

Unit 01: Spaceship Earth

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **FY**
Status: **Published**

Standards Alignment

New Jersey Student Learning Standards

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships.

Ask questions about what would happen if a variable is changed.

Identify scientific (testable) and non-scientific (non-testable) questions.

Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.

Use prior knowledge to describe problems that can be solved.

Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard).

Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.

Identify the evidence that supports particular points in an explanation.

Apply scientific ideas to solve design problems.

Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.

Connections to the Nature of Science: Most Closely Associated with Practices Scientific Investigations Use a Variety of Methods

Science methods are determined by questions.

Science investigations use a variety of methods, tools, and techniques.

Scientific Knowledge is Based on Empirical Evidence

Science findings are based on recognizing patterns.

Science uses tools and technologies to make accurate measurements and observations.

Scientific Knowledge is Open to Revision in Light of New Evidence

Science explanations can change based on new evidence.

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Science theories are based on a body of evidence and many tests.

Science explanations describe the mechanisms for natural events.

Crosscutting Statements

1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products.

Patterns of change can be used to make predictions.

Patterns can be used as evidence to support an explanation.

2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

Cause and effect relationships are routinely identified, tested, and used to explain change.

Events that occur together with regularity might or might not be a cause and effect relationship.

3. Scale, Proportion, and Quantity – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods.

7. Stability and Change – For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

Some systems appear stable, but over long periods of time will eventually change.

Connections to Engineering, Technology and Applications of Science Interdependence of Science, Engineering, and Technology

Science and technology support each other.

Tools and instruments are used to answer scientific questions, while scientific discoveries lead to the development of new technologies.

Connections to the Nature of Science: Most Closely Associated with Crosscutting Concepts Science is a Way of Knowing

Science is both a body of knowledge and processes that add new knowledge.

Science is a way of knowing that is used by many people.

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

Science assumes consistent patterns in natural systems.

Science is a Human Endeavor

Science affects everyday life.

Creativity and imagination are important to science.

ESS1: Earth's Place in the Universe

ESS1.A: The Universe and Its Stars

The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1)

ESS1.B: Earth and the Solar System

The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS1-2)

SCI.1-ESS1	Earth's Place in the Universe
SCI.1.ESS1.A	The Universe and its Stars
SCI.1.ESS1.B	Earth and the Solar System

Integration of Career Readiness, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

TECH.8.2.5	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.5.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.

Interdisciplinary Connections: NJSLs for ELA, Social Studies, Science and/or Math Section

	Key Ideas and Details
LA.K-12.NJLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
LA.RI.5	Reading Informational Text
LA.RI.5.1	Quote accurately from a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
LA.K-12.NJLSA.W	Writing
LA.K-12.NJLSA.W9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.K-12.NJLSA.SL	Speaking and Listening
	Comprehension and Collaboration
LA.K-12.NJLSA.SL1	Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
LA.K-12.NJLSA.L	Language
	Vocabulary Acquisition and Use
LA.K-12.NJLSA.L4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.
LA.W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.SL.5.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.
LA.SL.5.1.A	Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.
LA.SL.5.1.B	Follow agreed-upon rules for discussions and carry out assigned roles.
LA.SL.5.1.C	Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
LA.SL.5.1.D	Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.
LA.L.5.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 5 reading and content, choosing flexibly from a range of strategies.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media Literacy New Section

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale

Unit Rationale

The purpose of this unit...

This astronomy unit helps students develop a new perspective on the world they're standing on. They will be given evidence that the Earth beneath our feet is actually moving through space, both spinning on its axis, and traveling in a great orbit around the Sun. They will see how these movements account for the patterns we see in our sky (the paths of our Sun across the sky, the changing seasons, and the changing constellations). Accompanying us on this journey are the Moon and planets, which the students will observe have their own patterns of movement in the sky. Throughout this investigation students will engage in actual and simulated observations of the sky, and they will engage in the process of inquiry: beginning with observations, debating a range of possible causes, and reasoning to possible conclusions.

Meaning

Essential Questions

Essential Questions

- Why does the sun rise and set?
- Why do the stars change with the seasons?
- Why do we experience seasons?
- Why does the moon appear to change shape?
- What other planets are in our Solar System?

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

- The Earth's spin causes us to experience day and night.
- Constellations are seasonal, which proves the Earth orbits the Sun.
- Because of the Earth's tilt, the Sun's apparent path changes and causes seasons.
- Every 28 days, as it orbits the Earth, our moon begins a new cycle.
- The 8 planets of the Solar System orbit the Sun and appear to the naked eye as "wandering stars."

