5 Science Unit 3: Stars & The Solar System (Spaceship Earth)

Content Area: **Science**
Course(s):
Time Period: **Marking Period 3**
Length: **5 Weeks**
Status: **Published**

Unit Overview

In this unit, students explore the Earth, Sun, Moon, and stars using observations of shadows and changing patterns in the sky. Students also explore the planets of our Solar System and begin to consider what might lie beyond.

Standards

Scientific & Engineering Practices

- Students explore the phenomena of the Sun appearing to move across the sky. They use their own bodies as a model for the Earth to explain why the Sun rises and sets. Then students use mathematics and computational thinking to figure out the length of a day on hypothetical planets that spin faster and slower than the Earth.
- Students create a shadow clock, to observe how shadows change throughout the day. Students carry out an investigation to determine how the position of the sun changes the direction of the shadow at different times of day. Then, they go outside and interpret data from their shadow clock to determine what time of day it is.
- Students analyze and interpret data from photographs taken during different seasons and times of day, to determine how the sun's path affects Earth's surface. Students use evidence from the photos-- such as weather, shadow length, and sunrise/sunset time-- to construct an argument as to which season it is.
- Students develop a model of the universe, in order to construct an explanation for why we see different stars during different seasons. Using evidence from their model, students make an argument that supports the claim that the Earth orbits around the sun.
- Students develop a model of the sun and moon to carry out an investigation of the Moon's orbit and the different moon phases. Through this investigation, they obtain information about how the Moon goes through each phase. Then, they communicate this information by constructing an explanation about what causes the Moon's phases for someone who doesn't already know.
- Students use a model of the solar system to learn the order of the planets and their relative distance from the sun, and each other. Using sidewalk chalk, they draw the sun and the planets at their relative distances from one another. Then, they play "Running to Neptune," where they run to different planets in the model in order to help them learn their order in the solar system.
- Students use mathematics and computational thinking to calculate how high they could jump on planets and moons in our Solar System. They analyze and interpret this data to construct an explanation for why the amount of gravity is different on other planets.
- Students obtain, evaluate, and communicate information about temperature and light conditions that a planet must have for humans to survive. Students then use this evidence to

engage in an argument and justify their choice for an exoplanet space mission. Students consider what our Sun looks like when viewed from the surface of the far-away exoplanet.

Crosscutting Concepts

- Students recognize that the Sun moving across the sky is a pattern that can be explained by the Earth spinning. Students investigate this pattern to realize that the Earth spinning causes the effect of the Sun appearing to move across the sky.
- Students observe patterns in the change of shadow length and position throughout the day. They use shadow patterns to determine what time of day it is, without the use of a clock.
- Students observe the pattern of seasons caused by the sun's path. The unique characteristics of each season are caused by the sun's position in the sky. Each season repeats each year.
- Students observe the seasonal pattern of stars. They note the change of constellations that are visible in the night sky, based on the season. This pattern is used as evidence to argue that Earth is orbiting the Sun, and we only see a part of the night sky at a time.
- Students consider the phases of the Moon as a pattern. They learn that the orbit of the Moon around Earth causes each different phase. The phases repeat in the same order every 14 days, and then reverse in the same order for another 14 days. The total orbit of the Moon around the Earth takes 28 days, and then the pattern repeats.
- Students use a system model of the solar system to understand the parts (the planets and sun) that make up the whole (the solar system). By creating a scaled model, they are able to observe an immensely large system of natural objects. They learn that by creating scaled models, people can interact with systems they wouldn't otherwise be able to.
- Students observe the pattern that the more massive a planet is, the more gravity it has. Students figure out that the amount of gravity a planet has (cause) will impact the height that they are able to jump (effect).
- Students consider how the conditions of the Sun and planets in our Solar System can be extended to learn about other similar, but separate systems (other solar systems). Through this, students start to build an understanding of the scale of our Solar System and beyond.

SCI.3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
SCI.3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
SCI.5-PS2-1	Support an argument that the gravitational force exerted by Earth on objects is directed down.
SCI.5-ESS1-1	Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.
SCI.5-ESS1-2	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Materials

Core Materials:

- Mystery Science
  - How fast does the Earth Spin?

    - Who set the first clock?
    - How can the Sun tell you the season?
    - Why do the stars change with the seasons?
    - How does the Moon change shape?
    - What are the wandering stars?
    - Why is gravity different on other planets?
    - Could there be life on other planets?
- Teacher Created Labs

Supplemental Materials:

- BrainPop resources
- NewsELA
- GRC Lessons
- TBSAID
- Nearpod Activities

Technology

Technology Literacy

• 9.4.5.TL.1: Compare the common uses of at least two different digital tools and identify the advantages and disadvantages of using each.

