Willingboro
Public Schools

"Where Excellence is the Expectation"

Willingboro Public Schools
Grade 5 Science

Revised June, 2022
Jennifer Brandon - Supervisor of Science

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SCIENCE CURRICULUM AND INSTRUCTION:

The Willingboro Public Schools Science program is dedicated to delivering our students an innovative hands-on science program. Our program supports the State's vision that scientifically literate students will gain the knowledge and understanding of scientific concepts as required for personal decision-making, participation in civic and cultural affairs, and economic productivity.

Students are encouraged to ask questions about the world around them and practice science skills.

- Students' science experiences teach them to connect science concepts to their experience, see how human nature influences science, and explore how science and technology affects their lives.
- The science classes include activities that engage students in applying their science skills and understandings to examine social issues, solve real problems and make decisions.
- Students have the opportunity to use a variety of equipment and technology in their scientific investigations.
- Students learn how to find out and make up their own minds by experimenting and investigating how the world works rather than just memorizing facts.
- Students are learning how to conduct scientific inquiry and use data to explain their conclusions.
- The process of investigation and explanation is just as important as knowing "the" answer.

Teachers plan instruction that builds on what students know and think to increase students' scientific understanding.

- Teachers use the New Jersey Student Learning Standards in Science to plan lessons that are challenging, engaging and age appropriate.
- There are resources and opportunities for students to do at-home science activities like participating in the STEM Conference.

Course Sequence/Table of Contents:

Click here for the Grade 5 Science Pacing Guide.

Within each unit, please find:

- **Unit Overview**
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- **What This May Look Like**
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  - **Enduring Understandings**
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    - District/School Formative Assessment Plan
    - District/School Summative Assessment Plan
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Overview	**Content Standards - Arranged by Disciplinary Core Idea (DCI)** *Students who demonstrate understanding can:*	**Unit Focus**
ESS Unit: **Earth and Sun**	**5-PS1: Matter and its Interactions** ● **5-PS1-1** Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.] **5-PS2: Motion and Stability: Forces and Interactions** ● **5-PS2-1** Support an argument that the gravitational force exerted by Earth on objects is directed down. [Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.] [Assessment Boundary: Assessment does not include mathematical representation of gravitational force.] **5-ESS1: 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 Earth. [Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).] ● **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. [Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.] **5-ESS2: Earth's Systems** ● **5-ESS2-1** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere	The Earth and Sun unit provides students with experiences to explore the properties of the atmosphere, energy transfer from the Sun to Earth, and the dynamics of weather and water cycling in Earth's atmosphere.

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Overview	Content Standards - Arranged by Disciplinary Core Idea (DCI) *Students who demonstrate understanding can:*	Unit Focus
	interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.] ● **5-ESS2-2** Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]. **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, environment, and address climate change issues. **3-5-ETS1: Engineering Design** ● **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. ● **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.	
Suggested Open Educational Resources	● FOSS Next Generation Science Curriculum Resources ○ Think Link ○ Student Resource Books ● Generation Genius	

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Overview	**Content Standards - Arranged by Disciplinary Core Idea (DCI)** *Students who demonstrate understanding can:*	**Unit Focus**
PS Unit **Mixtures and Solutions**	•	The Mixtures and Solutions Module introduces students to the properties, behaviors, and changes in substances—fundamental ideas in chemistry. Students also develop models to explain how something works.

Suggested Open Educational Resources	• FOSS Next Generation Science Curriculum Resources
	  ○ Think Link
	  ○ Student Resource Books
	• Generation Genius	

LS **Unit 3** **Living Systems**	•	•

Unit 3:
 	
Suggested Open Educational Resources
	• FOSS Next Generation Science Curriculum Resources
	  ○ Think Link
	  ○ Student Resource Books
	• Generation Genius	

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Earth and Sun: Life and Physical Sciences

Overview

The Earth and Sun unit provides students with experiences to explore the properties of the atmosphere, energy transfer from the Sun to Earth, and the dynamics of weather and water cycling in Earth's atmosphere.

Essential Questions	Enduring Understandings
Overarching Driving Questions:	**Anchoring Phenomenon:**
• *How can we predict events based on shadows?* • *What do shadows tell us about daily patterns involving the Earth/sun system?* • *How and why does your shadow change during the day?* • *What is the relationship between the position of the Sun and the length and direction of shadows? What causes day and night?* • *What objects do we observe in our solar system and how do they move in relation to each other?* • *What do we see outside our system?* • *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?* • *Why does the shape of the Moon appear to change?* • *How do the parts of the solar system interact?* • *Why do stars appear to move across the night sky?* • *What is Earth's atmosphere and what does it have to do with weather?* • *What is air?* • *What is Earth's atmosphere?* • *How do meteorologist's measure and record weather variables?* • *How does Earth's atmosphere heat up?* • *What is the effect of sunlight on earth materials?* • *How does energy transfer to the air?* • *How is water distributed over Earth's surface and atmosphere, how does it move, and what is the effect on Earth?* • *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?*	• Shadows change during the day because the position of the Sun changes in the sky. • The length and direction of a shadow depends on the Sun's position in the sky. • Day is the half of Earth's surface being illuminated by sunlight; night is the half of Earth's surface in its own shadow. • The cyclical change between day and night is the result of Earth's rotating around the stationary Sun, Earth's star. • The solar system includes the Sun, a star, and the objects that orbit it, including Earth, the Moon, seven other planets, their satellites, and smaller objects. • Gravity is a pulling force between two masses; it is the force that pulls things toward the center of Earth. • The pulling force of gravity keeps the planets and other objects in orbit by continuously changing their direction of travel. • A great deal of light travels through space to Earth from the Sun and from distant stars. • Stars are at different distances from Earth. The Sun is the closest star to Earth, so it appears brighter and larger. • The side of Earth facing the Sun is always in daylight; the side facing away from the Sun is always in darkness. • Air is a mixture of gases held by gravity near Earth's surface. Air is made of particles too small to see. Air has mass, takes up space, and is compressible. • Most of Earth's air resides in the troposphere, the layer of the atmosphere closest to Earth's surface. • Weather is the condition of Earth's atmosphere at a given time in a given place. • Meteorology is the science of weather, and meteorologists are the scientists who study Earth's weather. • Weather is described in terms of several variables. • The Sun is the major source of energy that heats Earth.

