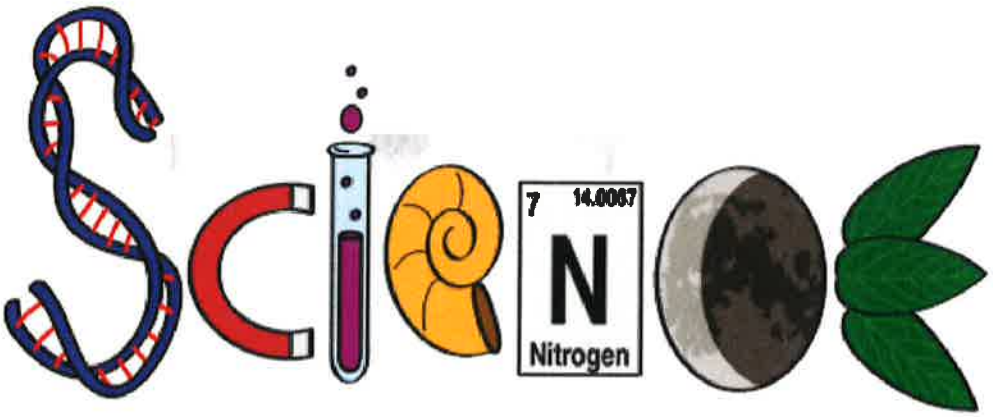
North Caldwell Public Schools

Science Curriculum K-6



Board Approval: **8/15/2022**

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North Caldwell
Science Curriculum

I. Science

Scientific and technological advances have proliferated and now permeate most aspects of life in the 21st century. It is increasingly important that all members of our society develop an understanding of scientific and engineering concepts and processes. Learning how to construct scientific explanations and how to design evidence-based solutions provides students with tools to think critically about personal and societal issues and needs. Students can then contribute meaningfully to decision-making processes, such as discussions about climate change, new approaches to health care, and innovative solutions to local and global problems.

II. Mission

All students will possess an understanding of scientific concepts and processes required for personal decision-making, participation in civic life, and preparation for careers in STEM fields (for those that chose).

III. Vision

Prepare students to become scientifically literate individuals who can effectively:

- Apply scientific thinking, skills, and understanding to real-world phenomena and problems;
- Engage in systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned;
- Conduct investigations, solve problems, and engage in discussions;
- Discuss open-ended questions that focus on the strength of the evidence used to generate claims;
- Read and evaluate multiple sources, including science-related magazine and journal articles and web-based resources to gain knowledge about current and past science problems and solutions and develop well-reasoned claims; and
- Communicate ideas through journal articles, reports, posters, and media presentations that explain and argue.

IV. COURSE DESCRIPTION:

The New Jersey Student Learning Standards for Science (NJSLS-S) describe the expectations for what students should know and be able to do, as well as promote three-dimensional science instruction across the three science domains (i.e. physical sciences, life science, Earth and space sciences). From the earliest grades, the expectation is that students will engage in learning experiences that enable them to investigate phenomena, design solutions to problems, make sense of evidence to construct arguments, and critique and discuss those arguments (in appropriate ways relative to their grade level)

The foundation of the NJSLS-S reflects three dimensions – science and engineering practices, disciplinary core ideas, and crosscutting concepts. The performance

expectations are derived from the interplay of these three dimensions. Within each standard, the three dimensions are intentionally presented as integrated components to foster sensemaking and designing solutions to problems. Because the NJSLS-S is built on the notions of coherence and contextuality, each of the science and engineering practices and crosscutting concepts appear multiple times across topics and at every grade level. Additionally, the three dimensions should be an integral part of every curriculum unit and should not be taught in isolation.

Disciplinary Core Ideas:

Physical Science:

- PS1: Matter and Its Interaction
  - PS1.A: Structure and Properties of Matter
  - PS1.B: Chemical Reactions
  - PS1.C: Nuclear Processes

- PS2: Motion and Stability: Forces and Interactions
  - PS2.A: Forces and Motion
  - PS2.B: Types of Interactions
  - PS2.C: Stability and Instability in Physical Systems

- PS3: Energy
  - PS3.A: Definitions of Energy
  - PS3.B: Conservation of Energy and Energy Transfer
  - PS3.C: Relationship Between energy and Forces
  - PS3.D: Energy in Chemical Processes and everyday Life

- PS4: Waves and Their Applications in Technologies for Information Transfer
  - PS4.A: Wave Properties
  - PS4.B: Electromagnetic Radiation
  - PS4.C: Information Technologies and Instrumentation

Life Science:

- LS1: From Molecules to Organisms: Structures and Processes
  - LS1.A: Structure and Function
  - LS1.B: Growth and Development of Organisms
  - LS1.C: Organization for Matter and Energy Flow in Organisms
  - LS1.D: Information Processing

- LS2: Ecosystems: interactions, Energy, and Dynamics
  - LS2.A: Interdependent Relationships in Ecosystems
  - LS2.B: Cycles of Matter and Energy Transfer in ecosystems
  - LS2.C: Ecosystem Dynamics, Functioning and Resilience
  - LS2.D: Social Interactions and Group Behavior

- LS3: Heredity: Inheritance and Variation of Traits
  - LS3.A: Inheritance of Traits
  - LS3.B: Variation of Traits

- LS4: Biological Evolution Unity and Diversity
  - LS4.A: Evidence of Common Ancestry and Diversity

- LS4.B: Natural Selection
- LS4.C: adaptation
- LS4.D: Biodiversity and Humans

Earth and Space Science

- ESS1: Earth's Place in the Universe
  - ESS1.A: The Universe and Its Stars
  - ESS1.B: Earth and the Solar System
  - ESS1.C: The History of Planet Earth

- ESS2: Earth's Systems
  - ESS2.A: Earth Materials and Systems
  - ESS2.B: Plate Tectonics and Large-Scale System Interactions
  - ESS2.C: The Roles of Water in Earth's Surface Processes
  - ESS2.D: Weather and Climate
  - ESS2.E: Biogeology
  -

- ESS3: Earth and Human Activity
  - ESS3.A: Natural Resources
  - ESS3.B: Natural Hazards
  - ESS3.C: Human Impacts on Earth Systems
  - ESS3.D: Global Climate Change

Engineering Technology, and the Application of Science

- ETS1: Engineering Design
  - ETS1.A: Defining and Delimiting an Engineering Problem
  - ETS1. B: Developing Possible Solutions
  - ETS1.C: Optimizing the Design Solution

- ETS2: Links Among Engineering, technology, Science, and Society
  - ETS2.A: Interdependence of Science, Engineering, and Technology
  - ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World

Scientific and Engineering Practices

- Asking Questions and Defining Problems
- Planning and Carrying Out Investigations
- Analyzing and Interpreting Data
- Developing and Using Models
- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence
- Using Mathematics and Computational thinking
- Obtaining, Evaluating, and Communicating Information

Crosscutting Concepts

- Patterns
- Cause and Effect: Mechanism and Explanation

- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Structure and Function
- Stability and Change

V.TEXTS/RESOURCES

A. https:l/www.wastatelaser.org/science-notebooks/

B. www.NSTA.org

C. www.nextgenscience.org

D. www.njctl.org

E. www.eie.org Engineering is Elementary

VII. EVALUATIONS/ASSESSMENTS

A combination of formative and summative assessments will be utilized in this course including, but not limited to teacher observations, student work and reflections, projects, quizzes and tests, and writing tasks.

VIII. Interdisciplinary Connections

Science, engineering, and technology influence and permeate every aspect of modern life. Some knowledge of science and engineering is required to engage with the major public policy issues of today as well as to make informed everyday decisions. In addition, understanding science and the extraordinary insights it has produced can be meaningful and relevant on a personal level, opening new worlds to explore and offering lifelong opportunities for enriching people's lives. In these contexts, learning science is important for everyone, even those who eventually choose careers in fields other than science or engineering.

Science, math, and language arts should complement each other as often as possible. Students will benefit from this cross-curricular relationship as they learn more about the world through exploration, experimentation, and collaboration.

IX. Integration of the Technology Standard through NJSLS 8

In this ever-changing digital world where citizenship is being re-imagined, our students must be able to harness the power of technology to live, solve problems and learn in college, on the job and throughout their lives. Enabled with digital and civic citizenship skills, students are empowered to be responsible members of today's diverse global society.

Readiness in this century demands that students actively engage in critical thinking, communication, collaboration, and creativity. Technology empowers students with real-world data, tools, experts and global outreach to actively

engage in solving meaningful problems in all areas of their lives. The power of technology discretely supports all curricular areas and multiple levels of mastery for all students.

X. Integration of 21st century skills through NJSLS 9

Creativity is a driving force in the 21st century global economy, with the fastest growing jobs and emerging industries relying on the ability of workers to think unconventionally and use their imaginations. Experience with and knowledge of the science, technology, engineering, arts, and math are essential components of the P-12 curriculum in the 21st century. As the state of New Jersey works to transform public education to meet the needs of a changing world and the 21st century workforce, capitalizing on the unique ability of science to unleash creativity and innovation in our students is critical for success.

