Science

Grade 5

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Science
Grade 5

Course Description:

The fifth-grade science curriculum is aligned with the New Jersey Student Learning Standards and focuses on the science content and practices that are essential for college and career readiness. Understanding science requires individuals to integrate a complex structure of many types of knowledge. These knowledge types include the ideas of science, the relationship between the ideas, the reasons for these relationships, and the ways to use these ideas to complete the following tasks: explain and predict other phenomena, interpret situations, solve problems, and participate productively in science practice and discourse. Students will display an understanding of the application of core principles and an integration of that knowledge with the processes that are necessary for practicing science. These practices emphasize the importance of students independently creating scientific arguments and explanations for observations made during investigations. Students will form the ability to examine their own knowledge and conceptual frameworks, to evaluate them in relation to new information or competing alternative frameworks, and to alter them by a deliberate and conscious effort is key scientific practices. The fifth-grade science curriculum becomes a sense-making enterprise for students in which they will be provided with ongoing opportunities to interact directly with the natural and designed world using tools, data collection techniques, models, and theories of science including; actively participating in scientific investigations, using cognitive and manipulative skills associated with the formulation of scientific explanations, and using evidence, applying logic, and constructing arguments for their proposed explanations.

Course Sequence:

Unit Title	Pacing
Unit 1: Matter and its Interactions	31 days
Unit 2: Interactions, Energy, and Dynamics in Ecosystems	24 days
Unit 3: Earth and Human Interactions	22 days
Unit 4: Earth's Place in the Universe	24 days
Total:	101 days

Prerequisite:

Fourth-grade science

UNIT #1: Matter and its Interactions

Overview

Content Area: Science

Unit Title: Matter and its Interactions

Grade Level(s): 5

Core Ideas: In this unit of study, students describe that matter is made of particles too small to be seen by developing a model. In addition, students will also develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved. Students determine whether the mixing of two or more substances results in new substances.

Standards (Content and Technology)

CPI#:	Statement:
Performance Expectations (NJSLS)	
5-PS1-1	Develop a model to describe that matter is made of particles too small to be seen.
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.
5-PS1-3	Make observations and measurements to identify materials based on their properties
5-PS1-4	Conduct an investigation to determine whether the mixing of two or more substances results in new substances
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
Career Readiness (9.2) Life Literacies, and Key Skills (standard 9.1, 9.4)	
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.
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.
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.
Technology Literacy (standard 8 or 9.4.(TL))	
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
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.5	Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
Interdisciplinary Connection	
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)
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)
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)
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)
MP.2	Reason abstractly and quantitatively. (5-PS1-1)
MP.4	Model with mathematics. (5-PS1-1)
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)

Cross-cultural Statements/Mandates (*Amistad, Holocaust, LGBT/Disabilities, SEL, etc...)*

Expose students to the work Bettye Washington Green, chemist. Ms. Green was the first female African American chemist to work at the Dow Chemical Company where her research focused on polymers.

Unit Essential Question(s):

- How do particles combine to form the variety of matter one observes?
- How can substances combine or change (react) to make new substances?
- How does one characterize and explain these reactions and make predictions about them

Science and Engineering Practices:

- Develop a model to describe phenomenon; (5-PS1-1)
  *Students will develop Frayer Model & model of an Atom
- Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)
  *Students will engineer a bridge and make stronger through trial and error

Crosscutting Concepts:

- Scale, Proportion, and Quantity
  **Natural objects exist from the very small to the immensely large. (5- PS1-1)

(An asterisk (*) indicates placement in the activities and timeline below.)

Enduring Understandings/ Disciplinary Core Ideas:

- 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 that shows that gasses 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.
- When two or more substances are mixed, a new substance with different properties may be formed.
- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish

Evidence of Learning

Formative Assessments:

Students who understand these concepts can…

- Make observations and measurements to identify materials based on their properties.
  - 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.
- Develop a model to describe that matter is made of particles too small to be seen. Examples of evidence could include: Adding air to expand a basketball, Compressing air in a syringe, dissolving sugar in water, and Evaporating salt water.
- Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
- Measure and describe physical quantities such as weight, time, temperature, and volume
- Measure and graph quantities such as weight to address scientific and engineering questions and problem
- Measure and graph quantities to provide evidence that regardless of the type of change that occurs when substances are heated, cooled, or mixed, the total weight is conserved. (Note: Assessment does not include distinguishing between mass and weight.) Examples of reactions or changes could include: Phase changes, Dissolving, and Mixing