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	• The different energy-transferring properties of earth materials (soil and water) 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 re-radiated from Earth's surfaces. • Convection is the circulation of fluid (liquid or gas) that results in energy transfer. Convection currents are driven by uneven heating of Earth's surface. • A solar water heater is a system that uses solar energy to heat water. • People can protect Earth's resources and environments by using alternative energy sources. • Evaporation and condensation contribute to the movement of water through the water cycle, redistributing water over Earth's surface. • As temperature increases, the rate of evaporation increases. • Most of Earth's water (97%) is salt water in the ocean; Earth's fresh water is found in the atmosphere, lakes and rivers, soil, ground ice, ground water, and glaciers. • The Sun's energy drives weather. • Climate is the average or typical weather that can be expected to occur in a region of Earth's surface. Earth's climate is changing.

Earth and Sun: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

Students who demonstrate understanding can:

5-PS1: Matter and its Interactions

- **5-PS1-1** Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]

5-PS2: Motion and Stability: Forces and Interactions

- **5-PS2-1** Support an argument that the gravitational force exerted by Earth on objects is directed down. [Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.] [Assessment Boundary: Assessment does not include mathematical representation of gravitational force.]

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Earth and Sun: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

5-ESS1: 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 Earth. [Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).]
- **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. [Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]

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. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]
- **5-ESS2-2** Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.].

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, environment, and address climate change issues.

3-5-ETS1: Engineering Design

- **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.
- **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.

Science and Engineering Practices

Asking Questions and Defining Problems

- Asking questions and defining problems in 3–5 builds on grades K– 2 experiences and progresses to specifying qualitative relationships.
  - 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. (3-5-ETS1-1)

Developing and Using Models

- Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.
  - Develop a model to describe phenomena. (5-PS1-1), (5-ESS2-1)

Planning and Carrying Out Investigations

- Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
  - Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-5-ETS1-3)

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Earth and Sun: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

Using Mathematics and Computational Thinking

- Mathematical and computational thinking in 3 - 5 builds on K - 2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.
    - Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2)

Analyzing and Interpreting Data

- Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.
    - Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (5- ESS1-2)

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.
    - Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5- ESS3-1)

Constructing Explanations and Designing Solutions

- 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.
    - Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3-5-ETS1-2)

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).
    - Support an argument with evidence, data, or a model. (5-PS2- 1), (5- ESS1-1)

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (5-PS1-1)

PS2.B: Types of Interactions

- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1)

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)

ESS2.A: Earth Materials and Systems

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Earth and Sun: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

- Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1)

ESS2.C: The Roles of Water in Earth's Surface Processes

- Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2)

ESS3.C: Human Impacts on Earth Systems

- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

ETS1.A: Defining and Delimiting Engineering Problems

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5- ETS1-1)

ETS1.B: Developing Possible Solutions

- Research on a problem, such as climate change, should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2) At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2) Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3)

ETS1.C: Optimizing the Design Solution

- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)

Crosscutting Concepts

Patterns

- Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2*)*

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1)

Scale, Proportion, and Quantity

- Natural objects exist from the very small to the immensely large. (5- PS1-1), (5- ESS1-1)
- Standard units are used to measure and describe physical quantities such as weight and volume. (5- ESS2-2)

Systems and System Models

- A system can be described in terms of its components and their interactions. (5-ESS2-1), (5-ESS3-1)

Connections to Nature of Science

Science Addresses Questions About the Natural and Material World.

- Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3- 1)

Influence of Engineering, Technology, and Science on Society and the Natural World

- People's needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1)
- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)

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Student Learning Objectives

Students will be able to...

- Students will be able to conduct investigations safely in the classroom
- Students will record observations accurately
- Students will form a prediction and explain their reasoning.
- Students will express questions and predictions using complete sentences in a science notebook.
- Students will share results of experiments with others and respectfully discuss results that are not expected
- Students will write claims and evidence
- Students will express procedures using complete sentences in a science notebook
- Students will investigate the phenomena of objects giving off light and others reflecting light in the sky.

Integrated Accommodations and Modifications

Special Education Students	English Language Learners	At Risk
• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments.	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) • Repeat, rephrase, paraphrase key concepts and directions • Allow for extended time for assignment completion as needed • Highlight key vocabulary	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments

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• Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed Appendix A: Special Education Accommodations and Modifications	• Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

Gifted and Talented Students	504 Plan
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills. • Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence • Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts • Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments

Interdisciplinary Connections	Computer Science and Design Thinking
Connections to NJSLS - English Language Arts *Reading*	**Computer Science and Design Thinking Practices** 1. ✓ Fostering an Inclusive Computing and Design Culture 2. ✓ Collaborating Around Computing and Design

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- RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-PS2-1), (5-ESS1-1), (5-ESS3-1), (3-5-ETS1-2)
- RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS1-1), (5-ESS1-1), (5-ESS2-1), (5-ESS2-2), (5-ESS3-1), (3-5-ETS1-2)
- RI.5.8 Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s). (5-ESS1-1)
- RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-PS2-1), (5-ESS1-1), (5-ESS3-1), (3-5-ETS1-2)

Writing

- W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5- PS2-1), (5-ESS1-1)
- W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different perspectives of a topic. (3-5-ETS1-1), (3-5-ETS1-3)
- W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS2-2), (5-ESS3-1), (3-5-ETS1-1), (3-5-ETS1-3)
- W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (5- ESS3-1), (3-5-ETS1-1), (3-5-ETS1-3)

Speaking and Listening

- SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS1-2), (5-ESS2-1), (5-ESS2-2)

Connections to NJSLS - Mathematics

3. ☐ Recognizing and Defining Computational Problems
4. ✓ Developing and Using Abstractions
5. ✓ Creating Computational Artifacts
6. ✓ Testing and Refining Computational Artifacts
7. ✓ Communicating About Computing and Design

Computer Science and Design Thinking Standards

Impacts of Computing

- The development and modification of computing technology is driven by individuals' needs and wants and can affect individuals differently.
    - 8.1.5.IC.1: Identify computing technologies that have impacted how individuals live and work and describe the factors that influenced the changes.

Data and Analysis

- Data can be organized, displayed, and presented to highlight relationships.
    - 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.
- Individuals can select, organize, and transform data into different visual representations and communicate insights gained from the 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.
- Many factors influence the accuracy of inferences and predictions.
    - 8.1.5.DA.5: Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

Engineering Design

- Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge. Often, several design solutions exist, each better in some way than the others.
    - 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.

