is visible to the observer. In fact, the Sun is the only object in our solar system that produces light. All other objects, such as the Moon, planets, asteroids, and comets are visible only because they reflect sunlight.		Provide students with sentence frames to compare planets in the Milky Way. Mars is_________but Saturn is____________ Mars and the Earth are both____________ Create 3 column charts to helps students sort the various kinds of galaxies. Pre-teach vocabulary: (**Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs**) spur and bridge Provide sentence frames and word boxes to help students describe the phases of the moon.

5th Grade Quarter 1 Curriculum Map

Quarter 1 Curriculum Map Feedback

Quarter 1		Quarter 2		Quarter 3		Quarter 4	
Structure and Routine	**Unit 1 The Solar System and Beyond**	Unit 2 Structure and Functions of Living Things	Unit 3 Traits and Heredity	Unit 4 Learn from the Past	Unit 5 Matter	Unit 6 Physical and Chemical Changes	Unit 7 Forces and Motion
1 week	**8 weeks**	3 weeks	6 weeks	4 weeks	5 weeks	5 weeks	4 weeks

UNIT 1: The Solar System and Beyond (8 weeks)

Overarching Question(s)

What is the universe, and what is Earth's place in it?

Unit 1: Lesson 3	Lesson Length	Essential Question	Vocabulary
Objects in Space	2 weeks	What other objects can be found in space?	asteroid, meteor, comet

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) ESS1 Earth's Place in the Universe **Standard(s)** 5.ESS1.2: Research and explain the position of the Earth and the solar system within the Milky Way galaxy, and compare the size and shape of the Milky Way to other galaxies in the universe. 5.ESS1.3: Use data to categorize different bodies in our solar system including moons, asteroids, comets, and meteoroids according to their physical properties and motion. **Explanation and Support of Standard**	**Learning Outcomes** Students will be able to support an argument to explain how the force of gravity affects the location of objects in space. **Suggested Phenomenon** *Perseid Meteor Shower* *Click on the phenomenon picture to view the video.*  Phenomenon Explanation:	**Curricular Resources** Engage TE, pp. 139-140 Be a Scientist Notebook, p. 143, Phenomenon, TE, p. 144, Essential Questions, TE, p. 144, Science and Engineering Practices Explore TE, pp. 141-142 *(LAB)* Be a Scientist Notebook, p. 145 Inquiry Activity: Modeling Moon Craters Explain

5.ESS1.2 Gravity is responsible for the shape and behavior of our galaxy. This is an extension of 5.PS2.3, wherein all objects in the galaxy moving towards a central point, similar to the way all objects fall towards the center of the Earth. Gravity is the centrally directed force responsible for the circular pattern in the motion of the bodies comprising the Milky Way galaxy (5.PS1.5). Views looking down onto the Milky Way galaxy show several arms radiating outward from the center of the galaxy as well as spurs and bridges connecting these central arms. Each of these features is notable for their dense populations of stars. The Milky Way galaxy is located on the Orion Arm (sometimes called spur). Many of the perceived stars visible to the naked eye are actually entire galaxies of stars. The Milky Way galaxy is just one type of galaxy in space. The arrangement of stars in other galaxies can result in different shapes for these galaxies. These shapes include: spiral, elliptical, lenticular, and irregular. 5.ESS1.3 The circular motion of objects within the solar system is maintained by the force of gravity. Students should recognize that a central force is needed to create circular patterns in motion (5.PS1.5). The circular motion of the planets is	In 2018, a new moon and minimum natural light pollution allowed Perseid meteor shower to be visible from Earth.	TE, pp. 143-148 Be a Scientist Notebook, p. 147: Vocabulary Science Handbook/eBook: The Planets Science Handbook/eBook: Super Space Objects Elaborate TE, pp. 149 *(LAB)* Be a Scientist Notebook, p. 152, Research, Investigate, and Communicate: Comets, Asteroids, and Meteors Evaluate TE, pp. 150-151 *(LAB)* Be a Scientist Notebook, p. 153, Performance Task: Model the Solar System eAssessment **Additional Resources** Lessons: Lesson (A) Planets of Our Solar System Lesson (B) Galaxies and More The Solar System Information How do scientist measure the stars Lexile 1300L - 1400L Determine the planets distance work sheet with answer key Solar System Cards