Summative/Benchmark Assessment(s):

- Quizzes
- Unit test
- Model creation with rubric

Alternative Assessments:
- Modified versions of formative and summative assessments, project-based assessments, and oral assessments

Resources/Materials:	**Key Vocabulary:**
● Discovery Education techbook	● vocabulary unique to each mini unit

Suggested Pacing Guide

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete**
Review of Matter	Students will be able to: ● Describe the three states of matter. ● Understand that we can describe matter based on its properties ● Identify properties of matter including mass, volume, density, color, texture, and temperature ● Observe examples of matter and compare and contrast them according to their properties	● define vocabulary ● Nearpod ● fill in notes ● Generation Genius video ● virtual lab ● properties lab	4 days
Formative Assessment	Students will be able to: ● Complete a formative assessment on matter		1 day
Atoms	Students will be able to: ● Explain that all matter is made of atoms ● *Model the parts that make up an atom ● **Analyze how atoms combine to form molecules ● **Describe the size of atoms and molecules.	● define vocabulary ● Nearpod ● fill in notes ● virtual lab ● *Create Model of an atom ● **Draw molecules and atoms (compare)	4 days
Formative Assessment	Students will be able to: ● Complete a formative assessment on atoms		1 day
Types of Mixtures	Students will be able to: ● Explain what a mixture is and develop logical arguments for classifying examples as mixtures. ● Differentiate between heterogeneous and homogeneous mixtures. ● Explain how the unique properties of a solution distinguish it from other mixtures.	● define vocabulary ● Nearpod ● fill in notes ● virtual lab	3 days

Solutions	Students will be able to: ● *Develop a model that describes solutions as mixtures made of particles too small to be seen. ● Distinguish between solutions and mixtures are not solutions. ● Evaluate the mixing of substances to determine if a new substance has been created. ● Analyze materials in order to classify them by their level of solubility.	● define vocabulary ● Nearpod ● fill in notes ● virtual lab ● Mixtures and solutions *Frayer Model creation	3 days
Formative Assessment	Students will be able to: ● Complete a formative assessment on mixtures and solutions		1 day
Changing States	Students will be able to: ● Explain what happens when a substance melts and freezes ● Compare evaporating with boiling ● Explain what happens when a substance condenses ● Describe how changes of states affect the mass of a substance.	● define vocabulary ● Nearpod ● fill in notes ● virtual lab ● Generation Genius video ● Physical and chemical change lab	4 days
Chemical Changes	Students will be able to: ● Explain how a chemical change differs from a physical change ● Describe what happens during a chemical change ● Explain how energy is involved in chemical change ● Explain how mass is affected by chemical change	● define vocabulary ● Nearpod ● fill in notes ● virtual lab ● Combination of matter lab	4 days
Formative Assessment	Students will be able to: ● Complete a formative assessment on changing states and chemical changes		1 day
Building with Materials	Students will be able to: ● Compare the strengths of a variety of structural shapes. ● *Describe how parts can be combined to form a strong structure ● Design and build a prototype to solve a construction problem ● Evaluate the advantages and disadvantages of a prototype or other possible solution to an engineering problem.	● Nearpod/Notes ● *Design and build bridge out of different material ● Graph strength ● Evaluate performance ● Trial and error to improve	3 days
Review	Students will be able to: ● Review information from Unit		1 day
Summative Assessment	Students will be able to: ● Complete a summative assessment on Unit 1.		1 day
Teacher Notes:			

Address the following misconceptions:

- They might believe that atoms can be seen with an optical microscope. In fact, the tiny size of atoms is difficult to imagine. They are too small to be seen with an optical microscope.
- They may think of atoms as tiny spheres that cannot be divided into even smaller parts. In fact, all atoms are composed of tiny subatomic particles.
- They may think that each type of matter can only exist in one state. In fact, matter can change states, as when a liquid boils, changing to a gas. When matter changes states, some of its properties also change.
- You can always see the components of a mixture. Reality: In many mixtures, the components are difficult or impossible to see. Milk and orange juice are examples. So is water from the tap, which is not pure water but rather a mixture of water with dissolved minerals and gasses.
- When water evaporates, the dissolved substances evaporate as well. Reality: When water evaporates, dissolved solids such as salt and sugar will remain behind.
- They may think that all mixtures are solutions. This misconception may cause students to refer to all mixtures as solutions. While all solutions are mixtures, only mixtures that appear to be a single substance because the components are evenly mixed are solutions.
- Students may think substances have to be cold to freeze and hot to boil. In reality, changes of state occur at different temperatures for different substances. Liquid iron is rather hot when it freezes, and liquid nitrogen is very cold when it boils.
- Students may think a change in state is a chemical change leading to the formation of new substances. However, changes of state only result in a change of the motion of the particles, not a change in the identity of the particles
- A failed design has no value. Reality: Sometimes, engineers learn more from failures than from successes. Failure is very common. When a design fails, an engineer investigates the cause of the failure and then modifies the design

Additional Resources:

- Generation Genius
- IXL
- Flocabulary
- BrainPop
- Crash Course for Kids

Differentiation/Modification Strategies

Students with Disabilities	**English Language Learners**
● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions, and permit drawing, as an explanation ● Accept participation at any level ● Consult with case managers and follow student IEP	● Consult student ELL Plan/ELL educator ● Assign a buddy, same language or English speaking ● Allow errors in speaking ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions ● Accept participation at any level
Gifted & Talented Students	**Students at Risk**
● Consult with G and T teacher ● Provide extension activities ● Build on students' intrinsic motivations	● Consult with I &RS, classroom teacher(s), and guidance counselors as needed ● Follow I & RS procedures/action plans ● Provide extended time to complete tasks ● Provide rewards as necessary
504 Students	**Other:**
● Consult 504 Plan and follow accommodations/modifications ● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions ● Accept participation at any level	

UNIT #2: Interactions, Energy, and Dynamics in Ecosystems

Overview

Content Area: Science

Unit Title: Interactions, Energy, and Dynamics in Ecosystems

Grade Level(s): 5

Core Ideas: In this unit of study, students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment, and they can explain that energy in animals' food was once energy from the sun. The crosscutting concepts of energy and matter and systems and system models are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in developing and using models and engaging in argument from evidence. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Standards (Content and Technology)

CPI#:	Statement:
Performance Expectations (NJSLS)	
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.
5-LS1-1	Support an argument that plants get the materials they need for growth chiefly from air and water
5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
Career Readiness (9.2) Life Literacies, and Key Skills (standard 9.1, 9.4)	
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.
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.
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.
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
9.4.5.CT.	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
Technology Literacy (standard 8 or 9.4.(TL))	
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
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.5	Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
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.ETW.1	Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems.

Interdisciplinary Connection	
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)
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)
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)
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)
W.5.1	Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-LS1-1)
MP.2	Reason abstractly and quantitatively. (5-PS1-1)
MP.4	Model with mathematics. (5-PS1-1)
MP.5	Use appropriate tools strategically. (5-LS1-1)
W.5.8	SLRecall 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)
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)
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)

Cross-cultural Statements/Mandates (*Amistad, Holocaust, LGBT/Disabilities, SEL, etc...)*

Expose students to the work of Steward Pickett, the first Black ESA President. Dr. Pickett is an expert in the ecology of plants, landscapes, and ecosystems.

Unit Essential Question(s):

Where do plants get the materials they need for growth?

- How does matter move among plants, animals, decomposers, and the environment?
- How can energy in animals' food be traced to the sun?
- How and why do organisms interact with their environment and what are the effects of these interactions?

Science and Engineering Practices:

- Develop a model to describe phenomenon;(5-PS1-1)
  *Students will model energy in an ecosystem through a diorama

Crosscutting Concepts:

- Systems and System Models
  **A system can be described in terms of its components and their interactions. (5-LS2-1)
- Energy and Matter
  **Matter is transported into, out of, and within systems. (5-LS1-1)

(An asterisk (*) indicates placement in the activities and timeline below.)