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- MP.2 Reason abstractly and quantitatively. (5-PS1-1), (5-ESS1-1), (5-ESS1-2), (5-ESS2-1), (5-ESS2-2), (5-ESS3-1), (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)
- MP.4 Model with mathematics. (5-PS1-1), (5-ESS1-1), (5-ESS1-2), (5-ESS2-1), (5-ESS2-2), (5-ESS3-1), (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)
- MP.5 Use appropriate tools strategically. (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)
- 3-5.OA Operations and Algebraic Thinking (3-5-ETS1-1), (3-5-ETS1-2)
- 5.NBT.A.1 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-PS1-1)
- 5.NF.B.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)
- 5.MD.C.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1- 1)
- 5.MD.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5-PS1- 1)
- 5.NBT.A.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-ESS1-1)
- 5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS1-2), (5-ESS2-1)

    - 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.
- Engineering design requirements include desired features and limitations that need to be considered.
    - 8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).
    - 8.2.5.ED.5: Describe how specifications and limitations impact the engineering design process.
    - 8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and tradeoffs identified in the design process.

Interaction of Technology and Humans

- Societal needs and wants determine which new tools are developed to address real-world problems.
    - 8.2.5.ITH.1: Explain how societal needs and wants influence the development and function of a product and a system.
- A new tool may have favorable or unfavorable results as well as both positive and negative effects on society. Technology spurs new businesses and careers.
    - 8.2.5.ITH.2: Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have.
    - 8.2.5.ITH.3: Analyze the effectiveness of a new product or system and identify the positive and/or negative consequences resulting from its use.
    - 8.2.5.ITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career.

Nature of Technology

- Technology innovation and improvement may be influenced by a variety of factors. Engineers create and modify technologies to meet people's needs and wants; scientists ask questions about the natural world.
    - 8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies.

Effects of Technology on the Natural World

- The technology developed for the human designed world can have unintended consequences for the environment. Technology must be continually developed and made more efficient to reduce the need for non-renewable resources.
    - 8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems.

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	○ 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.

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community member and employee.
- Attend to financial well-being.
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Model integrity, ethical leadership and effective management.
- Plan education and career paths aligned to personal goals.
- Use technology to enhance productivity, increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

Career Readiness, Life Literacies and Key Skills Standards

9.1 Personal Financial Literacy

- You can give back in areas that matter to you.
    - 9.1.5.CR.1: Compare various ways to give back and relate them to your strengths, interests, and other personal factors

9.2 Career Awareness, Exploration, Preparation, and Training

- An individual's passions, aptitude and skills can affect his/her employment and earning potential.
    - 9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
    - 9.2.5.CAP.2: Identify how you might like to earn an income.
    - 9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
    - 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

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- Income and benefits can vary depending on the employer and type of job or career.
    - 9.2.5.CAP.5: Identify various employee benefits, including income, medical, vacation time, and lifestyle benefits provided by different types of jobs and careers.

9.4 Life Literacies and Key Skills

Creativity and Innovation

- Collaboration with individuals with diverse perspectives can result in new ways of thinking and/or innovative solutions.
    - 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).
    - 9.4.5.CI.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7).
- Curiosity and a willingness to try new ideas (intellectual risk-taking) contributes to the development of creativity and innovation skills
    - 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).
    - 9.4.5.CI.4: Research the development process of a product and identify the role of failure as a part of the creative process (e.g., W.4.7, 8.2.5.ED.6).

Critical Thinking and Problem-solving

- The ability to solve problems effectively begins with gathering data, seeking resources, and applying critical thinking skills.
    - 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 (e.g., 6.1.5.CivicsCM.3).

Digital Citizenship

- Intellectual property rights exist to protect the original works of individuals. It is allowable to use other people's ideas in one's own work provided that proper credit is given to the original source
    - 9.4.5.DC.2: Provide attribution according to intellectual property rights guidelines using public domain or creative commons media.
    - 9.4.5.DC.3: Distinguish between digital images that can be reused freely and those that have copyright restrictions.

Global and Cultural Awareness

- Culture and geography can shape an individual's experiences and perspectives.
    - 9.4.5.GCA.1: Analyze how culture shapes individual and community perspectives and points of view (e.g., 1.1.5.C2a, RL.5.9, 6.1.5.HistoryCC.8).

Information and Media Literacy

- Digital tools and media resources provide access to vast stores of information, but the information can be biased or inaccurate.
    - 9.4.5.IML.1: Evaluate digital sources for accuracy, perspective, credibility and relevance (e.g., Social Studies Practice - Gathering and Evaluating Sources).
- Digital tools can be used to modify and display data in various ways that can be organized to communicate ideas.
    - 9.4.5.IML.2: Create a visual representation to organize information about a problem or issue (e.g., 4.MD.B.4, 8.1.5.DA.3). • 9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data
- Specific situations require the use of relevant sources of information.
    - 9.4.5.IML.6: Use appropriate sources of information from diverse sources, contexts, disciplines, and cultures to answer questions (e.g., RI.5.7, 6.1.5.HistoryCC.7, 7.1.NM. IPRET.5).

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Technology Literacy

- Different digital tools have different purposes.
  - 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.
- Collaborating digitally as a team can often develop a better artifact than an individual working alone.
  - 9.4.5.TL.4: Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a).
  - 9.4.5.TL.5: Collaborate digitally to produce an artifact (e.g., 1.2.5CR1d).

Climate Change

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

SEL Competencies

- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

https://www.nj.gov/education/safety/wellness/selearning/index.shtml

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards. Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods:	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* **Benchmark Assessments:** ● Assessment 1.1: Mid-Unit Assessment ● Assessment 1.2: End of Unit Assessment

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• Pre-Assessment • Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy) • Exit tickets, rotational activities (stations), quizzes, and small group activities • Classwork, homework, group work (formative assessment) • Teacher's observation, class discussion, and Student Notebook	• Assessment 1.3: End of Unit Performance Assessment **Standardized Assessments:** • NJSLA **Other Summative Assessments:** Teachers are encouraged to design and implement their own assessments (topic/module tests and quizzes) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary

Earth, sun, moon, solar system, shadow, illumination, movement, rotation, orbit, gravity, size, distance, proportion, scale, satellites, stars, atmosphere, troposphere, hydrosphere, air, salt, salt water, fresh water, reservoir, glaciers, water cycle, water vapor, evaporation, condensation, convection, weather, meteorologist, climate, solar, solar energy, alternative energy sources, resources, environment(s).

