



BOE Approved 8/18

Cliffside Park Public Schools

Science

Unit Name: Earth and Sun

Resource: FOSS Next Generation, Delta Education

Duration: Ten Weeks

Enduring Understandings

The Sun

- Shadows are the dark areas that result when light is blocked.
- The length and direction of a shadow depends on the Sun's position in the sky.
- Day is half of Earth's surface being illuminated by sunlight; night is the half of Earth's rotating on its own axis in its own shadow.
- The cyclical change between day and night is the result of Earth's rotating on its own axis in association with the stationary sun.

Planetary Systems

- The solar system includes a star, the Sun, and the objects that orbit, including Earth, the Moon, seven other planets, their satellites, and smaller objects.
- The moon is much smaller than Earth and orbits at a distance equal to about 30 Earth diameters.
- A great deal of light travels through space to Earth from the Sun and from distant stars.
- The pulling force of gravity keeps the planets and other objects in orbit by continuously changing their direction of travel.

Earth's Atmosphere

- Air is a mixture of gases held by gravity near Earth's surface.
- Most of Earth's air resides in the troposphere, the layer of the atmosphere closest to the Earth's surface.
- Weather is the condition of Earth's atmosphere at a given time in a given place.
- Weather is described in terms of several variables: temperature, humidity, precipitation, wind, and air pressure.

- Meteorology is the science of weather, and meteorologists are the scientists who study Earth's weather.

Heating Earth

- The Sun is the major source of energy that heats the Earth.
- The different energy-transferring properties of earth materials can lead to uneven heating of Earth's surface.
- The atmosphere is heated by conduction between Earth's surfaces and air particles as a result of contact, and by absorption of energy radiated directly from the Sun and redirected from Earth's surfaces.
- Convection is the circulation of fluid that results in energy transfer; cool masses sink, lifting warm masses.
- A solar water heater is a system that uses solar energy to heat water.

Water Planet

- The Sun's energy drives weather.
- Condensation is the process by which gas changes into liquid.
- Evaporation and condensation contribute to the movement of water through the water cycle, redistributing water over Earth's surface.
- Most of Earth's water,(97%), is salt water in the ocean; Earth's freshwater is found in many locations, including the atmosphere, lakes and rivers, soil, ground ice, groundwater, and glaciers.
- Climate is the average or typical weather that can be expected to occur in a region of Earth's surface, based on long-term observation and data analysis.

Essential Questions

The Sun

- How and why does your shadow change during the day?
- What can be learned by studying the length and direction of shadows?
- What causes day and night?

Planetary Systems

- How can you explain why we see some natural objects only in the night sky, some only in the day sky, and some at both times?
- How would you describe the size of and distance between Earth, the Moon, and the Sun?
- How does the shape of the moon change over 4 weeks?

Earth's Atmosphere

- What is air?
- What is Earth's atmosphere?
- How do meteorologists measure and record weather variables?

Heating Earth

- What happens to Earth materials when they are exposed to sunlight?
- How does energy transfer to the air?
- What happens when a volume of fluid is warmed at the bottom?
- What is the best design for a solar water heater?

Water Planet

- What causes condensation to form?
- How does water vapor get into the air?
- What is the water cycle?
- What is the difference between weather and climate?

Focus of Standards

Student Outcomes	Skills	Assessments
<p>The Sun</p> <ul style="list-style-type: none"> • I can observe and compare shadows during a school day. • I can relate the position of the Sun in the sky to the size and orientation of an object's shadow. • I can use physical models to explain day and night. • I can determine what causes day and night. <p>Planetary Systems</p> <ul style="list-style-type: none"> • I can record graphically the organization of the solar system. • I can use models to reveal patterns and build cause-and-effect explanations. <p>Earth's Atmosphere</p>	<ul style="list-style-type: none"> • Asking Questions and Defining Problems • Developing and Using Models • Classifying Information • Observing Investigations • Exploring New Ideas • Planning and Carrying Out Investigations • Analyzing and Interpreting Data • Using Mathematics and Computational Thinking • Constructing Explanations and Designing Solutions • Engaging in Argument from Evidence • Obtaining, Evaluating and 	<p>Assessments:</p> <ul style="list-style-type: none"> • Formative: Notebook Entries: <ul style="list-style-type: none"> ○ Notebook Entries ○ use physical models to explain day and night. While relating Earth's position ○ Explain that green plant cells make sugar (nutrients) from carbon dioxide and water in the presence of sunlight, and release oxygen. ○ 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. ○ Teacher Observation ○ Anecdotal Records/Notes ○ Science notebook