Enduring Understandings/ Disciplinary Core Ideas:

- Matter is transported into, out of, and within systems.
- Plants acquire their material for growth chiefly from air and water.
- Science explanations describe the mechanisms for natural events.
- A system can be described in terms of its components and their interactions.
- 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
- Energy can be transferred in various ways and between objects.
- The energy released from food was once energy from the sun, which was captured by plants in the chemical process that forms plant matter (from air and water)

	● Food provides animals with the materials they need for body repair and growth and the energy they need for motion and to maintain body warmth.

Evidence of Learning

Formative Assessments:

Students who understand these concepts can…

- Describe how matter is transported into, out of, and within systems.
- Support an argument with evidence, data, or a model.
- Support an argument that plants get the materials they need for growth chiefly from air and water.
- Describe a system in terms of its components and interactions.
- Develop a model to describe phenomena.
- Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. (Assessment does not include molecular explanations.)
- Emphasis is on the idea that matter that is not food—such as air, water, decomposed materials in soil—is changed
  into matter that is food. Examples of systems could include: Organisms, Ecosystems, and Earth
- Describe how energy can be transferred in various ways and between objects.
- Use models to describe phenomena.
- Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body.

Summative/Benchmark Assessment(s):

- Quizzes
- Unit test
- Model creation with rubric

Alternative Assessments:

- Modified versions of formative and summative assessments, project-based assessments, and oral assessments

Resources/Materials:	**Key Vocabulary:**
● Discovery Education techbook	● unique to each mini unit

Suggested Pacing Guide

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete**
Food and Oxygen	Students will be able to ● Describe how animals get energy from plants and other animals. ● Interpret and create food webs. ● Give examples of how animals get oxygen in different ways. ● Give examples of how animals use special actions and body parts to get the food they need.	● define vocabulary ● Nearpod ● fill in notes	4 days
Basic Needs of Plants	Students will be able to: ● **Explain how plants get the materials they need to survive and grow. ● **Describe the systems plants have to transport water and nutrients.	● define vocabulary ● Nearpod ● fill in notes ● BrainPop ● **virtual lab photosynthesis and nutrients in plants	4 days

	● **Explain the importance of photosynthesis.		
Formative Assessment	Students will be able to: ● Complete a formative assessment on basic needs of plants		1 day
Parts of Ecosystems	Students will be able to: ● Explain what makes up a balanced or healthy ecosystem. ● Explain the interdependence and interactions in an ecosystem. ● *Demonstrate through a model how energy flows through an ecosystem.	● define vocabulary ● Nearpod ● fill in notes ● Generation Genius ● virtual lab ● *ecosystem diorama	6 days
Formative Assessment	Students will be able to: ● Complete a formative assessment on parts of ecosystems.		1 day
Energy in Systems	Students will be able to: ● Explain how energy can change forms within a system. ● Describe how many systems convert energy to heat or motion. ● **Explain how energy changes form when it passes to a different organism in an ecosystem. ● **Create food-chain diagrams of several common foods. ● Describe how moving water and air act as sources of energy that can be used to make things move.	● define vocabulary ● Nearpod ● fill in notes ● virtual lab ● **food web activity	5 days
Formative Assessment	Students will be able to: ● Complete a formative assessment on energy in systems		1 day
Review	Students will be able to: ● Review information from Unit 2: Interactions, Energy and Dynamics in an Ecosystem		1 day
Summative Assessment	Students will be able to: ● Complete a summative assessment on Unit.		1 day
Teacher Notes: ***Address the following misconceptions:*** ● Students may think that fish breathe water. Actually, fish use their gills to absorb oxygen that is dissolved in			

- Students may think that plants need oxygen for survival. In fact, plants need carbon dioxide for photosynthesis, and they release oxygen into the air as a waste product of photosynthesis. Plants do use oxygen for their own respiration.
- Students may think that ecosystems only include living things. In fact, ecosystems are composed of living and nonliving things.
- Students may think that energy is a tangible thing. In fact, energy is defined as the capacity to do work. It is not transferred as an object or thing, but it can create changes in objects or things.