XI. Integration of 21st century Life and Career skills through Career Education

For students to be college and career ready they must have opportunities to understand career concepts and financial literacy. This includes helping students make informed decisions about their future personal, educational, work, and financial goals. By integrating Standard 9 into instruction, New Jersey students will acquire the necessary academic and life skills to not only achieve individual success but also to contribute to the success of our society. For example: Career Day event, exposure to a variety of careers in the science field, exploration of technology career options, school-wide science fair and science related field trips (e.g. Liberty Science Center, Buehler Science Center and Environmental Centers)

Career Ready Practices:

These practices outline the skills that all individuals need to have to truly be adaptive, reflective, and proactive in life and careers. These are researched practices that are essential to career readiness.

Personal Financial Literacy:

Fiscal knowledge, habits, and skills must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

Career Awareness, Exploration, and Preparation:

This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.

Career and Technical Education:

For students to be college and career ready they must have opportunities to understand career concepts and financial literacy. This includes helping students make informed decisions about their future personal, educational, work, and financial goals. By integrating Standard 9 into instruction, New Jersey students will acquire the necessary academic and life skills to not only achieve individual success but also to contribute to the success of our society.

XII. Integrated accommodations and modifications for students with: IEP and 504:

(For students with disabilities, appropriate accommodations, instructional adaptations, and/or modifications should be determined by the IEP or 504 team)

Modifications for Classroom

- Use multisensory instruction. Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Give repetition and practice exercises
- Model skills/techniques to be mastered
- Give extended time to complete class work
- Provide copy of class notes
- Determine if preferential seating would be beneficial
- Provide access to a computer
- Provide copies of textbooks
- Provide access to books on tape/CD/digital media, as available and appropriate'
- Assign a peer helper in the class setting
- Provide oral reminders and check student work during independent work time
- Assist student with long- and short-term planning of assignments
- Encourage student to proofread assignments and tests Provide regular parent/school communication

Modifications for Homework and Assignments

- Provide extended time to complete assignments
- Break down assignments into manageable chunks with definite time lines
- Provide the student with clearly stated (written) expectations and grading criteria for assignments
- Implement RAFT activities as they pertain to the types/modes of communication (role, audience, format, topic)

Modifications for Assessments

- Provide extended time on classroom tests and quizzes
- Provide alternate setting as needed
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests
- Establish procedures for accommodations /modifications for assessments

Differentiation for High End Learners:

- Allow students to pursue independent projects based on their individual interests
- Provide enrichment activities that include more advanced material
- Allow team-teaching opportunities and collaboration
- Set individual goals
- Conduct research and provide presentation of appropriate topics
- Design surveys to generate and analyze data to be used in discussion
- Use Higher-Level Questioning Techniques
- Provide assessments at a higher level of thinking

English Language Learners: Modifications for Classroom

- Pair visual prompts with verbal presentations
- Provide repetition and practice
- Model skills/techniques to be mastered

Modifications for Homework/Assignments

- Provide Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)
- Provide extended time for assignment completion as needed
- Highlight key vocabulary
- Use graphic organizers

Grade Levels: Kindergarten

Course Description:

Motion and Stability: Forces and Interactions is designed to allow students to investigate how forces, pushes and pulls, are responsible for the motion of objects. Students will have the opportunity to model the application of forces to objects and to observe the results on the motion of the objects. Students will collect data on the effect of force on speed.

In the *Energy* unit students will make observations to determine the effect of sunlight on the Earth's Surface. Students will use tools and materials to design and build a structure that reduces the warming effect of sunlight on an area.

Students will observe and describe what plants and animals need to survive in *From Molecules to Organisms: Structures and Processes.* In the plant unit students will observe and compare plant growth based on needs and will compare needs across environments. In the Animal unit students will observe and compare the needs of animals in various environments.

The *Earth's Systems* unit was developed to expand students' natural curiosity and enthusiasm for finding out about weather. Students engage in measurement, data collection, and making predictions. Students begin to understand the value of weather forecasting and planning for weather events including severe weather.

In the *Earth and Human Activity* unit students will use a model to represent the relationship between the needs of different plants or animals and the places they live. Students will develop an understanding of the purpose of weather forecasting and the impact of climate change and humans on the land, water, air, and/or other living things in the local environment.

Texts/Resources:

- https://www.wastatelaser.org/science-notebooks
- www.NSTA.org
- www.next genscience.org
- www.njctl.org
- www.eie.org Engineering is Elementary

Unit Name K1	**Motion and Stability: Forces and Interactions**
Estimated Timeline	October-May
Standards	**K-PS2-1 Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.** Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on one another. Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets. **K-PS2-2: Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull** Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn. Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.
Student Learning Objectives	• Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. • Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. • Define push, pull, direction, and change

Suggested projects, activities, labs used to support content, and resources	• Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other. Push and pull races. Limit assessment to different relative strengths or different directions, but not both at the same time. Mouse Trap game. Design a track (marbles) • Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. (Dominoes) • Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn. Design a ramp and comparing heights for speed. • Design a roller coaster
Science and Engineering Practices	• Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progress to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • Analyzing and Interpreting Data builds on prior experiences and progresses to collecting, recording, and sharing observations
Disciplinary Core Ideas	PS2.A: Forces and Motion: • Pushes and pulls can have different strengths and directions • Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. PS2.B: Types of Interactions: • When objects touch or collide, they push on one another and can change motion. PS3.C: Relationship Between Energy and Forces: • A bigger push or pull makes things speed up or slow down more quickly. ETS1.A: Defining Engineering Problems • A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions

Crosscutting Concepts	Cause and Effect: • Simple tests can be designed to gather evidence to support or refute student ideas about causes Scientific Investigations Use a Variety of Methods: • Scientists use different ways to study the world
Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • journal entries • response sheets
Suggested Resources	• http://www.nextgenscience.org/ • http://www.brainpop jr.com • http://www.learn360.com • Foss online: http://www.fossweb.com • https://www.teachingchannel.org • Foss Kit: Materials and Motion

	• Scholastic News • Science Spin • *The Boy who Harnessed the Wind* by William Kamkwamba & Brian Mealer • *Forces that Make Things Move* by Kimberly Bradley *What Makes a Magnet?* By Franklyn M. Branley • Lessn Plan for Push and Pull Unit http://www.harmonydc.org/Curriculum/pdf/kindersanple.pdf • Forces Unit: https://eucaps.wsu.edu/wp-content/uploads/sites/731/2015/04/Kindergarte-Force-Motion-Lessons.pdf
	Connections to NJSLS – English Language Arts • RI.K.1 With prompting and support, ask and answer questions about key details in a text. (K-PS2-2) • W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1) • SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-PS2-2) **Connections to NJSLS – Mathematics** • MP.2 Reason abstractly and quantitatively. (K-PS2-1) • K.MD.A.1 Describe measurable attributes of objects, such as length or weight. • Describe several measurable attributes of a single object. (K-PS2-1) • K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of/less of" the attribute, and describe the difference.

Unit Name K2	Energy
Estimated Timeline	October-May
NGSS	**K-PS3-1: Make observations to determine the effect of sunlight on Earth's surface.** Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water. Assessment Boundary Assessment of temperature is limited to relative measures such as warmer/cooler. **K-PS3-2: Use tools and materials to design and build a structure that reduce the warming effect of sunlight on an area** Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.
Student Learning Objectives	• Make observations to determine the effect of sunlight on Earth's surface. • Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.

Suggested projects, activities, labs used to support content	• Examples of Earth's surface could include sand, soil, rocks, and water. • Water experiments- liquid solid gas and how heat affects. Ice in sunlight and ice in shade experiment. • Sun's heat experiment: Using Rocks on plates put in shade and sunlight. Compare heat and feel. • Limit assessment of temperature to relative measures such as warmer/cooler • Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun. • Design shade for your pet rock.
Science and Engineering Practices	Planning and Carrying Out Investigations: • Make observations (firsthand or from media) to collect data that can be used to make comparisons Constructing Explanations and Designing Solutions: • Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem
Disciplinary Core Ideas	PS3.B: Conservation of Energy and Energy Transfer: • Sunlight warms Earth's surface.

Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • Journal entries • response sheets

Suggested resources	• http://www.nextgenscience.org/ • http://www.brainpop jr.com • http://www.learn360.com • Foss online: http://www.fossweb.com • https://www.teachingchannel.org • Scholastic News (w/ online resource) • Science Spin (w/ online resource) • The Boy Who Harnessed the Wind by, William Kamkwamba & Brian Mealer • Forces that Make Things Move by, Kimberly Bradley • What is the World Made Of? By, Kathleen Weidner Zoehfeld • What Makes a Magnet? By, Franklyn M. Branley
	Connections to NJSLS – English Language Arts • W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS3-1), (K-PS3-2) Connections to NJSLS – Mathematics • K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of/less of" the attribute, and describe the difference. (K-PS3-1), (K-PS3-2)

Unit Name K3	From Molecules to Organisms: Structures and Processes
Estimated Timeline	October-May
NGSS	**K-LS1-1: Use observations to describe patterns of what plants and animals (including humans) need to survive** Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not: the different kinds of food needed by different types of animals; the requirement of plants to have light; and that all living things need water.
Student Learning Objectives	• Use observations to describe patterns of what plants and animals (including humans) need to survive.
Suggested projects, activities, labs used to support content	• Examples of patterns could include that animals need to take in food but plants do not • The different kinds of food needed by different types of animals • The requirement of plants to have light • All living things need water Plant Unit • Planting, observing and comparing plant growth based upon needs • Comparing needs and wants of different plants (desert etc) Animal Units • Wants and needs of plants or animals and their environment: Chicks, butterflies, Frogs, Penguins, Squirrels (hibernation) • Habitat Design challenges:

	Ponds/Desert/Forest/Oceans/Arctic/Farm

Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • journal entries • response sheets
Suggested resources	• http://www.nextgenscience .erg/ • Foss Kits: Animals two by two https://www.fossweb.com/delegate/ssi-wdf-ucm- webContent?dDocName=G3871660 • http://www.brainpop jr.com • http://www.learn 360.com • Foss online: http://www.fossweb.com • https://www.teachingchannel.erg • Scholastic **News (w/** online resource) • Science Spin (w/ online resource) • Air is All Around You by, Franklyn M. Branley • The Boy Who Harnessed the Wind by, William Kamkwamba & Brian Mealer • Forces that Make Things Move by, Kimberly Bradley • My Light by Molly Bang

	• What is the World Made Of? By, Kathleen Weidner Zoehfeld • What Makes a Magnet? By, Franklyn M. Branley
Science and Engineering Practices	Analyzing and Interpreting Data • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions
Disciplinary Core Ideas	LS1.C: Organization for Matter and Energy Flow in Organisms: • All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow
Crosscutting Concepts	Patterns: • Patterns in the natural and human designed world can be observed and used as evidence Scientific Knowledge is Based on Empirical Evidence • Scientists look for patterns and order when making observations about the world.
	Connections to NJSLS – English Language Arts • W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS-1) Connections to NJSLS – Mathematics • K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of/less of" the attribute, and describe the difference. (K-LS-1)

Unit Name K4	Earth's Systems
Estimated Timeline	October-May
NGSS	**K-ESS2-1: Use and share observations of local weather conditions to describe patterns over time** Clarification Statement Examples of qualitative observations cold include descriptions of the weather; examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months. Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler. **K-ESS2-2: Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.** Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the rond to hide its food and tree roots can break concrete.
Student Learning Objectives	• Use and share observations of local weather conditions to describe patterns over time. • Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

Suggested projects, activities, labs used to support content	• Qualitative observations could include descriptions of the weather (such as sunny, rainy, and warm) • Quantitative observations could include numbers of sunny, windy, and rainy days in a month. • Patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months. • Limit assessment of quantitative observations to whole numbers and relative measures such as warmer/cooler. • Different types of severe weather: Make or model types of weather noises. Ex: thunder, rain • Design a plan for a severe weather kit: include things for safety and fun • Create a weather forecasting center and create tools for weather prediction • Adapting to environment: Hibernation, storing food for the winter
Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • Journal entries • response sheets

Science and Engineering Practices	Analyzing and Interpreting Data: • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions (K-ESS2-1) Engaging in Argument from Evidence: • Construct an argument with evidence to support a claim (K-ESS2-2)
Disciplinary Core Ideas	ESS2.D: Weather and Climate • Weather is the combination of sunlight, wind, snow, or rain, and temperature n a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2-1) ESS2.E Biogeology: Plants and animals can change their environment (K-ESS2-2) ESS3.C Human Impacts on Earth Systems: • Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things (secondly to -ESS2-1)
Crosscutting Concepts	Patterns: • Patterns in the natural world can be observed, can be used to describe phenomena, and used as evidence. (K-ESS2-1) Systems and System Models: • Systems in the natural and designed world have parts that work together (K-ESS2-2) Science Knowledge is Based on Empirical Evidence:

	• Scientists look for patterns and order when making observations about the world (K-ESS2-1)
Connection to NJSLS	English Language Arts • RL.K.1 With prompting and support, ask and answer questions about key details in a text (e.g., who, what, where, when, why, how). (K-ESS2-2) • W.K.1 Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book. (K-ESS2- • W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS2- 2) • W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-ESS2-1) Connections to NJSLS – Mathematics • MP.2 Reason abstractly and quantitatively. (K-ESS2-1) • MP.4 Model with mathematics. (K-ESS2-1) • K.CC.A Know number names and the count sequence. (K-ESS2-1) • K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1 • K.MD.B.3 Classify objects into given categories
Suggested resources	Foss Kit: Trees and Weather https://www.fossweb.com/delegate/ssi-wdf-ucm-
	webContent?dDocName=G3932057 • http://www.nextgenscience.org/ • http://www.brainpopjr.com • http://www.learn360.com • Foss online: http://www.fossweb.com • https://www.teachingchannel.org • Scholastic News (w/ online resource) • Science Spin (w/ online resource) • Magic School Bus: Lost in the Solar System

Engineer It • Plan a Severe Weather Safety Kit

Materials

Step 2

Ask questions about how weather safety kits would be different depending on the type of severe weather.

Choose a kind of severe weather. Find out what is needed to have prepared ahead of time.

Step 3

Step 4

Design a plan for what would be included in your kit for this type of weather.

What is your evidence?

Unit Name KS	**Earth and Human Activity**
Estimated Timeline	October-May
NGSS	**K-ESS3-1 Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.** Clarification Statement: Examples of relationships could include that deer eat buds and leaves,; herefore, they usually live in forested areas; and grasses need sunlight so they often grow in meadows. Plants, animals and their surroundings make up a system. **K-ESS3-2: Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.** Clarification Statement: Emphasis is on local forms of severe weather. **K-ESS3-3: Communicate solutions that will reduce the impact of climate change and humans on the land, water, air, and/or other living things in the local environment.** Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.
Student Learning Objectives	• Use a model to present the relationship between the needs of different plants or animals (including humans) and the places they live. • Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather. • Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

Suggested projects, activities, labs used to support content, and resources	• Deer eat buds and leaves therefore thy usually live in forested areas • Grasses need sunlight so they often grow in meadows. • Plants, animals and their surroundings make up a system. • Emphasis is on local forms of severe weather. • Human impact on the land : Recycle reduce reuse o Haunted House project read house project  • Exploring where trash goes : Experiment burying trash and observing • Natural Resources: 3 little pigs experiment- building houses using straw, popsicle sticks and clay bricks
Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets

Science and Engineering Practices	Asking Questions and Defining Problems • Ask questions based on observations to find more information about the designed world.(K-ESS3-2) Developing and Using Models • Use a model to represent relationships in the natural world. (K-ESS3-1) Obtaining, Evaluating, and Communicating Information • Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2) • Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. (K-ESS3-3)

Disciplinary Core Ideas	**ESS3.A: Natural Resources** · Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1) **ESS3.B: Natural Hazards** · Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (K-ESS3-2) **ESS3.C: Human Impacts on Earth Systems** · Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (K-ESS3-3) **ETS1.A: Defining and Delimiting Engineering Problems** · Asking questions, making observations, and gathering information are helpful in thinking about problems. *(secondary to K-ESS3-2)* **ETS1.B: Developing Possible Solutions** · Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas fora problem's solutions to other people. *(secondary to K-ESS3-3)*

Crosscutting Concepts	**Cause and Effect** • Events have causes that generate observable patterns. (K-ESS3-2), (K-ESS3-3) **Systems and System Models** • Systems in the natural and designed world have parts that work together. (K-ESS3-1) ***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** • People encounter questions about the natural world every day. (K-ESS3-2) **Influence of Engineering, Technology, and Science on Society and the Natural World** • People depend on various technologies in their lives; human life would be very different without technology. (K-ESS3-2)

Suggested Resources	• **Foss Kits: Trees and Weather _ h ttps://www.fossweb.com/delegate/ssi-wdf-ucm webContent?dDocName=G3932057** • **Foss Kits: Animals two by two https://www.fossweb.com/delegate/ssi-wdf-ucm webContent?d DocName=G3871660** • **http://www.nextgenscience.org/** • **http://www.brainpopjr. com** • **http://www.learn360.com** • **Foss online: http://www.fossweb.com** • **https://www.teachingchannel.org** • **Scholastic News (w/ online resource)** • **Science Spin (w/ online resource)** • **Water! Water! Water! By, Nancy Elizabeth Wallace** • **What is the World Made Of? By, Kathleen Weidner Zoehfeld** • **What Makes a Magnet? By, Franklyn M. Branley** • **Magic School Bus Inside the Earth**

Unit Name K6	**Engineering Design**
Estimated Timeline	September- June
NGSS	**K-2-ETS1-1** Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool. **K-2-ETS1-2** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. **K-2-ETS1-3** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
Student Learning Objectives	• Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. • Develop a simple sketch, drawing, or physical model to • illustrate how the shape of an object helps it function as needed to solve a given problem. • Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Suggested projects, activities, labs used to support content	Launching Unit: Exploring Centers • What is an engineering scientist? • What are problems/ solutions? • What are ways to design- sketching/physical model? • How do we analyze? Establish a weekly Engineering Center • Students create devices to get "that pesky itch in the center of your back." Once the idea is thought through students produce design sketches and are given everyday materials and recyclables to create their designs

Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • journal entries • response sheets

Science and Engineering Practices	Asking questions and defining problems • Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2-ETS1-1) • Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1) Developing and Using Models • Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2) Analyzing and Interpreting Data • Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3)