District/School Tasks	District/School Primary and Supplementary Resources
• Common Formative Assessments • Common District Summative Assessments • See above Assessment Sections for more information	**District-Mandated Resources** • FOSS Curriculum **Assessment Resources:** • Available on FOSS - ThinkLink • For additional resources, log in to https://edconnectnj.schoolnet.com **Other Resources:** • Generation Genius: "Water Cycle", "Earth's Orbit and Rotation", "Sun and Other Stars", "Moon and its Phases", "Interaction of Earth's Spheres", "Weather vs. Climate" • Warm-Up Activities: Amistad Activity, SEL Activity, Holocaust Activity, Climate Change Activity • Current Events, Articles: Readworks, Newsela, Scholastic Magazine (Science

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	World) • Simulations, Videos, Games: Scholastic Study Jams, The Science Spot, PBS Learning Media, PhET, Gizmos, BrainPop • Activities, and Lessons: Steve Spangler, Kesler Science, Science Buddies, • Youtube Channels (MooMooMath and Science, TedEd, CrashCourse, Sick Science, Teacher's Pet, etc.) • Freeze and Flow SEL Activity (SEL Resource) • African American Inventors (Amistad Resource) **Project Ideas:** • Projects to explore/model the scale of the solar system • Projects to explain the water cycle, communicate to a peer or audience.
Instructional Best Practices and Exemplars	
See Appendix A for Instructional Best Practices and Exemplars	
Pacing Guide	
Science Grade 5 Unit 1: "Earth and Sun" Pacing Guide	

Mixtures and Solutions: Life and Physical Sciences

Overview

The Mixtures and Solutions Module introduces students to the properties, behaviors, and changes in substances—fundamental ideas in chemistry. Students also develop models to explain how something works.

Essential Questions	Enduring Understandings
Overarching Driving Questions: ● *How do particles combine to form the variety of matter one observes?* ● *How do substances combine or change (react) to make new substances? How does one* ● *characterize and explain these reactions and make predictions about them?* ● *What is a design for?* ● *What are the criteria and constraints of a successful solution?* ● *What is the process for developing potential design solutions?* ● *How can the various proposed design solutions be compared and improved?*	● Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4) ● Natural objects exist from the very small to the immensely large. (5-PS1-1) ● Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1- 2),(5-PS1-3) ● Scientific Knowledge Assumes an Order and Consistency in Natural Systems ● Science assumes consistent patterns in natural systems. (5-PS1-2) ● People's needs and wants change over time, as do their demands for new and improved technologies. (3- 5-ETS1-1) ● Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)

Mixtures and Solutions: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)
Students who demonstrate understanding can:
5-PS1: Matter and its Interactions

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Mixtures and Solutions: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

- **5-PS1-1** Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]
- **5-PS1-2** Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. [Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.] [Assessment Boundary: Assessment does not include distinguishing mass and weight.]
- **5-PS1-3** Make observations and measurements to identify materials based on their properties. [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing mass and weight.]
- **5-PS1-4** Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

3-5-ETS1: Engineering Design

- **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.
- **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.

Science and Engineering Practices

Asking Questions and Defining Problems

- Asking questions and defining problems in 3–5 builds on grades K– 2 experiences and progresses to specifying qualitative relationships.
    - 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. (3-5-ETS1-1)

Developing and Using Models

- Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.
    - Develop a model to describe phenomena. (5-PS1-1)

Planning and Carrying Out Investigations

- Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
    - Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (5-PS1-4), (3-5-ETS1-3)
    - Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)

Using Mathematics and Computational Thinking

- Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.
    - Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)

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Mixtures and Solutions: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

Constructing Explanations and Designing Solutions

- 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

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (5-PS1-1)
- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)
- Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)

PS1.B: Chemical Reactions

- When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4) No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2)

ETS1.A: Defining and Delimiting Engineering Problems

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5- ETS1-1)

ETS1.B: Developing Possible Solutions

- Research on a problem, such as climate change, should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2) At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2) Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3)

ETS1.C: Optimizing the Design Solution

- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4)

Scale, Proportion, and Quantity

- Natural objects exist from the very small to the immensely large. (5- PS1-1)
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2), (5-PS1-3)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes consistent patterns in natural systems. (5- PS1-2)

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Mixtures and Solutions: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

Influence of Engineering, Technology, and Science on Society and the Natural World

- People's needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1)
- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)

Student Learning Objectives

Students will be able to...

- Students will be able to conduct investigations safely in the classroom
- Students will be introduced to and will practice academic vocabulary (diatomaceous earth, syringe, salt, gravel, solid, liquid, screen, filter, and funnel)
- Students will be able to use properties to compare and contrast solid materials
- Students will know that a mixture combines two or more materials that retain their own properties
- Students will record observations accurately
- Students will form a prediction and explain their reasoning about methods for separating mixtures
- Students will know that screens can be used to separate mixtures with larger particles, and that filers can be used to separate some mixtures with smaller particles
- Students will know that a solution forms when a material dissolves in a liquid (solvent) and cannot be retrieved with a filter
- Students will ask testable questions about separating components of a solution
- Students will know that evaporation is the change of a substance from a liquid to a gas
- Students will express questions and predictions using complete sentences in a science notebook.
- Students will know that evaporation can separate a liquid from a solid in a solution
- Students will share results of experiments with others and respectfully discuss results that are not expected
- Students will write claims and evidence
- Students will develop, communicate, and justify a procedure to separate simple mixtures based on physical properties
- Students will express procedures using complete sentences in a science notebook
- Students will share results of experiments with others and respectfully discuss results that are not expected
- Students will apply their understanding of properties and mixtures and solutions to design a procedure to separate a novel mixture..

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<tr><th colspan="3">Integrated Accommodations and Modifications</th></tr>
<tr><th>Special Education Students</th><th>English Language Learners</th><th>At Risk</th></tr>
<tr>
<td>

Utilize modifications & accommodations delineated in the student's IEP
Provide additional manipulatives to support instruction
Allow for alternative strategies to solve algorithms or tasks
Provide the steps needed to complete the task
Model frequently
Provide repetition and practice.
Use visuals to demonstrate/model the processes
Restate, reread, and clarify directions/questions
Ask students to restate information, directions, and assignments.
Provide copy of class notes
Distribute study guide for classroom tests.
Provide preferential seating to be mutually determined by the student and teacher
Provide extra textbooks for home.
Provide regular parent/ school communication
Allow extended time to complete assignment
Establish procedures for accommodations / modifications for assessments
Allow student to take/complete tests in an alternate setting as needed

Appendix A: Special Education Accommodations and Modifications
</td>
<td>
WIDA Can Do Descriptors
https://wida.wisc.edu/teach/can-do/descriptors