<ul style="list-style-type: none"> ● I can use models to investigate the properties of air. ● I can describe the atmosphere using visual displays. ● I can collect, organize, and interpret weather data. <p>Heating Earth</p> <ul style="list-style-type: none"> ● I can conduct experiments with heating of earth materials and with solar water heaters to build explanations and design solutions. <p>Water Planet</p> <ul style="list-style-type: none"> ● I can investigate the conditions that cause condensation and evaporation as part of the water cycle. 	<p>Communicating Information</p>	<ul style="list-style-type: none"> ○ Embedded Assessment Notes ● Summative Performance <ul style="list-style-type: none"> ○ Foss Post-test on Earth and Sun ○ Vocabulary check ● Benchmark Assessments: <ul style="list-style-type: none"> ○ Investigation Checks ○ Constructing models- earth position in space at different times/day/year ○ Diagramming Earth's atmosphere ○ Constructing models- solar heating ○ Diagramming- day/night ● Alternative: <ul style="list-style-type: none"> ○ Conferences ○ Diagrams ○ Word Bank for vocabulary ○ Modeling ○ Illustrations of solar system ○ Storybook assembly- path of earth
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NJ Student Learning Standards: Science

Matter and Its Interactions

5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen.

Motion and Stability: Forces and Interactions

5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed do

Earth's Place in the Universe

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 the Earth.

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.

5-ESS2 Earth's Systems

5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

5-ESS2-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

5-ESS3 Earth and Human Activity

5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Engineering Design

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.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Career Ready Practices

CRP 2. Apply appropriate academic and technical skills.

CRP 4. Communicate clearly and effectively and with reason.

CRP 7. Employ valid and reliable research strategies.

CRP 8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP 11. Use technology to enhance productivity.

ELA: RI.5.1, RI.5.3, RI.5.4, RI.5.5, RI.5.6, RI.5.8, RI.5.9

Math: 5.OA.A.1, 5.OA.A.2, 5.OA.A.3, 5.MD.A.1, 5.MD.B.2, 5.MD.C.3, 5.MD.C.4, 5.MD.C.5

NJ SLS: 21st Century Life and Careers

9.2 Career Awareness, Exploration, And Preparation

Strand B: Career Exploration

9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, homework, and extracurricular activities for use in a career.

9.2.8.B.4 Evaluate how traditional and nontraditional careers have evolved regionally, nationally, and globally.

NJSLS: Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

8.1.5.A.1 Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.

8.1.5.A.2 Format a document using a word processing application to enhance text and include graphics, symbols and/ or pictures.

8.1.5.A.3 Use a graphic organizer to organize information about problem or issue.

8.1.5.A.4 Graph data using a spreadsheet, analyze and produce a report that explains the analysis of the data.

D. Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.

8.1.5.D.1 Understand the need for and use of copyrights.

8.1.5.D.2 Analyze the resource citations in online materials for proper use.

8.1.5.D.4 Understand digital citizenship and demonstrate an understanding of the personal consequences of inappropriate use of technology and social media.

E: Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.

8.1.5.E.1 Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.

F: Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

8.1.5.F.1 Apply digital tools to collect, organize, and analyze data that support a scientific finding.

8.2 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.

A. The Nature of Technology: Creativity and Innovation

Technology systems impact every aspect of the world in which we live.

8.2.5.A.2 Investigate and present factors that influence the development and function of a product and a system.

B. Technology and Society: Knowledge and understanding of human, cultural and societal values are fundamental when designing technology systems and products in the global society.

8.2.5.A.3 Investigate and present factors that influence the development and function of products and systems, e.g., resources, criteria and constraints.

8.2.5.B.1 Examine ethical considerations in the development and production of a product through its life cycle.

C. Design: The design process is a systematic approach to solving problems.

8.2.5.C.1 Collaborate with peers to illustrate components of a designed system.

8.2.5.C.4 Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.

D. Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.

8.2.5.D.1 Identify and collect information about a problem that can be solved by technology, generate ideas to solve the problem, and identify constraints and trade-offs to be considered.

8.2.5.D.3 Follow step by step directions to assemble a product or solve a problem.

E. Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.

8.2.5.E.2 Demonstrate an understanding of how a computer takes input of data, processes and stores the data through a series of commands, and outputs information.

NJSLS: Science and Engineering Practices

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 backyard).

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.

Practice 7. Engaging in argument from evidence

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

Compare and refine arguments based on an evaluation of the evidence presented.

Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.

Respectfully provide and receive criticism from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.

Construct and/or support an argument with evidence, data, and/or a model.

Use data to evaluate claims about cause and effect.

Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

Practice 8. Obtaining, evaluating, and communicating information

Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.

Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.

Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices.

Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices.

Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.

Communicate scientific and/or technical information orally and/or in written formats, including various forms of media and may include tables, diagrams, and charts.

Core Instructional Materials:

- FOSS Next Generation: Earth and Sun(2016)

Supplemental Materials: (videos, leveled readers, Readworks, recommended books etc.)

Videos: <https://www.fossweb.com/module/detail?dDocName=G3842595&classId=>

Recommended books: <https://www.fossweb.com/additional-resources/books-xslt?dDocName=G4292315#non-fiction-books>

21st Century Themes**Global Awareness**

- Students come to understand that humans use natural resources for everything they do and that people affect the world around them.