Disciplinary Core Ideas	**ETS1.A: Defining and Delimiting** **Engineering Problems** A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2- ETS1-1) • Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool. (K-2- ETS1-1) • Before beginning to design a solution, it is important to clearly understand the problem. (K-2- ETS1-1) **ETS1.B: Developing Possible Solutions** • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions, such as climate change, to other people. (K-2-ETS1-2) **ETS1.C: Optimizing the Design Solution** • Because there is always more than one possible solution to a problem, it is useful to compare and tests. (K-2-ETS1-3)
Crosscutting Concepts	**Structure and Function** • The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

Connections to NJSLS	**English Language Arts** • **RI.2.1** Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1) • **W.2.6** With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1), (K-2-ETS1-3) • **W.2.8** Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1), (K-2-ETS1-3) • **SL.2.5** Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2) **Mathematics** • **MP.2** Reason abstractly and quantitatively. (K-2-ETS1-1), (K-2-ETS1-3) • **MP.4** Model with mathematics. (K-2-ETS1-1), (K-2-ETS1-3) • **MP.5** Use appropriate tools strategically. (K-2-ETS1-1), (K-2-ETS1-3) • **2.MD.D.10** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1), (K-2-ETS1-3)
Suggested resources	**Kindergarten Launching Unit/Center** **https://docs.google.com/document/d/1b7Ylc5m-** **evdfHIEBrWoYksecgA77xQqjP0GrJOf8FfA/edit** http://www.nextgenscience.org/

	http://www.brainpop.jr.com http://www.learn360.com Foss online: http://www.fossweb.com https://www.teachingchannel.erg Scholastic News (w/ online resource) Science Spin (w/ online resource) Rosie Revere Engineer by, Andrea Beaty NGSS Book Source Book List http://www. booksource.com/Products/NGSS-Kindergarten- Complete NGK-ALL-spc-16.aspx?CategoryBvin=b124d8b2- 763d-4fcb-920c-2cbf61800150&SubCategoryBvin=b34aa90f- 9a8d-4de8-b82d-41d31a4fbc84&CollectionBvin=bf7031f3- e73b-4b77-81b5-e1aa8110cb7e

Science

Grade 1

Course Description:

Waves and their Applications in Technologies for Information Transfer: Students investigate waves and their application in technology. Students conduct experiments to provide evidence that vibrating materials can make sound, as well as experiments that show that sound can make materials vibrate. Students also conduct experiments to demonstrate that objects can only be seen when they are illuminated and the effect on light waves when objects block their path. Students will use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

From Molecules to Organisms: Structure and Processes: Students will use their knowledge of how plants and/or animals use their external parts to help them survive, grow and meet their needs by using materials to design a solution to a human problem. Students will read texts and use media to determine patterns in behavior of parents and offspring that help offspring to survive.

Heredity: Inheritance and Variation of Traits: Students make observations to demonstrate that young plants and animals are like, but not exactly like, their parents.

Earth's Place in the Universe: Students observe the sun, moon and start to describe patterns that can be predicted. Students make observations of the amount of daylight at different times of the year.

Launching Unit

K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change (e.g. climate change) to define a simple problem that can be solved through the development of a new or improved object or tool

K-2-ETS1-3 Analyze data from tests of two objects designed to sole the same problem to compare the strengths and weaknesses of how each performs.

Day 1: What is science?

-Read aloud What is Science? by Rebecca Kai Dotlich

-Brainpopjr video - Science Skills

https:// jr.brainpop.com/science/beascientist/scienceskills/preview.wemI

Day 2: What do scientists do? (Study the world around them)

-Read aloud What is a Scientist? by Barbara Lehn

-Great Scientists Activity http://www.teacherspayteachers.com/Product/Freebie-Great-Scientists-861405

Scientist Anchor Chart - http://www.pinterest.com/pin/356066532791067 29/

-Draw and label a picture of what a scientist looks like to you.

Day 3: What do engineers do? (Problem solvers)

-Read aloud Rosie Revere Engineer by Andrea Beaty
https://www.teacherspayteachers.com/Product/Rosie-Revere-Book-growth-mindset mini-lesson-3127635
-What does an engineer look like activity. Display pictures of engineers. Draw and label a picture of an engineer.
-STEM video -
https://www.youtube.com/watch?v=AIPJ48simtE
gn-Process-900979

Day 4: Introduce and set up STEM notebook

-Templates for STEM notebooks on shared drive.

-Create cover, table of contents, page numbers.
https://www.wastatelase r.org/science-notebooks/

Days 5-6: Introduce Engineering Design

- **Process (EDP) for K-2**

-Introduce Engineering Design Process (Ask, Imagine, Plan, Create, Improve)

-Introduce Design Challenges - Design a name tag
https://www.teacherspayteachers.com/Product/STEM-Engineering-Starter-Kit-for Teachers-elementary-level-977781

Discuss science safety and proper use of science tools/materials throughout units as the lesson permits.

Unit Name	**1-PS4: Waves and their Applications in Technologies for Information Transfer**
Estimated Timeline	3 weeks/March https://docs.google.com/document/d/1mbbnduE5gsRYEKMoRz4PO1rbX2tmuGKHXA3Gym1pDeY/edit
Standards	**1-PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.** Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork. **1-PS4-2 Make observations to construct an evidence-based account that objects can be seen only when illuminated.** Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light. **1-PS4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.** Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror). The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light Assessment Boundary: Assessment does not include the speed of light **1-PS4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.** Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats Assessment Boundary: Assessment does not include technological details for how communication devices work.

Science and Engineering Practices	**Planning and Carrying Out Investigations** • Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question. (1-PS4-1), (1-PS4-3) **Constructing Explanations and Designing Solutions** • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-PS4-2) • Use tools and materials provided to design a device that solves a specific problem. (1-PS4-4)
Disciplinary Core Ideas	**PS4.A: Wave Properties** • Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1) **PS4.B: Electromagnetic Radiation** • Objects can be seen if light is available to illuminate them or if they give off their own light. (1-PS4-2) • Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (1-PS4-3) **PS4.C: Information Technologies and Instrumentation** 1. People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4)

Crosscutting Concepts	**Cause and Effect** • Simple tests can be designed to gather evidence to support or refute student ideas about causes. (1-PS4-1), (1-PS4-2), (1-PS4-3) ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Engineering, Technology, and Science, on Society and the Natural World** • People depend on various technologies in their lives; human life would be very different without technology. (1-PS4-4) ***Connections to Nature of Science*** **Scientific Investigations Use a Variety of Methods** • Science investigations begin with a question. (1-PS4-1) • Scientists use different ways to study the world. (1-PS4-1)

Connections to NJSLS	**English Language Arts** • W.1.2 Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure. (1-PS4-2) • W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). (1-PS4-1), (1-PS4-2), (1-PS4-3), (1-PS4-4) • W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-PS4-1), (1-PS4-2), (1-PS4-3) • SL.1.1 Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. (1-PS4-1), (1-PS4-2), (1-PS4-3) **Mathematics** • MP.5 Use appropriate tools strategically. (1-PS4-4) • 1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object. (1-PS4-4) • 1.MD.A.2 Express the length of an object as a whole number of length units, by layering multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. (1-PS4-4)
Suggested Activities	-Generation Genius activities -Kahoot -Making "instruments"... Ex. kazoos, guitars -STEM extensions
Suggested Resources	-Generation Genius website -Scholastic News
Suggested Assessments	-Generation Genius pdf/"quizzes" -Exit slips

Unit Name	**1-LS1: From Molecules to Organisms: Structure and Process**
Estimated Timeline	**April - June**
Standards	**1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.** Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears. **1-LS1-2 Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.** Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).
Student Learning Objectives	• Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. • Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

Science and Engineering Practices	**Constructing Explanations and Designing Solutions** • Use materials to design a device that solves a specific problem or a solution to a specific problem. (1-LS1-1) **Obtaining, Evaluating, and Communicating Information** • Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2)
Disciplinary Core Ideas	**LS1.A: Structure and Function** · All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1) **LS1.B: Growth and Development of Organisms** · Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (1-LS1-2) **LS1.D: Information Processing** · Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (1-LS1-1)

Crosscutting Concepts	**Patterns** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2) **Structure and Function** • The shape and stability of structures of natural and designed objects are related to their function(s). (1-LS1-1) ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Engineering, Technology, and Science on Society and the Natural World** • Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. (1-LS1-1) ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** • Scientists look for patterns and order when making observations about the world. (1-LS1-2)

Connections to NJSLS	**ELA** • RL.1.1 Ask and answer questions about key details in a text. (1-LS1-2) • RL.1.2 Identify the main topic and retell key details of a text. (1-LS1-2) • RL.1.10With prompting and support, read and comprehend stories and poetry at grade level text complexity or above. (1-LS1-2) • W.1.7Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). (1-LS1-1) **Mathematics** • 1.NBT.B.3 Compare two two-digit numbers based on the meanings of the tens and one digits, recording the results of comparisons with the symbols >, =, and <. (1-LS1-2) • 1.NBT.C.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning uses. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. (1-LS1-2) • 1.NBT.C.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. (1-LS1-2 • 1.NBT.C.6 Subtract multiples of 10 in the range 10–90 from multiples of 10 in the range 10–90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. (1-LS1-2)
Suggested Activities	-Observation/Experiments
Suggested Resources	-Generation Genius
Suggested Assessments	-Generation Genius "quizzes"... Guided questions, exit slips -Kahoot