• 9.4.5.TL.2: Sort and filter data in a spreadsheet to analyze findings.

• 9.4.5.TL.3: Format a document using a word processing application to enhance text, change page formatting, and include appropriate images graphics, or symbols.

Technology - Engineering Design

• 8.2.5.ED.1: Explain the functions of a system and its subsystems.

• 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.

• 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.

Technology - Data & Analysis

• 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.

• 8.1.5.DA.2: Compare the amount of storage space required for different types of data.

• 8.1.5.DA.3: Organize and present collected data visually to communicate insights gained from different views of the data.

• 8.1.5.DA.4: Organize and present climate change data visually to highlight relationships or support a claim.

• 8.1.5.DA.5: Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

Technology - Effects on the Natural World

• 8.2.5.ETW.2: Describe ways that various technologies are used to reduce improper use of resources.

• 8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.

• 8.2.5.ETW.4: Explain the impact that resources, such as energy and materials used to develop technology, have on the environment.

• 8.2.5.ETW.5: Identify the impact of a specific technology on the environment and determine what can be done to increase positive effects and to reduce any negative effects, such as climate change.

Evidence of Learning/Assessment

Formative Assessment

- Teacher Observation
- Quizzes
- Exit Tickets
- Labs

Summative Assessment

- Benchmark Tests
- Alternative Assessments: Performance Tasks & Projects

Accommodations & Modifications

Special Education

Follow IEP Plan which may contain some of the following examples…

- In class/pull out support with special ed teacher
- Additional time during intervention time
- Preferred seating
- Questions read aloud
- Extended time for completing tasks
- Graphic organizers
- Vocabulary support
- Mnemonic devices
- Songs/videos to reinforce concepts
- Study Guides
- Limit number of questions
- Scribe

- Newsela leveled reading passages

504

Follow 504 Plan which may contain some of the following examples…

- In class/pull out support with special ed teacher
- Additional time during intervention time
- Preferred seating
- Questions read aloud
- Extended time for completing tasks
- Graphic organizers
- Vocabulary support
- Mnemonic devices
- Songs/videos to reinforce concepts
- Study Guides
- Limit number of questions
- Scribe
- Newsela leveled reading passages

ELL

- Translation device/dictionary
- In class/pull out support with ESL teacher
- In class/pull out support with special ed teacher
- Additional time during intervention time
- Preferred seating
- Questions read aloud
- Extended time for completing tasks
- Graphic organizers
- Vocabulary support
- Mnemonic devices
- Songs/videos to reinforce concepts
- Study Guides
- Limit number of questions
- Scribe
- Newsela leveled reading passages

At-risk of Failure

- Extra time during intervention
- In class/pull out support with special ed teacher
- Additional time during intervention time
- Preferred seating
- Questions read aloud
- Extended time for completing tasks
- Graphic organizers
- Vocabulary support
- Mnemonic devices
- Songs/videos to reinforce concepts
- Study Guides

- Limit number of questions
- Scribe
- Newsela leveled reading passage

Gifted & Talented

- Independent projects
- STEM Projects
- Leveled Reading with Newsela

Interdisciplinary Connections

Connections to NJSLS - English Language Arts

• RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS3-1), (3-LS3-2)

• RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS3- 1), (3-LS3-2)

• W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS3-1), (3-LS3-2) • SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (3-LS3-1), (3-LS3-2)

• RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). (3-LS1-1)

• SL.3.5 Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details. (3-LS1-1)

Connections to NJSLS - Mathematics

• MP.2 Reason abstractly and quantitatively. (3-LS3-1), (3-LS3-2)

• MP.4 Model with mathematics. (3-LS3-1), (3-LS3-2)

• 3.MD.B.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters. (3-LS3-1), (3-LS3-2)

• 3.NBT Number and Operations in Base Ten (3-LS1-1)

• 3.NF Number and Operations—Fractions (3-LS1-1)

Career Readiness, Life Literacies, and Key Skills

Critical Thinking and Problem Solving:

• 9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).

• 9.4.5.CT.2: Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem (e.g., 2.1.5.CHSS.1, 4-ESS3-1).

• 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems. • 9.4.5.CT.4: Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global

Career Ready Practices

- CRP6. Demonstrate creativity and innovation.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.