Modify Assignments
Use testing and portfolio assessment
Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)
Repeat, rephrase, paraphrase key concepts and directions
Allow for extended time for assignment completion as needed
Highlight key vocabulary
Define essential vocabulary in context
Use graphic organizers, visuals, manipulatives and other concrete materials
Use gestures, facial expressions and body language
Read aloud
Build on what students already know and prior experience

</td>
<td>

Pair visual prompts with verbal presentations
Ask students to restate information, directions, and assignments.
Provide repetition and practice
Model skills / techniques to be mastered.
Provide extended time to complete class work
Provide copy of class notes
Provide preferential seating to be mutually determined by the student and teacher
Allow the use of a computer to complete assignments.
Establish expectations for correct spelling on assignments
Provide extra textbooks for home.
Provide Peer Support
Increase one on one time

</td>
</tr>
<tr><th colspan="2">Gifted and Talented Students</th><th>504 Plan</th></tr>
<tr>
<td colspan="2">

Utilize advanced, accelerated, or compacted content
Provide assignments that emphasize higher- level thinking skills.
Allow for individual student interest
Gear assignments to development in areas of affect, creativity, cognition, and research skills

</td>
<td>

Pair visual prompts with verbal presentations
Ask students to restate information, directions, and assignments.
Provide repetition and practice
Model skills / techniques to be mastered.
Provide extended time to complete class work

</td>
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• Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence • Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Provide copy of class notes • Break long assignments into smaller parts • Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments
Interdisciplinary Connections	**Computer Science and Design Thinking**
Connections to NJSLS - English Language Arts *Reading* • 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. (3-5-ETS1-2) • RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS1-1), (3-5-ETS1-2) • RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3-5-ETS1-2) *Writing* • W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-PS1-2), (5-PS1-3), (5-PS1-4), (3-5-ETS1-1), (3-5-ETS1-3) • W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-PS1-2), (5- PS1-3), (5-PS1-4), (3-5-ETS1-1), (3-5-ETS1-3) • W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-PS1-2), (5- PS1-3), (5-PS1-4), (3-5-ETS1-1), (3-5-ETS1-3)	**Computer Science and Design Thinking Practices** 8. ✓ Fostering an Inclusive Computing and Design Culture 9. ✓ Collaborating Around Computing and Design 10. ☐ Recognizing and Defining Computational Problems 11. ✓ Developing and Using Abstractions 12. ✓ Creating Computational Artifacts 13. ✓ Testing and Refining Computational Artifacts 14. ✓ Communicating About Computing and Design **Computer Science and Design Thinking Standards** *Impacts of Computing* • The development and modification of computing technology is driven by individual's needs and wants and can affect individuals differently. ○ 8.1.5.IC.1: Identify computing technologies that have impacted how individuals live and work and describe the factors that influenced the changes. *Data and Analysis* • Data can be organized, displayed, and presented to highlight relationships. • 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim. • Individuals can select, organize, and transform data into different visual representations and communicate insights gained from the data.

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Connections to NJSLS - Mathematics

- MP.2 Reason abstractly and quantitatively. (5-PS1-1), (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)
- MP.4 Model with mathematics. (5-PS1-1), (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)
- MP.5 Use appropriate tools strategically. (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)
- 3-5.OA Operations and Algebraic Thinking (3-5-ETS1-1), (3-5-ETS1-2)
- 5.NBT.A.1 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-PS1-1)
- 5.NF.B.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)
- 5.MD.C.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1- 1)
- 5.MD.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5-PS1- 1)

    - 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.
- Many factors influence the accuracy of inferences and predictions.
    - 8.1.5.DA.5: Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

Engineering Design

- Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge. Often, several design solutions exist, each better in some way than the others.
    - 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.
- Engineering design requirements include desired features and limitations that need to be considered.
    - 8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).
    - 8.2.5.ED.5: Describe how specifications and limitations impact the engineering design process.
    - 8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and tradeoffs identified in the design process.

Interaction of Technology and Humans

- Societal needs and wants determine which new tools are developed to address real-world problems.
    - 8.2.5.ITH.1: Explain how societal needs and wants influence the development and function of a product and a system.
- A new tool may have favorable or unfavorable results as well as both positive and negative effects on society. Technology spurs new businesses and careers.
    - 8.2.5.ITH.2: Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have.
    - 8.2.5.ITH.3: Analyze the effectiveness of a new product or system and identify the positive and/or negative consequences resulting from its use.

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	○ 8.2.5.ITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career. *Nature of Technology* ● Technology innovation and improvement may be influenced by a variety of factors. Engineers create and modify technologies to meet people's needs and wants; scientists ask questions about the natural world. ○ 8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies. Effects of Technology on the Natural World ● The technology developed for the human designed world can have unintended consequences for the environment. Technology must be continually developed and made more efficient to reduce the need for non-renewable resources. ○ 8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems. ○ 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.

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community members and employee.
- Attend to financial well-being.
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Model integrity, ethical leadership and effective management.
- Plan education and career paths aligned to personal goals.
- Use technology to enhance productivity increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

Career Readiness, Life Literacies and Key Skills Standards

9.1 Personal Financial Literacy

- You can give back in areas that matter to you.

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- 9.1.5.CR.1: Compare various ways to give back and relate them to your strengths, interests, and other personal factors

9.2 Career Awareness, Exploration, Preparation, and Training

- An individual's passions, aptitude and skills can affect his/her employment and earning potential.
  - 9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
  - 9.2.5.CAP.2: Identify how you might like to earn an income.
  - 9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
  - 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
- Income and benefits can vary depending on the employer and type of job or career.
  - 9.2.5.CAP.5: Identify various employee benefits, including income, medical, vacation time, and lifestyle benefits provided by different types of jobs and careers.

9.4 Life Literacies and Key Skills

Creativity and Innovation

- Collaboration with individuals with diverse perspectives can result in new ways of thinking and/or innovative solutions.
  - 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).
  - 9.4.5.CI.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7).
- Curiosity and a willingness to try new ideas (intellectual risk-taking) contributes to the development of creativity and innovation skills
  - 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).
  - 9.4.5.CI.4: Research the development process of a product and identify the role of failure as a part of the creative process (e.g., W.4.7, 8.2.5.ED.6).

Critical Thinking and Problem-solving

- The ability to solve problems effectively begins with gathering data, seeking resources, and applying critical thinking skills.
  - 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 (e.g., 6.1.5.CivicsCM.3).