Unit Name	**1-LS3: Heredity: Inheritance and Variation Traits**
Estimated Timeline	April - June
Standards	**1-LS3-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.** Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same
Student Learning Objectives	Students will be able to identify the ways in which young plants and animals are like, but not exactly like their parents
Science and Engineering Practices	• **Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-LS3-1**
Disciplinary Core Ideas	**LS3.A: Inheritance of Traits** • Young animals are very much, but not exactly like, their parents. Plants also are very much, but not exactly, like their parents. (1-LS3-1) **LS3.B: Variation of Traits** • Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (1-LS3-1)

Crosscutting Concepts	**Patterns** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS3-1)
Connections to NJSLS	**ELA** • **RI.1.1 Ask and answer questions about key details in a text.** • **W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). (1-LS3-1)** • **W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-LS3-1)** **Mathematics** • **MP.2 Reason abstractly and quantitatively. (1-LS3-1)** • **MP.5 Use appropriate tools strategically. (1-LS3-1)** • **1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object. (1-LS3-1)**
Suggested Activities	-Observation/Experiments
Suggested Resources	-Generation Genius
Suggested Assessments	-Generation Genius "quizzes"... Guided questions, exit slips -Kahoot

Unit Name	**K-2-ETS1: Engineering Design**
Estimated Timeline	September-June https://docs.google.com/document/d/1mbbnduE5gsRYEKMoRz4PO1rbX2tmuGKHXA3Gym1pDeY/edit
Standards	K-2-ETS-1 Ask questions, make observation, and gather information about a situation people want to change (e.g.climate change) to define a simple problem that can be solved through the development of a new or improved object or tool K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. K-2-ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
Student Learning Objectives	• Create STEAM journal/notebook-explain routine of using the notebook to keep track of observations • Understand the roles of a scientist and engineer • Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. • Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. • Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Suggested projects, activities, labs used to support content	• Students can draw diagrams of their planned derby cars and build them based on those drawings. • Students will design their own investigation based on the question they created about pill bugs. You can encourage students to create a model for a final product based on what they learned throughout their investigation.
Suggested assessments	Students can demonstrate competency with tasks such as: ▪ developing and refining models ▪ generating, discussing and analyzing data ▪ constructing spoken and written scientific explanations ▪ engaging in evidence-based argumentation ▪ reflecting on their own understanding ▪ Journal entries ▪ response sheets ▪ Self assessment/rubric

Suggested Resources	https://www.spfk12.org/cms/lib/NJ01001501/Centricity/Domain19/Science%20Rubric.pdf tps://betterlesson.com/lesson/resource/3070763/the engineering-design-process?from=lessonsection narrative https://betterlesson.c http://www.nextgenscience.org/htom/home http://speechisbeautiful.com/2017/03/10-wordless-videos-teach-problem-solving/ http://www.brainpopjr.com http://www.learn360.com Foss online: http://www.fossweb.com https://www.teachin gchannel.org https://nj.pb slearningmedia.org/resource/75e3c673-b02d-4d7b-a490-8a943c013662/75e3c673-b02d-4d7b-a490-8a943c013662/#.WRnD3-srlcs Scholastic News (w/ online resource) Science Spin (w/ online resource) Rosie Revere, Engineer by, Andrea Beaty Thomas Edison: Great American Inventor by, Shelley Bedik The Most Magnificent Thing by Ashley Spires..author website/blog & youtube clip The Girl Who Never Made Mistakes by Mark Pett What Do You Do With An Idea? By Kobi Yamada Those Darn Squirrels! By Adam Rubin

Unit Name	**1-ESS1: Earth's Place in the Universe**
Estimated Timeline	October - February
Standards	**1-ESS1-1** Use observations of the sun, moon, and stars to describe patterns that can be predicted. Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day **1-ESS1-2** Make observations at different times of year to relate the amount of daylight to the time of year Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall
Student Learning Objectives	• Use observations of the sun, moon, and stars to describe patterns that can be predicted. • Make observations at different times of year to relate the amount of daylight to the time of the year.
Suggested projects, activities, labs used to support content, and resources	• Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set in another part of the sky. • Oreo Cookie Moon Phases • Observations of the night sky for 2 weeks for homework. Draw a picture of the night sky (Moon,Stars) • Stars are visible at night but not during the day • Compare amount of daylight in the winter to the amount in the fall, spring, summer

Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • journal entries • response sheets • Self assessment/rubric
Science and Engineering Practice	**Planning and Carrying out Investigations** • Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2) **Analyzing and Interpreting Dat** • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)
Disciplinary Core Ideas	**ESS1.A: The Universe and its Stars** • Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1) **ESS1.B: Earth and the Solar System** • Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1-2)

Crosscutting Concepts	**Patterns** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1), (1-ESS1-2) ***Connections to Nature of Science*** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** • Science assumes natural events happen today as they happened in the past. (1-ESS1-1) • Many events are repeated. (1-ESS1-1)

Suggested Resources	• http://www.nextgenscience.org/ • https://betterlesson .com/lesson/635856/the-predictable patterns-of-the-sun-and-the-seasons • https://betterlesson.com/lesson/613470/observing-the-sun • https://betterlesson.com/lesson/613469/introduction-and-pre **assessment** • https://betterlesson.com/lesson/633422/let -s-observe-the-sun-day-1 • https://betterlesson.com/home • http://www.brainpopjr.com • http://www.learn360.com • Foss online: http://www.fossweb.com • https://www.teachingchannel.org • Scholastic News (w/ online resource) • Science Spin (w/ online resource) • The Magic School Bus Explores the Solar System • https://mysteryscience.com/sky/sun-moon-stars • The Sun by Seymour Simon • King Kafu and the Moon by, Trish Cooke

Science

Grade 2

Course Description:

Matter and It's Interactions: Students plan and conduct investigations to describe and classify different kinds of materials by their observable properties. Students analyze data to determine which materials have the properties that are best suited for their intended purpose . Students will conduct an experiment that demonstrates that some changes caused by heating or cooling can be reversed and some cannot.

Ecosystems: Interactions, Energy, and Dynamics: Students plan and conduct investigations to determine if plants need sunlight and water to grow. Students make observations of plants and animals to compare the diversity of life in different habitats, as well as the function of an animal in dispersing seeds or pollinating plants.

Earth's Place in the Universe: Students use information from several sources to provide evidence that Earth events can occur quickly or slowly.

Earth's Systems: Students compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. Students design a model to represent the shapes and kinds of land and bodies of water in an area.

Engineering Design: Students gather information about a situation people want to change to define a problem that can be solved through the development of a new or improved object or tool. Students analyze data from two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Unit Name 2.1	**2-PS1 Matter and Its Interactions**
Estimated Timeline	September
Standards	**2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.** Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share. **2-PS1-2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.** Examples of properties could include, strength, flexibility, hardness, texture, and absorbency. Assessment Boundary: Assessment of quantitative measurements is limited to length. **2-PS1-3 Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.** Examples of pieces could include blocks, building bricks, or other assorted small objects. **2-PS1-4 Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.** Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.

Student Learning Objectives	• Scientists ask questions, solve problems, make models and investigate. • Scientists draw conclusions, analyze and interpret data. • Scientists use interactive notebooks to organize ideas, share observations and reflect on results. • Scientists follow safety procedures during investigations. • Teacher model's investigation and students observe and discuss • Students repeat investigation with teacher guidance (procedures, diagrams, and results) • Teacher models recording, investigation, reflections in notebooks and students practice with guided instruction.
Suggested projects, activities, labs used to support content	• Students write, illustrate and present science safety rules on posters. • Students explore science tools placed randomly in buckets and make predictions as to what the tools may be used for.
Suggested Assessments	Students can demonstrate competency with tasks such as: • Developing and refining models • Generating, discussing and analyzing data • Constructing spoken and written scientific explanations • Engaging in evidence-based argumentation • Reflecting on their own understanding • Notebook entries • Response sheets • Self-assessment/ rubric

Science and Engineering Practices	**Planning and Carrying Out Investigations** • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-PS1-1) **Analyzing and Interpreting Data** • Analyze data from tests of an object or tool to determine if it works as intended. (2-PS1-2) **Constructing Explanations and Designing Solutions** • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (2-PS1-3) **Engaging in Argument from Evidence** • Construct an argument with evidence to support a claim. (2-PS1-4)
Disciplinary Core Ideas	**PS1.A: Structure and Properties of Matter** • Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. (2-PS1-1) • Different properties are suited to different purposes. (2-PS1-2), (2-PS1-3) • A great variety of objects can be built up from a small set of pieces. (2-PS1-3) **PS1.B: Chemical Reactions** • Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not. (2-PS1-4)

Crosscutting Concepts	**Patterns** • Patterns in the natural and human designed world can be observed. (2-PS1-1) **Cause and Effect** • Events have causes that generate observable patterns. (2-PS1-4) • Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2) **Energy and Matter** • Objects may break into smaller pieces and be put together into larger pieces or change shapes. (2-PS1-3) ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Engineering, Technology, and Science on Society and the Natural World** • Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. (2-PS1-2) ***Connections to Nature of Science*** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** • Scientists search for cause and effect relationships to explain natural events. (2-PS1-4)