Additional Resources:

- Generation Genius
- IXL
- Flocabulary
- BrainPop
- Crash Course for Kids

Differentiation/Modification Strategies

Students with Disabilities	**English Language Learners**
● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions, and permit drawing, as an explanation ● Accept participation at any level ● Consult with case managers and follow student IEP	● Consult student ELL Plan/ELL educator ● Assign a buddy, same language or English speaking ● Allow errors in speaking ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions ● Accept participation at any level
Gifted & Talented Students	**Students at Risk**
● Consult with G and T teacher ● Provide extension activities ● Build on students' intrinsic motivations	● Consult with I &RS, classroom teacher(s), and guidance counselors as needed ● Follow I & RS procedures/action plans ● Provide extended time to complete tasks ● Provide rewards as necessary
504 Students	**Other:**
● Consult 504 Plan and follow accommodations/modifications ● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions ● Accept participation at any level	

UNIT #3: Earth and Human Activity

Overview

Content Area: Science

Unit Title: Earth and Human Activity

Grade Level(s): 5

Core Ideas: In this unit of study, students describe and graph data to provide evidence about the distribution of water on Earth. The crosscutting concepts of scale, proportion, quantity and systems, and systems models are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade appropriate proficiency in using mathematics and computational thinking and in obtaining, evaluating, and communicating information. Students are also able to describe ways in which the geosphere, biosphere, hydrosphere, and atmosphere interact. The crosscutting concept of systems and system models is called out as an organizing concept for this disciplinary core idea. Students are expected to demonstrate grade-appropriate proficiency in developing and using models, obtaining, evaluating, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Standards (Content and Technology)

CPI#:	Statement:
Performance Expectations (NJSLS)	
5-ESS2-1	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
5-ESS2-2	Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
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.
Career Readiness (9.2) Life Literacies, and Key Skills (standard 9.1, 9.4)	
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.
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
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
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.
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.
9.4.5.CT.4	Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global
Technology Literacy (standard 8 or 9.4.(TL))	
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
8.1.5.DA.3	Organize and present collected data visually to communicate insights gained from different views of the data.
8.1.5.DA.4	Organize and present climate change data visually to highlight relationships or support a claim.

8.1.5.DA.5	Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
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.
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.
Interdisciplinary Connection	
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)
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)
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)
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)
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)
W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-ESS3-1)
MP.2	Reason abstractly and quantitatively. (5-PS1-1)
MP.4	Model with mathematics. (5-PS1-1)
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-ESS2-1)
Cross-cultural Statements/Mandates (*Amistad, Holocaust, LGBT/Disabilities, SEL, etc...)*	
Expose students to the work of marine biologist Rachel Carson. Ms. Carson passionately published work on how pesticides damage natural habitats. (LGBT)	

Unit Essential Question(s):	**Enduring Understandings/ Disciplinary Core Ideas:**
● Where is water found on Earth? What percentage of Earth's water is fresh water? ● How and why is the earth constantly changing? ● How do individual communities use science ideas to protect Earth's resources and environment?	● 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.

- In what ways do the geosphere, biosphere, hydrosphere, and/or atmosphere interact?
- How do individual communities use science ideas to protect Earth's resources and environment?

Science and Engineering Practices:

- Develop a model using an example to describe a scientific principle. (5-ESS2-1)
  *Students will create a water cycle model
- Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2)
  *Students will understand the amount of garbage produced by humans quantatively and come up with solutions for discarding.

Crosscutting Concepts:

- Systems and System Models
  **A system can be described in terms of its components and their interactions. (5-ESS2-1)

(An asterisk (*) indicates placement in the activities and timeline below.)

- A system can be described in terms of its components and their interactions.
- Science findings are limited to questions that can be answered with empirical evidence.
- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space.
- A system can be described in terms of its components and their interactions.
- 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).
- The Earth's major 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 landforms to determine patterns of weather.
- Individuals and communities are doing things to help protect Earth's resources and environments.

Evidence of Learning

Formative Assessments:

Students who understand these concepts can…

- Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
- Describe a system in terms of its components and interactions.
- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
- Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
- Describe a system in terms of its components and interactions.
- Develop a model using an example to describe a scientific principle.
- Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. (The geosphere, hydrosphere, atmosphere, and biosphere are each a system. Assessment is limited to the interactions of two systems at a time.) Examples could include: The influence of oceans on ecosystems, landform shape, and climate; The influence of the atmosphere on landforms and ecosystems through weather and climate; The influence of mountain ranges on the wind and clouds in the atmosphere.