Digital Citizenship

- Intellectual property rights exist to protect the original works of individuals. It is allowable to use other people's ideas in one's own work provided that proper credit is given to the original source
  - 9.4.5.DC.2: Provide attribution according to intellectual property rights guidelines using public domain or creative commons media.
  - 9.4.5.DC.3: Distinguish between digital images that can be reused freely and those that have copyright restrictions.

Global and Cultural Awareness

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- Culture and geography can shape an individual's experiences and perspectives.
    - 9.4.5.GCA.1: Analyze how culture shapes individual and community perspectives and points of view (e.g., 1.1.5.C2a, RL.5.9, 6.1.5.HistoryCC.8).

Information and Media Literacy

- Digital tools and media resources provide access to vast stores of information, but the information can be biased or inaccurate.
    - 9.4.5.IML.1: Evaluate digital sources for accuracy, perspective, credibility and relevance (e.g., Social Studies Practice - Gathering and Evaluating Sources).
- Digital tools can be used to modify and display data in various ways that can be organized to communicate ideas.
    - 9.4.5.IML.2: Create a visual representation to organize information about a problem or issue (e.g., 4.MD.B.4, 8.1.5.DA.3). • 9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data
- Specific situations require the use of relevant sources of information.
    - 9.4.5.IML.6: Use appropriate sources of information from diverse sources, contexts, disciplines, and cultures to answer questions (e.g., RI.5.7, 6.1.5.HistoryCC.7, 7.1.NM. IPRET.5).

Technology Literacy

- Different digital tools have different purposes.
    - 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.
- Collaborating digitally as a team can often develop a better artifact than an individual working alone.
    - 9.4.5.TL.4: Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a).
    - 9.4.5.TL.5: Collaborate digitally to produce an artifact (e.g., 1.2.5CR1d).

Climate Change

- Addressed in Units 1 and 3

SEL Competencies

- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

https://www.nj.gov/education/safety/wellness/selearning/index.shtml

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* **Benchmark Assessments:**

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Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods: ● Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy) ● Exit tickets, rotational activities (stations), quizzes, and small group activities ● Classwork, homework, group work (formative assessment) ● Pre-Assessment, teacher's observation, class discussion, and journal	● Assessment 1.1: Mid-Unit Assessment ● Assessment 1.2: End of Unit Assessment ● Assessment 1.3: End of Unit Performance Assessment **Standardized Assessments:** ● NJSLA **Other Summative Assessments:** Teachers are encouraged to design and their own assessments (topic/module tests and quizzes) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary
mixtures, solutions, solute, solvent, solubility, diatomaceous earth, syringe, solid, screen, filter, particle, matter, substance, react, salts, extracts, evaporation, concentration,

District/School Tasks	**District/School Primary and Supplementary Resources**
● Common Formative Assessments ● Common District Summative Assessments ● See above Assessment Sections for more information	**District-Mandated Resources** ● FOSS Curriculum and Science Kits **Assessment Reosurces:** ● Available on FOSS - ThinkLink ● For additional resources, log in to https://edconnectnj.schoolnet.com **Other Resources:** ● Generation Genius: "Chemical and Physical Changes" ● Achieve 3000 ● Flocabulary ● Chemical and Engineering Network: Famous Black Chemists (Amistad Resource) ● Teaching Holocaust Activities for Middle School (can adapt for 5th grade) (Holocaust Resource)

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	• **SEL Resource:** "The Mistake Game" Students draw models on whiteboards, intentionally include a "mistake", other students respectfully find it, discuss, and include why the mistake is good because of what can be learned from it. **Project Ideas:** • Growing Crystals • Researching Famous Chemists: Alfred Nobel, Marie Curie, Niels Bohr. and many more
Instructional Best Practices and Exemplars	
See Appendix A for Instructional Best Practices and Exemplars	
Pacing Guide	
Science Grade 5 Unit 2: "Mixtures and Solutions" Pacing Guide	

Living Systems: Life and Physical Sciences

Overview

Living systems are open self-organizing life forms that interact with their environment. These systems are maintained by flows of information, energy and matter. Some scientists have proposed in the last few decades that a general living systems theory is required to explain the nature of life.

Essential Questions	Enduring Understandings
Overarching Driving Questions: ● How are plants, animal and human life systems similar and different? ● How will knowledge of the basic needs of living things enhance the quality of human lives? ● How can we use scientific processes to conduct investigations and build explanations?	● The basic unit of life is the cell. ● All cells have basic needs—water, food, gas exchange, and waste disposal. ● Materials are transported to cells in multicellular organisms in specific ways. ● Structure and functions of the circulatory, respiratory, digestive and excretory systems in humans. ● Vascular plants have specialized tissue (xylem and phloem tubes) for the transport of water, minerals and sugar to cells. ● Leaves play an important role in the transport of water to cells in vascular plants. ● Green plant cells make sugar from carbon dioxide and water in the presence of sunlight and release oxygen. ● Plant and animal cells obtain energy by breaking down sugar into carbon dioxide and water (cellular respiration). ● Leaves can be classified based on venation pattern. ● Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion (secondary to 5-PS3-1). ● Plants acquire their material for growth chiefly from air and water (5-LS1-1). ● Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. ● The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their

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	needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1) ● Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1) ● The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. ● The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water) (5-PS3-1). ● Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1) ● Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

Living Systems: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

Students who demonstrate understanding can:

5-LS1: From Molecules to Organisms: Structures and Processes

- **5-LS1-1.** Support an argument that plants get the materials they need for growth chiefly from air and water. [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]

5-LS2: Ecosystems: Interactions, Energy, and Dynamics

- **5-LS2-1.** Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]

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Living Systems: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

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. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]
- **5-ESS2-2** Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.].

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, environment, and address climate change issues

5-PS3: Energy

- **5-PS3-1**. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. [Clarification Statement: Examples of models could include diagrams, and flow charts.].