Connections to NJSLS	**English Language Arts** RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-PS1-4) RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-PS1-4) RI.2.8 Describe how reasons support specific points the author makes in a text. (2-PS1-2), (2-PS1-4) W.2.1Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section. (2-PS1-4) W.2.7Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-PS1-1), (2-PS1-2), (2-PS1-3) W.2.8Recall information from experiences or gather information from provided sources to answer a question. (2-PS1-1), (2-PS1-2), (2-PS1-3) **Mathematics** MP.2 Reason abstractly and quantitatively. (2-PS1-2) MP.4 Model with mathematics. (2-PS1-1), (2-PS1-2) MP.5 Use appropriate tools strategically. (2-PS1-2) 2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (2-PS1-1), (2-PS1-2)

Unit Name	**2-LS2: Ecosystems: Interactions, Energy, and Dynamics**
Estimated Timeline	February - May
Standards	**2-LS2-1 Plan and conduct an investigation to determine if plants need sunlight and water to grow.** Assessment boundary: Assessment is limited to testing one variable at a time. **2-LS2-2 Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.** **2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats.** Emphasis is on the diversity of living things in each of a variety of different habitats.
Student Learning Objectives	• Plan and conduct an investigation to determine if plants need sunlight and water to grow. • Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. • Make observations of plants and animals to compare the diversity of life in different habitats. • Plant seeds in three different environments and observe which grew faster.
Suggested projects, activities, labs used to support content	• Limit assessment to one variable at a time with sunlight and water. • Emphasis on the diversity of living things in a variety of different habitats (not including specific animal and plant • names). Endangered animal research project: focus on Habitat, animal description, and why they are endangered. • Each classroom represents a different habitat. • Incorporate Empowering Writers-Oviparous creatures

Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets
Science and Engineering Practices	**Developing and Using Models** · Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2) **Planning and Carrying Out Investigations** · Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1) · Make observations (firsthand or from media) to collect data that can be used to make comparisons. (2-LS4-1)

Disciplinary Core Ideas	**LS2.A: Interdependent Relationships in Ecosystems** · Plants depend on water and light to grow. (2-LS2-1) · Plants depend on animals for pollination or to move their seeds around. (2-LS2-2) **ETS1.B: Developing Possible Solutions** · Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (secondary to 2-LS2-2) **LS4-D Biodiversity and Humans** · There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)
Crosscutting Concepts	**Cause and Effect** · Events have causes that generate observable patterns. (2-LS2-1) Structure and Function · The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2) **Connections to Nature of Science** **Scientific Knowledge is Based on Empirical Evidence** · Scientists look for patterns and order when making observations about the world. (2-LS4-1)

Connections to NJSLS	**English Language Arts** • W.2.7 Participate in shared research and writing projects (e.g. read a number of books on a single topic to produce a report; record science observations. (2-LS2-1) • W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1) • SL. 2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories, or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-LS2-2) **Mathematics** • MP.2 Reason abstractly and quantitatively. (2-LS2-1) • MP.4 Model with mathematics. (2-LS2-1), (2-LS2-2) • MP.5 Use appropriate tools strategically (2-LS2-1) • 2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented n a bar graph (2-LS2-2)

Unit Name	**2-ESS2: Earth's Systems**
Estimated Timeline	October - November
Standards	**2-ESS2-1 Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.** Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land. **2-ESS2-2 Develop a model to represent the shapes and kinds of land and bodies of water in an area.** Assessment Boundary: Assessment does not include quantitative scaling in models. **2-ESS2-3 Obtain information to identify where water is found on Earth and that it can be solid or liquid.**
Student Learning Objectives	• Use information from several sources to provide evidence that Earth events can occur quickly or slowly. • Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. • Develop a model to represent the shapes and kinds of land and bodies of water in an area. • Obtain information to identify where water is found on Earth and that it can be solid or liquid.

Suggested projects, activities, labs used to support content	• Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly. • Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass and trees to hold back the land. • Build sand castles and demonstrate how slow/fast the Earth Changes • Read books based on natural disasters and do brain pops.
Suggested Assessment	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • Self-assessment/rubric

Science and Engineering Practices	Developing and Using Models • Develop a model to represent patterns in the natural world (2-ESS2-2) Constructing Explanations and Designing Solutions • Compare multiple solutions to a problem (2-ESS2-1) Obtaining, Evaluating, and Communicating Information

Disciplinary Core Ideas	ESS2.A: Earth Materials and Systems • Wind and water can change the shape of the land. (2-ESS2-1) ESS2.B: Plate Tectonic and Large-Scale System Interactions • Maps show where things are located. One can map the shapes and kinds of land and water in any area (2-ESS2-2) ESS2.C: The Roles of Water in Earth's Surface Process • Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3) ETS1.c: Optimizing the Design Solution • Because there is always more than one possible solution to a problem, it is useful to compare and test designs.
Crosscutting Concepts	Patterns • Patterns in the natural world can be observed. (2ESS2-2), (2-ESS2-3) Stability and Change • Things may change slowly or rapidly (2-ESS2-1) Connections to Engineering, Technology, and Applications of Science • Developing and using technology has impacts on the natural world. (2-ESS2-1) Connections to Nature of Science Science Addresses Questions About the Natural and Material World • Scientists study the natural and material world. (2-ESS2-1)
Suggested resources	• http://www.nextgenscience .erg/ • http//www.brainpopjr .com • http://www.learn360.com • Foss online: http://www.fossweb.com • https://www.teachingchannel.erg Scholastic News (w/ online resource) Science Spin (w/ online resource) National Geographic Readers: Water by Melissa Stewart
	http://betterlesson.com

	Coastal Erosion- htt12s://betterlesson.com/lesson/636745/coastal-erosion Bill Nye - Erosion Season 5 Episode 14 Bill Nye- Volcanoes Season 4 Episode 14 Bill Nye - Earthquakes Season 4 Episode 4 https://jr.brainpop.com/science/land/fastlandchanges/ https://jr.brainpo12. com/science/

Unit Name	**2-ESS1 Earth's Place in the Universe**
Estimated Timeline	December-January
Standards	2-ESS1-1 Use information from several sources to provide evidence that Earth events can occur quickly or slowly • Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly. Assessment Boundary: Assessment does not include quantitative measurements of timescales.

Student Learning Objectives	• SWBAT Use information from several sources to provide evidence that Earth events can occur quickly or slowly. (2-ESS1-1) • SWBAT Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. (2- ESS2-1) • SWBAT Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1) • SWBAT Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. . (K-2-ETS1-2)
Suggested projects, activities, labs used to support content	• Compare multiple solutions to a problem. • Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. Examples of solutions could include: *Different designs of dikes and windbreaks to hold back wind and water * Different designs for using shrubs, grass, and trees to hold back the land. • Ask questions based on observations to find more information about the natural and/or designed world. • Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. •Define a simple problem that can be solved through the development of a new or improved object or tool. • Develop a simple model based on evidence to represent a proposed object or tool. • Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Suggested Assessments	• Create a poster to demonstrate understanding of fast/slow Earth changes • Class discussion • Venn Diagrams • Vocabulary games • End of unit written test • Create a plan to limit erosion in our community • Mystery Science Assessments

Suggested Resources	• www.mysteryscience.com
	  ○ Works of Water Unit:
	  ○ Mystery 2: Why is there sand at the beach?
	  ○ Mystery 3: What's strong enough to make a canyon?
	• Brainpopjr.com
	  ○ Slow Land Changes video
	  ○ Fast Land Changes video

Science and Engineering Practices	Constructing Explanations and Designing Solutions • Make observations from several sources to construct an evidence-based account for natural phenomena. (2-ESS1-1)
Disciplinary Core Ideas	ESS1.C: The History of Planet Earth • Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe (2-ESS1-1)
Crosscutting Ideas	Stability and Change • Things may change slowly or rapidly (2-ESS1-1)

Connections to NJSLS	**English Language Arts** • RI.2.1Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-ESS1-1) • RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-ESS1-1) • W.2.6With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (2-ESS1-1) • W.2.7 Participate in shared research and writing projects (e.g. read a number of books on a single topic to produce a report; record science observations). (2-ESS1-1) • •W.2.8Recall information from experiences or gather information from provided sources to answer a question. (2-ESS1-1) • SL.2.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media. (2-ESS1-1) Mathematics • MP.2 Reason abstractly and quantitatively. (2-ESS1-1) • MP.4 Model with mathematics. (2-ESS1-1) • 2.NBT.A Understand place value (2-ESS1-1)

Unit Name	**K-2ETS1:** Engineering Design
Estimated Timeline	Sept- June
Standards	**K-2-ETS1-1** Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool. **K-2-ETS1-2** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. **K-2-ETS1-3** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
Student Learning Objectives	• Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. • Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. • Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
Suggested projects, activities, labs used to support content	• Students are asked to design and build a stick that can pollinate plants in the same manner that a bee does. • Use observations and the engineering design process to test a variety of materials and decide which would make the best rain-proof roof for a doghouse.

Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets
Science and Engineering Practices	Asking Questions and Defining Problems • Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2-ETS1-1) • Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1) Developing and Using Models • Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2) Analyzing and Interpreting Data • Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3)

Disciplinary Core Ideas	ETS1.A: Defining and Delimiting Engineering Problems • A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) • Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1) • Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1) ETS1.B: Developing Possible Solutions • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2) ETS1.C: Optimizing the Design Solution • Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ETS1-3)
Crosscutting Ideas	Structure and Function • The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)
Suggested resources	• http://www.nextgenscience.org/ http://www.brainpopjr.com http://www.learn360.com • Foss online: http://www.fossweb.com • https://www.teachingchannel.erg • Scholastic News (w/ online resource) • Science Spin (w/ online resource) • Rosie Revere, Engineer by, Andrea Beaty • Thomas Edison: Great American Inventor by, Shelley Bedik

Connections to NJSLS	**English Language Arts** • RI.2.1Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1) • W.2.6With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1), (K-2-ETS1-3) • •W.2.8Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1), (K-2-ETS1-3) • SL.2.5Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2) **Mathematics** • MP.5 Use appropriate tools strategically. (1-PS4-4) • MP.2 Reason abstractly and quantitatively. (K-2-ETS1-1), (K-2-ETS1-3) • MP.4 Model with mathematics. (K-2-ETS1-1), (K-2-ETS1-3) • MP.5 Use appropriate tools strategically. (K-2-ETS1-1), (K-2-ETS1-3) • 2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1), (K-2-ETS1-3)

Science

Grade 3

Course Description:

Motion and Stability: Forces and Interactions: Students plan and conduct investigations to provide evidence of the effect of balanced and unbalanced forces on the motion of an object,as well as make observations and/measurements of an object's motion to provide evidence that patterns can predict future motion. Students determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.

From Molecules to Organisms: *Structures and Processes*: Students develop models to show that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction and death.

Ecosystems: Interactions, Energy, and Dynamics: Students investigate and construct an argument to demonstrate that animals form groups to help members survive.

Heredity: Inheritance and Variation of Traits: Students will analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. Students will use evidence to support the explanation that traits can be influenced by the environment.

Biological Evolution: Unity and Diversity: Students examine fossils to determine what they can tell us about organisms and environments that existed in the past. Students will investigate the impact of certain characteristics that are advantageous for survival and reproduction.

Earth's Systems: Students create graphical displays to describe typical weather conditions expected during a particular season. Students obtain data/information to describe climates in different regions of the world.

Earth and Human Activity: Students design solutions to weather-related hazards and/or impact of climate change on the environment.

Engineering Design: Students generate and compare multiple possible solutions to a problem. Students plan and carry out tests to identify aspects of a model or prototype that can be improved. .

Unit Name	**3-PS2: Motion and Stability: Forces and Interactions**
Estimated Timeline	February-March (6 weeks)
	3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all. Qualitative and conceptual, but not quantitative addition of forces, are used at this level. Assessment Boundary: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down. **3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.** Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw. Assessment Boundary: Assessment does not include technical terms such as period and frequency. **3-PS2-3 Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.** Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paper clips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force

	Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity. **3-PS2-4 Define a simple design problem that can be solved by applying scientific ideas about magnets.** Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.
Essential Questions	• What forces are acting on an object at rest? • What forces are acting on an object in motion? • How can you change the forces acting on an object? • How can measurements and observations help predict future motion of objects? • How can electric and magnetic interactions between two objects affect the motion of an object? • What simple designs solve problems using magnets?
Student Learning Objectives (standards)	• Students will plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. • Students will make observations and/ or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. • Students will ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. • Students will create a simple design problem that can be solved by applying scientific ideas about magnets. • Students will define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. • Students will 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. • Students will 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 projects, activities, labs used to support content	• Create an investigation to identify and describe the effects of different forces on an object's motion (starting, stopping, changing direction). • Develop an investigation to change the motion of an object at rest by applying both balanced (forces that sum zero) and unbalanced forces (forces that do not sum to zero) • Develop models to represent balanced and unbalanced forces • Describe the motion of an object will be observed and recorded (control strength and vary the direction, control direction and strength, number of trials needed) • Create an investigation that tests the magnetic pull of a bar magnet at varying distances with the use of paper clips. Students will hypothesize, conduct the experiment, collect the data, and draw conclusions. As a class, students will then compare each team's data and their interpretation of the results. • Participate in hands-on investigations to observe the phenomena that occurs when an electrically charged comb interacts with cereal and Styrofoam pellets. • Participate in investigation where students will be given a set of everyday objects and asked to make predictions on how far each object will move when they blow on it. They will then measure the distances the objects moved and record their data and observations in their science journals. • Develop and carry out investigations to answer the following o Will magnets work underwater? o Can magnets be blocked by certain materials? o Is it harder for a magnet to work through solids, liquids, or gases? o Is it truly possible to block a magnetic field? o Are all metals magnetic? o Does the orientation of a magnet affect movement?

	o Does distance between the objects affect movement? o Does the size of the objects affect movement? o Can magnetism be transferred to other objects? • Design a car that could move as far as possible with one breath of air only using four Lifesavers, two straws, two paper clips, scissors, tape, and a sheet of paper. • Design and improved model of an everyday object using a magnet (example being a magnetic latch to keep a door closed) • Motion and Wind- See Student Recording Sheet • Lifesaver Model Car- See Student Recording Sheet
Suggested Assessments	Students can demonstrate competency with tasks such as: • Developing and refining models • Planning and carrying out investigations • Generating, discussing and analyzing data • Constructing spoken and written scientific explanations • Engaging in evidence-based argumentation • Reflecting on their own understanding • Notebook entries • Response sheets • Focus question answers • Science and engineering practices checklist • Rubrics to assess designs and models

Suggested Resources	• *Christina Melillo will send Motion and Matter Unit* • NSTA Resources and Lesson Plans: h ttp://ngss.nsta.org/classroom-resources-result.saspx?Coreldea=2 • Design a car investigation:_ http://static.nsta.org/files/sc150134.pdf • Movement lab_ h ttp://serc.carleton.edu/sp/mnstep/activtiies/48587.html • Static electricity lab_ h ttps://www.scientificamerican.com/article/bring-science-home-static electrlcity-attraction/ • Magnet lab (distance)_ http://serc.carleton.edu/sp/mnstep/activities/2685.0html • Build your own ramp challenge_ https://stemplayground.org/activities/ramp-race/ • Improve an object using a magnet https://betterlesson.com/lesson/resource/3228140/situations • Inertia trajectory investigation_ https://betterlesson.com/lesson/637934/the-law-of-Inertia • Make Magnetic Slime_ http://frugalfun4boys.com/2014/03/06/make-magnetic-slime/

Science and Engineering Practices	• Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3) **Planning and Carrying Out Investigations** • 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-PS2-1) • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (3-PS2-2)
Disciplinary Core Ideas	**PS2.A: Forces and Motion** • Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces, are used at this level.) (3-PS2-1) • The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (3-PS2-2) **PS2.B: Types of Interactions** • Objects in contact exert forces on each other. (3-PS2-1) • Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (3-PS2-3), (3-PS2-4)

Crosscutting Concepts	**Patterns** · Patterns of change can be used to make predictions. (3-PS2-2) **Cause and Effect** · Cause and effect relationships are routinely identified. (3-PS2-1) · Cause and effect relationships are routinely identified, tested, and used to explain change. (3-PS2-3) ***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** · Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. (3-PS2-4) ***Connections to Nature of Science*** **Science Knowledge is Based on Empirical Evidence** · Science findings are based on recognizing patterns. (3-PS2-2) **Scientific Investigations Use a Variety of Methods** · Science investigations use a variety of methods, tools, and techniques. (3-PS2-1)

Connections NJSLS	**Language Arts** • RI.3.1 Ask and answer questions, and make relevant connections to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-PS2-1), (3-PS2-3) • RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-PS2-3) • RI.3.8 Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence) to support specific points the author makes in a text. (3-PS2-3) • W.3.7 Conduct short research projects that build knowledge about a topic. (3-PS2-1), (3-PS2-2) • W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-PS2-1), (3-PS2-2) • SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. (3-PS2-3) **Mathematics** • MP.2 Reason abstractly and quantitatively. (3-PS2-1) • MP.5 Use appropriate tools strategically. (3-PS2-1) • 3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (3-PS2-1)

Unit Name	**3-LS1: From Molecules to Organisms: Structures and Processes**
Estimated Timeline	September (3 weeks)
Standards	**3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles, but all have in common birth, growth, reproduction, and death.** Changes organisms go through during their life form a pattern. Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.
Essential Questions	• What are the life cycles for birds, reptiles, and fish? • What are the life cycles for amphibians? • What are the life cycles for insects? • What are the life cycles of mammals? • How do different plants reproduce? • How do different animals reproduce? • What are the stages in an organism's life cycle?
Student Learning Objectives	• Students will develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. • Students will define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. • Students will 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. • Students will 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 projects, activities, labs used to support content	• Students will research an organism's life cycle • Students will develop models (conceptual, physical, and drawings) to represent different animal life cycles. • Students will develop models with clay to describe the phenomenon (birth, growth, reproduction, death). • Students will identify patterns across life cycles. • Students will observe and track the stages in an organism's life cycle using a life specimen in the classroom. • Students will observe and track the stages in the life cycle of a lima bean plant in a mason jar. • Differentiate among the stages in the life cycle of a butterfly, mealworm, frog and plant.