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know...

- The Earth spins on its axis once every 24 hours.
- The Earth also orbits the sun, causing the constellations to be seasonal.
- The Earth's tilt causes seasons.
- The sunlight reflecting off the moon as it orbits the Earth every 28 days causes the phases of the moon
- There are 8 planets in the Solar System - Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune - that orbit the Sun.

Skills

Skills

Student will be skilled at ...

- Explain how the model of the Earth spinning on its axis is supported by our observations of the movement of the Sun throughout the day.
- Describe how the seasonal nature of the constellations supports the idea that the Earth orbits the Sun every 365 days.
- Argue that the fact that the Earth is tilted on its axis explains why some areas of the Earth experience seasons.
- Demonstrate with a flashlight and a sphere how the phases of our moon change in appearance as our moon orbits the Earth every 28 days.

- Identify and evaluate the differences between the 8 planets in the Solar System.

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

Mystery Science Spaceship Earth Videos

MS SE1: Why does the sun rise and set?

MS SE2: Who set the first clock?

MS SE3: Why do the stars change with the seasons?

MS SE4: How can the sun tell you the season?

MS SE5: Why does the moon change shape?

MS SE6: What are the wandering stars?

Mystery 1 and 2 Assessments: Why does the sun rise and set? And Who set the first clock?

Summative: Written Test

MS SE1 Assessment Revised (Schwartz)

MS SE2 Assessment Revised (Schwartz)

Mystery 3 Assessment: Why do the stars change with the seasons?

Summative: Written Test

MS SE3 Assessment Revised (Schwartz)

Mystery 4 Assessment: How can the sun tell you the seasons?

Summative: Written Test

MS SE4 Assessment Revised (Schwartz)

Mystery 5 Assessment: Why does the moon change shape?

Summative: Written Test

MS SE5 Assessment Revised (Schwartz)

Mystery 6 Assessment: What are the wandering stars?

Summative: Written Test

MS SE6 Assessment Revised (Schwartz)

Science Guided Reading List (Collingswood): *Exploring Our Sun* by Mae Jemison

Cross-content Non-fiction NGSS Recommended Reading List:

- Lowe, S. (2015). Cosmos: The infographic book of space.

An engaging book of infographics depicting various concepts about space and the solar system, including planetary distances.

- Sisson, S. (2014). Star stuff: Carl Sagan and the mysteries of the cosmos.

Tells the story of astrophysicist Carl Sagan, from his days stargazing from the bedroom window of his Brooklyn apartment, through his love of speculative science fiction novels, to his work as an internationally renowned scientist who worked on the Voyager missions exploring the farthest reaches of space.

- Simon, S. (1989). The sun.

Explores the wonders of the sun, from the constant nuclear explosions at its core to the sea of boiling gases that forms the surface

- Gibbons, G. (1995) The reason for seasons.

How the position of Earth in relation to the sun causes seasons.

- Bailey, J. (2004). Sun up, sun down: The story of day and night.

Follows the sun from dawn to dusk to explain how light rays travel, how shadows are formed, how the moon lights up the night sky, and more.

- Zopf, G. (2014). Shadowman.

This book of lights both small and tall follows Shadowman, a being who lives lost in the shadows without a guiding light to set him free. Struggling with being defined by others, Shadowman has to embrace his own blinding nature in order to explore the world outside.

[MS SE1: Why does the sun rise and set?](#)

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[MS SE5: Why does the moon change shape?](#)

[MS SE6: What are the wandering stars?](#)

[MS SE1 Assessment revised](#)
[MS SE2 Assessment revised](#)
[MS SE3 Assessment revised](#)
[MS SE4 Assessment revised](#)
[MS SE5 Assessment revised](#)
[MS SE6 Assessment revised](#)

Formative Assessment Strategies

Formative Assessment Strategies

- Answering questions posted within Mystery Science videos
- Working with small groups to discuss observations during lab work
- Analysis of student-side pages of Interactive Notebooks

Learning Activities/Unit of Study

Learning Activities/Unit of Study

- Mystery Science Spaceship Earth videos
- Hands-on lab activities for each lesson from Mystery Science
- Note-taking in teacher-led pages of Interactive Notebooks
- Non-fiction read-alouds and discussions
- Lecture

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, Gifted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next

day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.