maintained by the Sun's gravitational pull on the planets, while the circular motion of moons is exerted by the planet they orbit. Students might relate to the difference in force needed to twirl a baseball vs a tennis ball on the end of a string in order to help make sense of the amount of central force (gravity) needed. Data on the orbital motion of the rotating bodies can confirm that the influence of mass and distance on the force and gravity (5.PS1.4). **Suggested Science and Engineering Practice(s)** Obtaining, Evaluating, and Communicating Information Analyzing and Interpreting Data **Suggested Crosscutting Concept(s)** Cause and Effect **Teacher Overview** Gravity is a force that pulls two objects toward each other. All objects with mass have gravity, and all objects with mass are affected by gravity. An object with a larger mass will have a stronger pull than an object with a smaller mass. Gravity is also the force that keeps planets in orbit around the Sun. The Sun's gravity is so strong that it keeps all objects in the solar system in orbit around the Sun. The amount of gravitational force that an object exerts is		The Milky Way Article Lexile 900L - 1000L Meet the Milky Way Article Lexile 1100L - 1200L Sort the Solar System worksheet Different Types of Galaxies Article Lexile 1400L - 1500L Information on Famous Star Gazers Labs: 1 hour lab Relative size printable sheets Lab: 1 hour lab Incredible eatable planets **ESL Supports and Scaffolds** WIDA Standard 4**:** The Language of Science Provide column charts and word boxes to help students categorize the different bodies in a solar system. Pre-teach physical properties. Provide visuals with physical properties flashcards During labs, provide ESL students with a partner. Provide fewer instructions at a time to help them access the directions.

directly proportional to its mass and indirectly proportional to the distance the object is from another object. **Misconceptions** One common misconception is that the Sun is the same size as the Moon. Although they appear to be about the same size in the sky, the Sun is much larger than the Moon and Earth. The Sun appears to be the same size as the Moon only because it is much farther away from Earth than the Moon is. A common misconception about objects in space is that they move independently of the Sun. Students might be unaware that the Sun is the center of the solar system because of its gravitational pull and its influence on the other objects around it. Help students change their original ideas about gravity by discussing how every object in space exerts a gravitational pull on every other object. This means that gravity influences the paths objects take when they are traveling through space. Have students think of gravity as the glue that holds galaxies together. Think about the water, carbon, and nitrogen cycles. Gravity can make planets habitable by trapping gases and liquids in an atmosphere to allow these cycles to work and be resources for living things.		To support students with the scientific explanation: **Model speaking and writing expectations for Entering Level ELs. Consider using the recommended stems to support students in their discussions and writing.** **In creating arguments, consider using these stems:** **Evidence:** The (data/graph/results) support the claim because…. The picture shows that….. **Reason:** This was caused by…. The fact that _____ was caused by _____ means ________. Therefore, _______ explains why I support/reject the claim______. <u>Question Starters</u>

		What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows…? But does your claim account for…(evidence) Response Starters I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

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1 week	**8 weeks**	3 weeks	6 weeks	4 weeks	5 weeks	5 weeks	4 weeks

UNIT 1: The Solar System and Beyond (8 weeks)			
Overarching Question(s)			
What is the universe, and what is Earth's place in it?			
Unit 1: Lesson 4	**Lesson Length**	**Essential Question**	**Vocabulary**
Stars and Star Pattern	3 weeks	What are stars, and why are some stars brighter than others?	Star, light-year, constellation, nebula, white dwarf, supernova, black hole

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**
DCI(s) ESS1 Earth's Place in the Universe **Standard(s)** 5.ESS1.1: Explain that differences in apparent brightness of the sun compared to other stars are due to their relative distances from the Earth. 5.ESS1.4: Explain the cause and effect relationship between the positions of the sun, earth, and moon and resulting eclipses, position of constellations, and appearance of the moon.	**Learning Outcomes** Students will be able to gathered information to explain how organisms survive changes in their ecosystems by using structural and behavioral adaptations. **Suggested Phenomenon** *Click on the phenomenon picture to view the video.* *Below* ↓	**Curricular Resources** Engage TE, pp. 153-154 Be A Scientist Notebook, p. 157 (Phenomenon) Be A Scientist Notebook, Essential Questions, p. 158 Be A Scientist Notebook, Science and Engineering Practices, p. 158 Explore TE, pp. 155-156 *(LAB)* Be a Scientist Notebook, p. 159 Inquiry Activity: Star Brightness