Science and Engineering Practices

Developing and Using Models

- Modeling in 3–5 builds on K–2 models and progresses to building and revising simple models and using models to represent events and design solutions.
  - Develop a model to describe phenomena. (5-LS2-1)
  - Develop a model using an example to describe a scientific principle. (5-ESS2-1)
  - Use models to describe phenomena. (5-PS3-1)

Using Mathematics and Computational Thinking

- Mathematical and computational thinking in 3 - 5 builds on K - 2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions. Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2)

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.
  - Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5- ESS3-1*)*

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).
  - Support an argument with evidence, data, or a model. (5-LS1- 1)

Disciplinary Core Ideas

PS3.D: Energy in Chemical Processes and Everyday Life

- The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1)

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Living Systems: Life and Physical Sciences

NJSLS Science Content Standards - Arranged by Disciplinary Core idea (DCI)

LS1.C: Organization for Matter and Energy Flow in Organisms

- Plants acquire their material for growth chiefly from air and water. (5-LS1-1)
- Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1)

LS2.A: Interdependent Relationships in Ecosystems

- The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2- 1)

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)

ESS2.A: Earth Materials and Systems

- Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1)

ESS2.C: The Roles of Water in Earth's Surface Processes

- Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2)

ESS3.C: Human Impacts on Earth Systems

- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

Crosscutting Concepts

Energy and Matter

- Matter is transported into, out of, and within systems. (5-LS1-1)
- Energy can be transferred in various ways and between objects. (5-PS3-1)

Scale, Proportion, and Quantity

- Standard units are used to measure and describe physical quantities such as weight and volume. (5- ESS2-2)

Systems and System Models

- A system can be described in terms of its components and their interactions. (5-LS2-1), (5-ESS2-1), (5-ESS3-1)

Connections to Nature of Science

Science Addresses Questions About the Natural and Material World.

- Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3- 1)

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

- Science explanations describe the mechanisms for natural events. (5- LS2-1)

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Student Learning Objectives

Students will be able to…

- Communicate that the basic unit of life is the cell.
- Conduct investigations that demonstrate that all cells have basic needs—water, food, gas exchange, and waste disposal.
- Investigate how materials are transported to cells in multicellular organisms.
- Explain the structure and functions of the circulatory, respiratory, digestive and excretory systems in humans.
- Plan and conduct investigations that show that vascular plants have specialized tissue (xylem and phloem tubes) for the transport of water, minerals and sugar to cells.
- Discover that leaves play an important role in the transport of water to cells in vascular plants.
- explain that green plant cells make sugar from carbon dioxide and water in the presence of sunlight and release oxygen.
- Plan and conduct an investigation that demonstrates plant and animal cells obtain energy by breaking down sugar into carbon dioxide and water (cellular respiration).
- Classify leaves based on venation pattern.
- Design, conduct and analyze the results of experiments.
- Write scientific reports.
- Use metric tools and make and record quantitative observations in a scientific investigation.

Integrated Accommodations and Modifications		
Special Education Students	**English Language Learners**	**At Risk**
• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Provide repetition and practice. • Use visuals to demonstrate/model the processes	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) • Repeat, rephrase, paraphrase key concepts and directions	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Provide preferential seating to be mutually determined by the student and teacher

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• Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed Appendix A: Special Education Accommodations and Modifications	• Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

Gifted and Talented Students	**504 Plan**
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills. • Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence • Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts • Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments
Interdisciplinary Connections	**Computer Science and Design Thinking**
Connections to NJSLS - English Language Arts	**Computer Science and Design Thinking Practices**

Reading

- RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-LS1-1), (5-ESS2-1), (5-ESS2-2), (5-ESS3-1)
- RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-LS2-1), (5-ESS3-1), (5-PS3-1)
- RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-LS1-1), (5-ESS3-1)

Writing

- W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5- LS1-1)
- W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS2-2), (5-ESS3-1)
- W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (5- ESS3-1)

Speaking and Listening

- SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-LS2-1), (5-ESS2-1), (5-ESS2-2), (5-PS3-1)

Connections to NJSLS - Mathematics

- MP.2 Reason abstractly and quantitatively. (5-LS1-1), (5-LS2-1), (5-ESS2-1), (5-ESS2-2), (5-ESS3-1)
- MP.4 Model with mathematics. (5-LS1-1), (5-LS2-1), (5-ESS2-1), (5-ESS2-2), (5-ESS3-1)
- MP.5 Use appropriate tools strategically. (5-LS1-1)
- 5.MD.A.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems. (5-LS1-1)

15. ✓ Fostering an Inclusive Computing and Design Culture
16. ✓ Collaborating Around Computing and Design
17. ☐ Recognizing and Defining Computational Problems
18. ✓ Developing and Using Abstractions
19. ✓ Creating Computational Artifacts
20. ✓ Testing and Refining Computational Artifacts
21. ✓ Communicating About Computing and Design

Computer Science and Design Thinking Standards

Impacts of Computing

- The development and modification of computing technology is driven by individuals' needs and wants and can affect individuals differently.
    - 8.1.5.IC.1: Identify computing technologies that have impacted how individuals live and work and describe the factors that influenced the changes.

Data and Analysis

- Data can be organized, displayed, and presented to highlight relationships.
    - 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.
- Individuals can select, organize, and transform data into different visual representations and communicate insights gained from the 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.
- Many factors influence the accuracy of inferences and predictions.
    - 8.1.5.DA.5: Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

Engineering Design

- Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge. Often, several design solutions exist, each better in some way than the others.
    - 8.2.5.ED.1: Explain the functions of a system and its subsystems.

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● 5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS2-1)	○ 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. ● Engineering design requirements include desired features and limitations that need to be considered. ○ 8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints). ○ 8.2.5.ED.5: Describe how specifications and limitations impact the engineering design process. ○ 8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and tradeoffs identified in the design process. *Interaction of Technology and Humans* ● Societal needs and wants determine which new tools are developed to address real-world problems. ○ 8.2.5.ITH.1: Explain how societal needs and wants influence the development and function of a product and a system. ● A new tool may have favorable or unfavorable results as well as both positive and negative effects on society. Technology spurs new businesses and careers. ○ 8.2.5.ITH.2: Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have. ○ 8.2.5.ITH.3: Analyze the effectiveness of a new product or system and identify the positive and/or negative consequences resulting from its use. ○ 8.2.5.ITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career. *Nature of Technology* ● Technology innovation and improvement may be influenced by a variety of factors. Engineers create and modify technologies to meet people's needs and wants; scientists ask questions about the natural world. ○ 8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies. Effects of Technology on the Natural World ● The technology developed for the human designed world can have unintended consequences for the environment. Technology must be continually developed and made more efficient to reduce the need for non-renewable resources.

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	○ 8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems. ○ 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.

