Unit: Space

Content Area: **Science**
Course(s): **Integrated Science 8**
Time Period: **1 marking period**
Length: **9 Weeks**
Status: **Published**

Unit Overview

Students will discover how patterns that you see in the sky such as ellipses, are related to the position of Earth, the sun, and the moon as they are oriented in space.

Students will describe the role of gravity in the solar system.

Students will compare the characteristics of different solar system objects using data collected from telescopes on Earth and in space.

Students will organize, analyze, and present the data in the form of a strong argument on how to classify the planets of the solar system.

Students will model gravity's role beyond the solar system, in the Milky Way Galaxy and other galaxies around us.

Transfer

Students will be able to independently use their learning to...

- Understanding that Earth-Sun-Moon allow for all the patterns you see in the sky.
- Collecting, analyzing, and interpreting data allows us to better understand the phenomena of how objects in the solar system are similar and different for future exploration.
- Patterns in our solar system and galaxy can be connected to phenomena that can be observed on Earth.

Meaning

Understandings

Students will understand...

Chapter 1

How patterns that are seen in the sky, such as eclipses, are related to the position of the Earth, the sun and the moon as they are oriented in space

How to model the patterns that are seen in a classroom planetarium

How to produce a video that will will teach adults about the patterns seen in the sky

Chapter 2

The characteristics of different solar system objects, by using data collected from telescopes on Earth and in space and spacecraft that fly into space

How to develop a strong argument on how to classify the planets of the solar system by organizing, analyzing and presenting data

Chapter 3

How scientists explore the universe through time and space

The role of gravity throughout the universe

Gravity's role in the formation of the solar system, the Milky Way Galaxy and other galaxies

Essential Questions

Students will keep considering...

- Why do the stars and sun appear and move across the sky?
- Why are there different seasons?
- Why does the moon seem to change shape?
- How are lunar and solar eclipses different?
- How are solar systems held together?
- What are the characteristics of the terrestrial planets?
- What are the characteristics of gas planets?
- How did the solar system form?
- What are the scales of objects in the universe?

Application of Knowledge and Skill

Students will know...

Chapter 1

How patterns that are seen in the sky, such as eclipses, are related to the position of the Earth, the sun and the moon as they are oriented in space

How to model the patterns that are seen in a classroom planetarium

How to produce a video that will will teach adults about the patterns seen in the sky

Chapter 2

The characteristics of different solar system objects, by using data collected from telescopes on Earth and in space and spacecraft that fly into space

How to develop a strong argument on how to classify the planets of the solar system by organizing, analyzing and presenting data

Chapter 3

How scientists explore the universe through time and space

The role of gravity throughout the universe

Gravity's role in the formation of the solar system, the Milky Way Galaxy and other galaxies

Students will be skilled at...

- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) and other media that will be useful in answering a scientific question.
- Develop models that will describe various scientific phenomena
- Make observations from several sources to construct an evidence-based account for natural phenomena.
- Compare and critique multiple solutions to a problem.
- Analyze data to determine if tests and/or tools are working as intended.
- Observe and construct explanations of various scientific phenomena relating to space.

Academic Vocabulary

Learning Goal 1 (Chapter 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.

SCI.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.
SCI.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.

Target 1 (Lesson 1)

Model the patterns that are caused by Earth's rotation and revolution.

Target 2 (Lesson 2)

Model how the Earth's tilted axis leads to seasonal patterns.

Target 3 (Lesson 3)

Use a model to show how the moon goes through phases.

Target 4 (Lesson 4)

Use a model to show how the orientation of Earth, the sun, and the moon causes eclipses.

Learning Goal 2 (Chapter 2)

Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

SCI.MS-ESS1-2	Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
SCI.MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
SCI.MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Target 1 (Lesson 1)

Develop scale models of the Earth-sun-moon system and the solar system.

Target 2 (Lesson 3)

Work in groups to design a vehicle that can land on Mars.

Target 3 (Lesson 2,4)

Organize and analyze data about the planets and present arguments about planet classification.

Learning Goal 3 (Chapter 2, 3)

Analyze and interpret data to determine scale properties of objects in the solar system.

SCI.MS-ESS1-3	Analyze and interpret data to determine scale properties of objects in the solar system.
SCI.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.
SCI.MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
SCI.MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Target 1 (Ch 2, Lesson 1)

Design scale models of the Earth-sun-moon system and the solar system.