5.ESS1.6: Use tools and describe how stars and constellations appear to move from the Earth's perspective throughout the seasons. **Explanation and Support of Standard** 5.ESS1.1 Our Sun is an example of a star, just like the stars that we see in the night sky which are all capable of producing light. The Sun is close enough to illuminate our planet, creating a period we refer to as day. Other stars would have similar effects were it not for the immense distance between Earth and these other stars. The difference in distance makes the sun appear much larger than these other stars. Students should note that the same object will appear dimmer and smaller as it moves away. Stars are much larger than the Earth, but appear smaller due to their distance from Earth. To appreciate the actual size of the sun relative to these other stars, students can be introduced to the types and classifications the sun and other stars and basic stellar life cycles. A general discussion of star types could include: main sequence, giants, super giants, and white dwarfs. Students can model the effects of distance on the apparent size of objects by taking playground balls out onto the playground/gym/cafeteria/hallway and noting the difference in apparent sizes. *(Understanding the different star types sets a foundation for explaining the formation of elements in later grades.*	 Phenomenon Explanation: A black hole is an object whose gravity is so strong that light cannot escape it.	Explain TE, pp. 156-163 Be a Scientist notebook, p. 161: Vocabulary Science Handbook/eBook: Constellations Digital Interactive: Constellations Science Handbook/eBook: Our Star, the Sun Elaborate TE, pp. 163-164 *(LAB)* Be a Scientist Notebook, p. 165, Research, Investigate, and Communicate: Star Cycles Evaluate TE, pp. 164-165 *(LAB)* Be a Scientist Notebook, p. 166, Inquiry Activity: Model a Constellation eAssessment **Additional Resources** Video: What's inside a black hole? Lesson: Constellation Patterns Earth's Tilt (seasons) Seasons Module with workbook Article: Astronomical Lexile 1300L - 1400L Why is the Earth Tilted? Article 1000L - 1100L Activity: 3D Constellation activity

Knowledge of mass and temperature and their effects on stellar life cycle are beyond the scope of this standard, as is a Hertzsprung-Russel Diagram.) 5.ESS1.4 In 4.ESS1.2, students create models to explain patterns observable in the time scale of single days. 5.ESS1.4 calls for explanation of patterns occurring at larger scales. Student models should include the components, relationships between the components and connection between the models and the observable phenomenon. For example, a model demonstrating the cause of an eclipse should include the components: Sun, Earth, Moon. The student should be able to express how these components move relative to each other, and finally, how the model itself can be used to explain an eclipse. *(Students in 1.ESS1.1 observe patterns, but are not expected to explain the mechanism causing the patterns.)* 5.ESS1.6 Constellations are arrangements of stars in the sky. Planets are also visible in the evening sky and can be differentiated from stars based on their appearance to the naked eye. Positions of constellations and planets vary throughout the year as the relative position of the sun, earth, and distant stars change in the night sky. Tools such as star charts can be used to track and predict the location of constellations at various times during the year.		Demonstration of the Earth on its Axis **ESL Supports and Scaffolds** WIDA Standard 4**:** **The Language of Science** To support students in speaking, refer to this resource: WIDA Doing and Talking Science To support students with the scientific explanation: **Model speaking and writing expectations for Entering Level ELs. Consider using the recommended stems to support students in their discussions and writing.** Use graphic organizers or concept maps to support students in their comparison of stars. Provide compare/contrast sentence stems: This is the same as, because. This is different than, because. All these are because…, and all have/are.

Throughout history, the location of some constellations and stars have been used in navigation. Student models should include appropriate components (e.g., Sun, Earth, distant stars), relationships within the model (e.g. the Earth rotates once daily, and revolves around the Sun once yearly) and connections (e.g. the model can be used to show that during certain seasons our night sky changes and constellations may become hidden by daylight). **Suggested Science and Engineering Practice(s)** Constructing Explanations and Designing Solutions Developing and Using Models **Suggested Crosscutting Concept(s)** Scale, Proportion, and Quantity **Teacher Overview** A star is a massive ball of plasma (very hot, charged particles) held together by its own gravity. It radiates energy from internal nuclear reactions. The stars we see in the night sky are at various stages in their life cycles. Stars begin with the collapse of a gaseous nebula, which is comprised primarily of hydrogen. A constellation is a group of stars in a recognizable shape or pattern that are visible in a particular region of the night sky. Some are named after animals or mythological figures, such as Leo (the lion) or Orion (the hunter), respectively. The end of a star's life depends on its initial mass. Stars with a lot of		When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals

mass might end their lives as black holes or neutron stars. A star with less mass will end their lives as a white dwarf. **Misconceptions** Students might think that all the stars in a constellation are located in the same area. Help students understand that all stars in a constellation are not near one another. Help students avoid the misconception that all stars are the same distance from Earth by examining maps and star charts that show the variation in stars' distances from Earth. Students might also have misconceptions about black holes from movies or other media. They might think of black holes as giant vacuum cleaners that suck up everything around them. Show students a video from a reliable educational source to help demonstrate that the black hole's enormous gravity traps some materials in a one-way spiral to oblivion.		