Environmental Literacy

- Students will explore the origins of materials and resources that we use everyday (paper, fabric, wood.)
- Students will learn that these resources are finite and explore strategies for conserving natural resources (recycling.)
- Students will understand what plants and animals need to survive and the relationship between their needs and where they live. Students will gain an understanding of the importance of weather forecasts to prepare for severe weather.

21st Century Skills

Creativity and Innovation

- Critical Thinking and Problem Solving
- Communication and Collaboration
- Students engage in science and engineering practices by asking questions, participating in collaborative investigations, observing, recording and interpreting data to build explanations.

Interdisciplinary Connections

ELA

- Read and comprehend complex science texts related to their prior experience and knowledge.
- Write informational/explanatory texts, arguments to support claims, and narratives about experience in science.
- Engage in collaborative discussions about science.
- Learn new vocabulary and language structures in context.

Mathematical Practices

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Differentiation/Accommodations/Modifications *(Alternate Modes of Instruction and Support)*

Modifications to Support Gifted and Talented Students

Modifications to Support English Language Learners

Modifications to Support Our Learners (Students with IEPs/504s and At-Risk Learners)

<p>Newsela article: <i>Earth's Atmosphere: a jacket for the planet</i> Lexile: 930</p> <p>Recommended non fiction books https://www.fossweb.com/additional-resources-books-xslt?dDocName=G4292315#non-fiction-books</p> <p>Independent research-movement of solar system through the galaxy</p> <p>Debate / Compare and contrast-heliocentric/geocentric models</p> <p>Participate in inquiry and project-based learning units of study</p> <p>Assigning roles within partnerships</p> <p>Differentiated supports: content, process, product, environment</p>	<p>Newsela article: <i>Earth's Atmosphere: a jacket for the planet</i>(Spanish version)</p> <p>Equipment photo cards (spanish and english)</p> <p><u>Crash Course Kids: Following the Sun</u></p> <p>Modeling solar system - diagram and label- in native language</p> <p>Visual cues- image gallery https://www.fossweb.com/additional-resources-image-galleries-xslt?dDocName=G4292315#image-galleries</p> <p>Researching Solutions we drink</p> <p>Vocabulary log-</p> <p>Pronunciation/translation assistance https://dictionary.cambridge.org/us/</p> <p>Vocabulary builder Thesaurus- https://www.thesaurus.com/</p> <p>Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) Pair visual prompts with verbal presentations</p> <p>Front Load and immerse students in literacy and language experiences related to content</p>	<p>Newsela article: <i>Earth's Atmosphere: a jacket for the planet</i> Lexile: 630</p> <p>Storyboard- Earth's rotation-daily-seasonally</p> <p><u>Kinesthetic Astronomy - Sky Time Lesson</u> <u>Journey North Mystery Class – What Makes Day and Night</u> <u>Motion of the Sun Simulator</u> <u>Scale Model of Sun and Earth</u></p> <p>Equipment photo cards</p> <p>Visual cues- image gallery https://www.fossweb.com/additional-resources-image-galleries-xslt?dDocName=G4292315#image-galleries</p> <p>Word walls</p> <p>Review student individual educational plan and/or 504 plan.</p> <p>Establish procedures for accommodations and modifications for assessments as per IEP/504.</p> <p>Establish procedures for modification of classwork and homework as per IEP/504.</p> <p>Modify classroom environment to support academic and physical needs of the students as per IEP/504.</p> <p>Provide appropriate accommodations, instructional adaptations, and/or modifications as determined by the IEP or 504 team.</p> <p>Differentiation through content, process, product, environment Provide Title I services to students not meeting academic standards in ELA and/or Math.</p> <p>Provide instructional adaptations and interventions in the general education classroom.</p>
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	<p>Provide students with visual models, sentence stems, concrete objects, and hands-on materials.</p> <p>Model procedures for life skills.</p> <p>Collaboration between ELL and general education teacher to maximize learning</p>	<p>Modify classroom environment to support student needs.</p> <p>Differentiated instruction</p> <p>Basic Skills</p> <p>Intensive individual intervention</p>
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Sources:

NJSLS Science Standards (2016): <http://www.nj.gov/education/cccs/2016/science/>

NJ: 2014 SLS: Technology: <http://www.state.nj.us/education/cccs/2014/tech/8.pdf>

NJSLS-S: Science and Engineering Practices: <http://www.nj.gov/education/cccs/2016/science/3-5-ETS1.pdf>

21st Century Life and Careers: <http://www.state.nj.us/education/cccs/2014/career/9.pdf>

Career Ready Practices: <http://www.state.nj.us/education/cccs/2014/career/9.pdf>

2015 FOSS Next Generation: www.FOSSweb.com

NSTA: <https://ngss.nsta.org/>