Summative/Benchmark Assessment(s):

- Quizzes
- Unit test
- Model creation with rubric

Alternative Assessments:

- Modified versions of formative and summative assessments, project-based assessments, and oral assessments

Resources/Materials:

- Discovery Education techbook

Key Vocabulary:

- unique to each mini unit

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete
Review of Water Cycle	Students will be able to: ● Develop a simple model of the water cycle. ● Describe how Earth's systems interact in the water cycle. ● *Explain the processes by which water changes state during the water cycle. ● Describe how water collects in bodies on Earth's surface and underground.	● define vocabulary ● Nearpod ● fill in notes ● *water cycle model	2 days
Waters of the Earth	Students will be able to: ● Explain how lakes and rivers form. ● Describe uses of lakes and rivers. ● *Explain the difference between fresh water and salt water. ● Describe the estuary ecosystem and the interdependence of its inhabitants. ● *Describe characteristics of the ocean.	● define vocabulary ● Nearpod ● fill in notes ● Generation Genius ● virtual lab ● graphing saltwater and freshwater	4 days
Formative Assessment	Students will be able to: ● Complete a formative assessment on waters of the Earth		1 day
Water in the Atmosphere	Students will be able to: ● Compare and contrast the forms of visible moisture in the air, including fog, clouds, and precipitation. ● Describe invisible moisture in the air in the form of water vapor. ● **Investigate and explain how clouds form. ● **List and describe the three factors involved in cloud formation.	● define vocabulary ● Nearpod ● fill in notes ● BrainPop ● **virtual lab- how do clouds form	4 days

	● Explain how different cloud types are related to different types of weather.		
Formative Assessment	Students will be able to: ● Complete a formative assessment on water in the atmosphere		
Formation of Landforms	Students will be able to: ● Explain how wind, water, and ice help shape the surface of the Earth. ● Describe the processes involved in forming, valleys, canyons, deltas, and dunes. ● *Evaluate the impact of human activities on different landforms.	● define vocabulary ● Nearpod ● fill in notes ● Generation Genius ● virtual lab ● *Simulation- how do humans impact earth based on the amount of garbage hey create in a day/moth/year. Where do we put it?	4 days
Formative Assessment	Students will be able to: ● Complete a formative assessment on formation of landforms		1 day
Alternative Energy Sources	Students will be able to: ● Identify natural resources from which energy can be produced. ● Distinguish between renewable and nonrenewable resources and their use as energy resources. ● Explain the advantages and disadvantages of alternative energy resources. ● Describe some of the things individuals and communities are doing to help protect Earth's resources and environments.	● define vocabulary ● Nearpod ● fill in notes ● virtual lab ● alternative energy lab	4 days
Formative Assessment	Students will be able to: ● Complete a formative assessment on alternative energy sources		1 day
Review	Students will be able to: ● Review information from Unit 3: Earth and Human Interaction		1 day
Teacher Notes: ***Address the following misconceptions:***			

- Students may think groundwater and surface water are separate systems. In fact, all water is connected through the water cycle and gets recycled again and again.
- Students may develop the misconception that water evaporates only from the oceans. In fact, it evaporates from inland bodies of water and from the ground as well.
- They might believe that humidity is liquid water. Actually, humidity is a measure of the amount of water vapor in the air. Water vapor is an invisible gas.
- All the energy contained in a natural resource such as coal can be used for practical purposes like making electricity, forgetting energy losses. Reality: When extracting energy from natural resources, not all of the energy is available to do useful work; some of the energy ends up as heat or other forms of unusable energy.

Additional Resources:

- Generation Genius
- IXL
- Flocabulary
- BrainPop
- Crash Course for Kids

Differentiation/Modification Strategies

Students with Disabilities	**English Language Learners**
● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions, and permit drawing, as an explanation ● Accept participation at any level ● Consult with case managers and follow student IEP	● Consult student ELL Plan/ELL educator ● Assign a buddy, same language or English speaking ● Allow errors in speaking ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions ● Accept participation at any level
Gifted & Talented Students	**Students at Risk**
● Consult with G and T teacher ● Provide extension activities ● Build on students' intrinsic motivations	● Consult with I &RS, classroom teacher(s), and guidance counselors as needed ● Follow I & RS procedures/action plans ● Provide extended time to complete tasks ● Provide rewards as necessary
504 Students	**Other:**
● Consult 504 Plan and follow accommodations/modifications ● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions ● Accept participation at any level	

UNIT #4: Earth's Place in the Universe

Overview

Content Area: Science

Unit Title: Earth's Place in the Universe

Grade Level(s): 5

Core Ideas: In this unit of study, students develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. The crosscutting concepts of patterns, cause and effect, and scale, proportion, and quantity are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in analyzing and interpreting data and engaging in argument from evidence. Students are also expected to use these practices to demonstrate an understanding of the core ideas.