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- Utilize critical thinking to make sense of problems and persevere in solving them.
- Model integrity, ethical leadership and effective management.
- Plan education and career paths aligned to personal goals.
- Use technology to enhance productivity, increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

Career Readiness, Life Literacies and Key Skills Standards

9.1 Personal Financial Literacy

- You can give back in areas that matter to you.
    - 9.1.5.CR.1: Compare various ways to give back and relate them to your strengths, interests, and other personal factors

9.2 Career Awareness, Exploration, Preparation, and Training

- An individual's passions, aptitude and skills can affect his/her employment and earning potential.
    - 9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
    - 9.2.5.CAP.2: Identify how you might like to earn an income.
    - 9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
    - 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
- Income and benefits can vary depending on the employer and type of job or career.
    - 9.2.5.CAP.5: Identify various employee benefits, including income, medical, vacation time, and lifestyle benefits provided by different types of jobs and careers.

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9.4 Life Literacies and Key Skills

Creativity and Innovation

- Collaboration with individuals with diverse perspectives can result in new ways of thinking and/or innovative solutions.
    - 9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6).
    - 9.4.5.CI.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7).
- Curiosity and a willingness to try new ideas (intellectual risk-taking) contributes to the development of creativity and innovation skills
    - 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).
    - 9.4.5.CI.4: Research the development process of a product and identify the role of failure as a part of the creative process (e.g., W.4.7, 8.2.5.ED.6).

Critical Thinking and Problem-solving

- The ability to solve problems effectively begins with gathering data, seeking resources, and applying critical thinking skills.
    - 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 (e.g., 6.1.5.CivicsCM.3).

Digital Citizenship

- Intellectual property rights exist to protect the original works of individuals. It is allowable to use other people's ideas in one's own work provided that proper credit is given to the original source
    - 9.4.5.DC.2: Provide attribution according to intellectual property rights guidelines using public domain or creative commons media.
    - 9.4.5.DC.3: Distinguish between digital images that can be reused freely and those that have copyright restrictions.

Global and Cultural Awareness

- Culture and geography can shape an individual's experiences and perspectives.
    - 9.4.5.GCA.1: Analyze how culture shapes individual and community perspectives and points of view (e.g., 1.1.5.C2a, RL.5.9, 6.1.5.HistoryCC.8).

Information and Media Literacy

- Digital tools and media resources provide access to vast stores of information, but the information can be biased or inaccurate.
    - 9.4.5.IML.1: Evaluate digital sources for accuracy, perspective, credibility and relevance (e.g., Social Studies Practice - Gathering and Evaluating Sources).
- Digital tools can be used to modify and display data in various ways that can be organized to communicate ideas.
    - 9.4.5.IML.2: Create a visual representation to organize information about a problem or issue (e.g., 4.MD.B.4, 8.1.5.DA.3). • 9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data
- Specific situations require the use of relevant sources of information.
    - 9.4.5.IML.6: Use appropriate sources of information from diverse sources, contexts, disciplines, and cultures to answer questions (e.g., RI.5.7, 6.1.5.HistoryCC.7, 7.1.NM. IPRET.5).

Technology Literacy

- Different digital tools have different purposes.

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- 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.

- Collaborating digitally as a team can often develop a better artifact than an individual working alone.
  - 9.4.5.TL.4: Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a).
  - 9.4.5.TL.5: Collaborate digitally to produce an artifact (e.g., 1.2.5CR1d).

Climate Change

- **5-ESS2-1** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact
- **5-ESS3-1** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources, environment, and address climate change issues
- Also addressed in Unit 1

SEL Competencies

- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

https://www.nj.gov/education/safety/wellness/selearning/index.shtml

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards. Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods: ● Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy) ● Exit tickets, rotational activities (stations), quizzes, and small group activities ● Classwork, homework, group work (formative assessment) ● Pre-Assessment, teacher's observation, class discussion, and journal	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* **Benchmark Assessments:** ● Assessment 1.1: Mid-Unit Assessment ● Assessment 1.2: End of Unit Assessment ● Assessment 1.3: End of Unit Performance Assessment **Standardized Assessments:** ● NJSLA

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	Other Summative Assessments: Teachers are encouraged to design their own assessments (topic/module tests and quizzes) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary

Life, living, organism, environment, energy, matter, cell, transport, cell membrane, cell wall, warmth, gas exchange, waste disposal, food, vascular, non-vascular, xylem, phloem, leaf, venation, circulatory, respiratory, digestive, excretory, systems, organ, organ systems, tissue, carbon dioxide, water, minerals, cellular respiration, sugar, stimuli, information, brain, neural, perceptions, memories, food chain, food webs, microbes, fungi, bacteria, decomposers, decomposition, ecosystem, invasive species, introduced species, geosphere, hydrosphere, atmosphere, biosphere, climate, wind, clouds, agriculture, industry, land, vegetation, resources, environments

District/School Tasks	District/School Primary and Supplementary Resources
• Common Formative Assessments • Common District Summative Assessments • See above Assessment Sections for more information	**District-Mandated Resources** • FOSS Curriculum **Assessment Resources:** • Available on FOSS - ThinkLink • For additional resources, log in to https://edconnectnj.schoolnet.com **Other Resources:** • Generation Genius: "Brain Processing of Senses", "Food Webs", "Ecosystems", "How do we use food", "Human Body Systems" • Famous Biologists: Wangari Maathai (Amistad), Rosalind Franklin (Holocaust), Jane Goodall, Rachael Carson • Teaching Holocaust Activities for Middle School (can adapt for 5th grade) (Holocaust Resource) • SEL Activities: Breathing activities (tie into lungs/respiration, etc) **Project Ideas:** • "Spheres of Experts": Students become "experts" in one sphere (geosphere, hydrosphere, atmosphere, biosphere - make sure all 4 are represented) and create

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	models to teach their sphere to the larger group. Then expert groups are paired up to work together and present how the two systems interact. Gifted students/early finishers can extend to show the interactions between a third sphere as well if time allows (the third sphere is formative, assessment is limited to 2 spheres).
Instructional Best Practices and Exemplars	
See Appendix A for Instructional Best Practices and Exemplars	
Pacing Guide	
Science Grade 5, Unit 3: "Living Systems" Pacing Guide	

Appendix A: **Instructional Best Practices and Exemplars**

Appendix A: Instructional Best Practices and Exemplars: Unit 1

Appendix A: Instructional Best Practices and Exemplars: Unit 2

Appendix A: Instructional Best Practices and Exemplars: Unit 3

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Appendix B:

Exemplars and Explanations

Appendix B: Instructional Exemplars and Explanations: Unit 1

Appendix B: Instructional Exemplars and Explanations: Unit 2

Appendix B: Instructional Exemplars and Explanations: Unit 3

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Appendix C:

<subject> Classroom Philosophy, Schedule, Structure, and Expectations

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