Target 2 (Ch. 3, Lesson 1)

Model gravity's role in the formation of the solar system and evaluate the solar system formation for pattern consistency.

Target 3 (Ch. 3, Lesson 2)

Produce scale maps of the distances between celestial objects and design models of stars in the Milky Way galaxy.

Formative Assessment and Performance Opportunities

Chapter 1: Presenting a model of the Sun-Earth-Moon system

Chapter 2: Classifying planets

Chapter 3: Writing a gravity adventure scene

Lesson Game

Students test their understanding of key concepts with an educational game.

Interactive Tutorial

Students can work independently to check their understanding in a safe environment that provides instant feedback but is not graded.

Interactive Student Notebook

Students record their understanding of both the reading and activity. Review during the lesson to gauge student understanding.

Vocabulary Cards

Students check their understanding of key vocabulary terms with digital flip cards.

Class Participation/Discussion Questions

Throughout the lesson students will have opportunities embedded in the lesson to check for student understanding.

Summative Assessment

NJSLS-Science Designed Lesson Assessments:

- Earth's rotation and revolution
- Earth's tilted axis
- Phases of the moon

- Eclipses
- Gravity and the solar system
- The Inner solar system
- The Outer solar system
- Formation of the solar system
- Beyond the solar system

LinkIt Common Assessment

Accommodations/Modifications

Quicker Coverage

Complete investigation as a class

Eliminate Some Planets Use only some of the pages of Handout D and have students visit a select few planets.

Deeper Coverage

Opposing Evidence to Patterns. Ask students to find an example of a planet or exoplanet that appears to go against the patterns outlined in the nebular hypothesis—for example, Venus spinning the wrong way, Pluto orbiting 17º from the ecliptic, and "Hot Jupiters."

Contrast the Northern and Southern hemispheres.

English Language Learners

Reinforce Vocabulary.

Research in native language

Support learning with visuals

Learners Reading and Writing Below Grade Level

Read Handouts Aloud. Have different students read each segment aloud. The reading can be divided either within groups or among the class.

Outline the Explanation. Tell students they can prepare their explanation in outline form rather than writing a full paragraph of complete sentences. Make sure they include a Claim, Evidence, and Reasoning in their explanation.

Provide copy of readings

Shorten answer lengths

Learners with Special Education Needs

Make Calculations as a Class.

Show Videos to Help Comprehension.

Assist with analyzing sources.

Support note taking.

Advanced Learners

Nuclear Fusion Have students research how a proto-star eventually becomes an actual star—the key point being that it eventually reaches temperatures high enough to ignite nuclear fusion—and describe the process.

Hot Jupiters and Hot Neptunes. Have students research these planets and discuss what this means for what they studied during this lesson. Do these exoplanets disprove the theory, or can they still fit within that model?

Research another moon.

Enhanced Learning

Utilize TCI videos and websites to enhance lessons.

Discuss current events related to the lesson.

Unit Resources

TCI Online Manual/ Materials

Vocabulary Cards

TCI Kit

Student Textbook

21st Century Life and Careers

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they

	follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP9.1	Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.
CRP.K-12.CRP10.1	Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

Interdisciplinary Connections

LA.W.8.1.A	Introduce claim(s), acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
LA.W.8.1.B	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.
LA.W.8.1.C	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
LA.W.8.1.E	Provide a concluding statement or section that follows from and supports the argument presented.
LA.W.8.2.A	Introduce a topic and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia).
LA.W.8.2.B	Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
LA.W.8.2.C	Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
LA.W.8.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
LA.W.8.2.F	Provide a concluding statement or section that follows from and supports the information or explanation presented.
LA.RI.8.1	Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RI.8.2	Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.
LA.RI.8.3	Analyze how a text makes connections among and distinctions between individuals, ideas,

	or events (e.g., through comparisons, analogies, or categories).
LA.RI.8.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.
LA.RL.8.1	Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
MA.6.EE.A.3	Apply the properties of operations to generate equivalent expressions.
MA.6.EE.A.4	Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).
MA.6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
MA.6.EE.C.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.
MA.6.RP.A.3b	Solve unit rate problems including those involving unit pricing and constant speed.
MA.6.RP.A.3d	Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
MA.6.SP.B.5b	Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
MA.8.F.A.2	Compare properties (e.g. rate of change, intercepts, domain and range) of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
MA.8.EE.A.3	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.
MA.8.EE.A.4	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.