Standards (Content and Technology)

CPI#:	Statement:
Performance Expectations (NJSLS)	
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.
5-ESS1-2	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
5-PS2-1	Support an argument that the gravitational force exerted by Earth on objects is directed down.
Career Readiness (9.2) Life Literacies, and Key Skills (standard 9.1, 9.4)	
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.
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
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.
9.4.5.CT.4	Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global
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.
9.4.5.TL.5	Collaborate digitally to produce an artifact
Technology Literacy (standard 8 or 9.4.(TL))	
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
8.1.5.DA.5	Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
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.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.
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.
Interdisciplinary Connection	
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)
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)
W.5.1	Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-ESS1-1)
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)
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)
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)
W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-ESS3-1)
MP.2	Reason abstractly and quantitatively. (5-PS1-1)
MP.4	Model with mathematics. (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-ESS2-1)
Cross-cultural Statements/Mandates (*Amistad, Holocaust, LGBT/Disabilities, SEL, etc...)*	
Expose students to the work of astrophysicist Neil deGrasse Tyson. (Amistad)	

Unit Essential Question(s):	**Enduring Understandings/ Disciplinary Core Ideas:**
● What effect does Earth's gravitational force have on objects?	● Cause-and-effect relationships are routinely identified and used to explain change.

- What effect does the relative distance from Earth have on the apparent brightness of the sun and other stars?
- What is the universe, and what is Earth's place in it?
- What patterns do we notice when observing the sky?

Science and Engineering Practices:

- Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (5- ESS1-2)
  *model and graph seasons based on hemisphere and tilt of earth

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)

(An asterisk (*) indicates placement in the activities and timeline below.)

- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.
- Natural objects exist from the very small to the immensely large.
- 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.
- Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena.
- 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; Different positions of the sun, moon, and stars at different times of the day, month, and year.

Evidence of Learning

Formative Assessments:
Students who understand these concepts can…

- Identify cause-and-effect relationships in order to explain change.
- Support an argument with evidence, data, or a model.
- Support an argument that the gravitational force exerted by Earth on objects is directed down. ("Down" is a local description of the direction that points toward the center of the spherical Earth.)
- Support an argument with evidence, data, or a model.
- Support an argument that differences in the apparent brightness of the sun compared to that of other stars is due to their relative distances from Earth.
- Sort, classify, communicate, and analyze simple rates of change for natural phenomena using similarities and differences in patterns.
- Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.
- 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. Examples of patterns could include: The position and motion of Earth with respect to the sun; Selected stars that are visible only in particular months.

Summative/Benchmark Assessment(s):

- Quizzes
- Unit test
- Model creation with rubric

Alternative Assessments:

- Modified versions of formative and summative assessments, project-based assessments, and oral assessments

Resources/Materials:	**Key Vocabulary:**
● Discovery Education techbook	● unique to each mini unit

Suggested Pacing Guide

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete

Gravity	Students will be able to: ● Explain that things on or near Earth are pulled toward Earth by gravity. ● Demonstrate that Earth's gravity pulls objects toward it without touching them. ● Defend the claim that objects with greater masses have a greater gravitational pull between them than objects with lesser masses. ● **Cite evidence that shows that objects that are closer together have a greater gravitational pull between them than objects that are farther apart.	● define vocabulary ● Nearpod ● fill in notes ● virtual lab ● **gravity lab- graph gravitational pull on objects	4 days
Formative Assessment	Students will be able to: ● Complete a formative assessment on gravity.		1 day
Constellations	Students will be able to: ● Classify stars and constellations, and give examples of each. ● Explain why stars appear so small in the night sky and how telescopes help us see them better. ● Explain why stars appear to move in the sky. ● Explain why stars appear so small in the night sky and how telescopes help us see them better. ● Explain why stars appear to move in the sky. ● Summarize ways the stars have helped people throughout history. ● Distinguish ways that stars are different from one another.	● define vocabulary ● Nearpod ● fill in notes ● Generation Genius ● virtual lab ● constellation viewer ● constellation project	3 days
Our Star the Sun	Students will be able to: ● Summarize the characteristics of the sun. ● Explain why the sun is important to life on Earth.	● define vocabulary ● Flocabulary ● Nearpod ● fill in notes ● Generation Genius ● virtual lab	4 days

	● Distinguish what happens to different objects that are exposed to the sun and why. ● Explain why the sun appears larger and brighter than other stars.		
Formative Assessment	Students will be able to: ● Complete a formative assessment on constellations and the sun.		1 day
The Cycle of Day and Night	Students will be able to: ● Model the Earth's rotation on its axis and explain how it creates the cycle of day and night. ● Draw a simple diagram to explain that when it is daytime on one side of the Earth, it is nighttime on the other. ● Explain how Earth's rotation affects the way that we view the planets, Sun, and stars.	● define vocabulary ● Nearpod ● fill in notes ● Generation Genius ● virtual lab	4 days
The Seasons	Students will be able to: ● Connect the fact that Earth's seasons are caused due to the tilt of Earth's axis. ● *Model the position of Earth and the sun in different seasons. ● Explain why the seasons are opposite in the Northern and Southern Hemispheres. ● Know that the path of the sun is predictable from day to day and season to season. ● Explain why we see different constellations in the night sky at different times of the year.	● Video- Earth Seasons (Youtube) ● *Record temperatures as a team on earth during specific seasons. ● *Coordinate data and make a conclusion about temperature/seasons dependent on hemisphere (Graph)	4 days
Formative Assessment	Students will be able to: ● Complete a formative assessment on day and night and seasons		1 day
Review	Students will be able to: ● Review information from Unit 4: Earth's Place in the Universe		1 day
Summative Assessment	Students will be able to:		1 day

	● Complete a summative assessment on Unit.		

Teacher Notes:
Address the following misconceptions:

- They may think that there is no gravity in space. In fact, the force of gravity acts between all objects in the universe.
- They may believe that gravity increases with height. In fact, gravity is the force of attraction between two objects. The greater the masses of the objects and the smaller the distance between them, the greater is the gravitational pull between them.
- They may think that the stars appear to move in the night sky because of the stars' movement; in fact, the stars appear to move because of Earth's rotation and orbit around the sun. It is like turning in a circle. The objects around you appear to move, but it is actually you who is moving.
- They may think the sun actually travels across the sky throughout the day. In fact, the sun only appears to move this way because Earth is rotating on its axis.
- They may believe that if it is daytime where they live, it is daytime everywhere on Earth. Actually, as Earth rotates, about half of the planet experiences day while the other half experiences night.
- They may think that Earth's changing seasons are caused by the changing distance between Earth and the sun. Actually, the seasons change because Earth's axis remains tilted in one direction in space as it orbits the sun. When a hemisphere is tilted toward the sun, it has summer, and when a hemisphere is tilted away from the sun, it has winter

Additional Resources:

- Generation Genius
- IXL
- Flocabulary
- BrainPop
- Crash Course for Kids

Differentiation/Modification Strategies

Students with Disabilities	**English Language Learners**
● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions, and permit drawing, as an explanation ● Accept participation at any level ● Consult with case managers and follow student IEP	● Consult student ELL Plan/ELL educator ● Assign a buddy, same language or English speaking ● Allow errors in speaking ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions ● Accept participation at any level
Gifted & Talented Students	**Students at Risk**
● Consult with G and T teacher ● Provide extension activities ● Build on students' intrinsic motivations	● Consult with I &RS, classroom teacher(s), and guidance counselors as needed ● Follow I & RS procedures/action plans ● Provide extended time to complete tasks ● Provide rewards as necessary
504 Students	**Other:**
● Consult 504 Plan and follow accommodations/modifications ● Allow errors ● Rephrase questions, directions, and explanations ● Allow extended time to answer questions ● Accept participation at any level	