	• Life cycle museum (students choose a life cycle to research and represent using a model)
Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist • Rubrics to assess designs and projects

Science and Engineering Practices	**Asking Questions and Defining Problems** · Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3) · Define a simple problem that can be solved through the development of a new or improved object or tool. (3-PS2-4) **Developing and Using Models** · Develop models to describe phenomena. (3-LS1-1)
Disciplinary Core Ideas	**LS1.B: Growth and Development of Organisms** · Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)
Crosscutting Concepts	**Patterns** · Patterns of change can be used to make predictions. (3-LS1-1) ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** · Science findings are based on recognizing patterns. (3-LS1-1)

Connections to NJSLS	**English Language Arts** RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). (3-LS1-1) SL.3.5 Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details. (3-LS1-1) **Mathematics** • MP.4 Model with mathematics. (3-LS1-1) • 3.NBT Number and Operations in Base Ten (3-LS1-1) • 3.NF Number and Operations—Fractions (3-LS1-1)

Unit Name	**3-LS2: Ecosystems: Interactions, Energy, and Dynamics**
Estimated Timeline	November-December (6 weeks)
Standards	**3-LS2-1 Construct an argument that some animals form groups that help members survive.**
Essential Questions	• Why do some animals form groups? • What do animals do to survive in their environments? • What do animals need to survive in their environments?
Student Learning Objectives	• Students will construct an argument that some animals form groups to survive. • Students will define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. • Students will 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. • Students will 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 projects, activities, labs used to support content	• Students will participate in "survival game". Students will be split up and assigned a specific animal (lone animal, animal in a pack) Students will have a limited time to travel around the room to get food, water, and shelter which are scattered around the room on different colored post-it notes. Students will debrief on the activity, discussing how the animal in a group had an easier time surviving. • Watch videos observing different animals in groups. Write and discuss advantages and disadvantages to living in groups. • Read and discuss articles on animals to identify animal behaviors and the benefits and drawbacks to these behaviors. • Read articles and watch videos to discuss and write about how changes in the environment can affect animals.

Suggested Resources	• Reading passages on survival in groups_ htti;i,s://betterlesson.comtlesson/632399/animal-grougs-benfelts-and-disadvantages
	• Surviving in groups activity_ https://betterlesson.com/lesson/632602/anima-lgrougs-what-Qurgose-do-they service
	• Observing animals in groups videos_ https://betterlesson.com/lesson/632602/animal-gro l u2s-what-Purpose-do-they-serve
	• Writing the relationship between predator and prey (coyote/rabbit)_ https://betterlesson.com/lesson/631543/gredator-and-Qrey-act-it-out
	• Amazing group behaviors in insects_ https://betterlesson.com/lesson/632312/amazing-ants-groug-behavior-in-insects
	• Talents of ants https://betterlesson.com/lesson/635052/social-insects-the-many-talents-of-ants
	• Gorilla survival- htt Qs://betterlesson.com/lesson/631906/introduction-to-mountain-gorillas • Animal Adaptations htt Q:// stem-works.com/subjects/30-the-animal-kingdom/activities/620

	• Animal Lifecycles Video http://stem-works.com/sub jects/30-the-animal-kingdom/activities/620 " http://stem works.com/subiects/30-the-animal kinqdom/activities/620
Suggested Assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist
Science and Engineering Practices	**Engaging in Argument from Evidence** Construct an argument with evidence, data, and/or a model. (3-LS2-1)
Disciplinary Core Ideas	**LS2.D: Social Interactions and Group Behavior** Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size (3-LS2-1)
Crosscutting Concepts	**Cause and Effect** Cause and effect relationships are routinely identified and used to explain change. (3-LS2-1)

Connections to NJSLS	**English Language Arts** • RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS2-1) • RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS2-1) • W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-LS2-1) **Mathematics** • MP.4 Model with mathematics. (3-LS2-1) • 3.NBT Number and Operations in Base Ten (3-LS2-1)

Unit Name	**3-LS3: Heredity: Inheritance and Variation of Traits**
Estimated Timeline	October (3 weeks)

Standards	**3-LS3-1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.** Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans. Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples. **3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment.** Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.
Essential Questions	• What similarities and differences in traits are shared between offspring, parents, and siblings? • What variations on traits are present among plants or animals of the same group? • What patterns can be observed and recorded? • What traits are inherited? • What traits are affected by the environment? • How can traits be affected by the environment?

Student Learning Objectives	• Students will analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. • Students will use evidence to support the explanation that traits can be influenced by the environment. • Students will define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. • Students will 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 projects, activities, labs used to support content	• Students make a claim to support a given explanation of an adaptation/behavior (ex.: nest building, colorful plumage to attract mates, bright flowers). In their claim, students will include the idea that characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. • Students will develop a model (e.g., Punnett squares, diagrams, simulations) of genetic variation in offspring relative to their parents. • Students will use cause-and-effect relationships found in the model between the type of reproduction and the resulting genetic variation to predict that more genetic variation occurs in organisms. • Students will identify inherited traits in partners.

Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist
Suggested Resources	• NSTA Resources and Lesson Plans: http:l/ngss.nsta.org/DisplayStandard.aspx?view=topic&id=32 • Inventory of Traits:_ http://teach.genetics.utah.edu/content/heredity/files/InventoryOfT raits.pdf,_ http://learn.genetics.utah.edu/content/inheritance/observable/ • Effect of Environment on Plant Growth: http://www.apsnet.org/edcenter /K-12/TeachersGuide/PlantBiotechnology/Pages/Activity2.aspx • Mutations and Variations: http://www.cosee-west.org/April/LectureMaterials/Activities/Mutations&_Variation.pdf • Reproduction Lesson:_ http://ca.pbslearningmedia.org/resource/tdc02.sci.life.repro.lp reproduce/reprod uction/ • Human Traits • https://drive.aooate.com/drvi e/foldersO/BvFBd0lns-tSYTRsSUSOcOtVRFE • Monster Traits activity

Science and Engineering Practices	**Analyzing and Interpreting Data** **Clarification: When possible and feasible, digital tools should be used.** • Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1) **Constructing Explanations and Designing Solutions** • Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2)
Disciplinary Core Ideas	**LS3.A: Inheritance of Traits** · Many characteristics of organisms are inherited from their parents. (3-LS3-1) · Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (3-LS3-2) **LS3.B: Variation of Traits** · Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1) · The environment also affects the traits that an organism develops. (3-LS3-2)
Crosscutting Concepts	**Patterns** · Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1) **Cause and Effect** · Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2)

Connections to NJSLS	**English Language Arts** RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS3-1), (3-LS3-2) RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS3-1), (3-LS3-2) W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS3-1), (3-LS3-2) SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (3-LS3-1), (3-LS3-2) **Mathematics** MP.2 Reason abstractly and quantitatively. (3-LS3-1), (3-LS3-2) MP.4 Model with mathematics. (3-LS3-1), (3-LS3-2) 3.MD.B.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters. (3-LS3-1), (3-LS3-2)

Unit Name	**3-LS4: Biological Evolution: Unity and Diversity**
Estimated Timeline	January-February (6 weeks)
Standards	**• 3-LS4-1 Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.** Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms. Assessment Boundary: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages. **• 3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.** Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring. **• 3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.** Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other. **• 3-LS4-4 Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.** Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms. Assessment Boundary: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.

Essential Questions	• What can fossils tell us about organisms and environments long ago? • How do certain characteristics in living organisms act as advantages for survival and reproduction? • How do certain characteristics in living organisms act as disadvantages for survival and reproduction? • What cause and effect relationships are evident between organisms characteristics and their ability to survive, find mates, and reproduce? • What factors in an organism's habitat affect its ability to survive, find a mate, and reproduce? • How do environmental changes affect an organism's ability to survive, find a **mate,** and reproduce?

Student Learning Objectives	• Students will analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. • Students will use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. • Students will construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. • Students will make a claim about the merit of a solution to a problem caused with the environment changes and the types of plants and animals that live there may change. • Students will define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. • Students will 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. • Students will 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. • Students will identify how traits can be influenced by environmental factors (food, exercise, water, chemicals, etc.).

Suggested projects, activities, labs used to support content	• Students will compare animals of the same species with different traits to identify advantages and disadvantages. • Students will discuss and write about environmental factors that affect the traits of living things using videos and text. • Students will identify information that can be concluded from fossils. • Students will look at the size and distribution of fossils to draw conclusions about how land has changed over time. • Students will participate in online-web quests to investigate fossils. • Students will create their own fossils. • Students will analyze real fossils and draw conclusions.

Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist

Suggested Resources	Inherited Traits in Animals: http:g://cals.arizona.edu/fi;,s/sites/cals.arizona.edu.fi;,s/files/education
	What Made a Giraffe Decide to be Tall- htt12s://a12i bP.tfP.rlP.sson c.om/mt12/IP.ssnn/f0 94R/12rlnt
	What does the Walrus do when the Ice is Gone?- htti;,s://ai;,i. betterlesson.com/mti;,/lesson/629946i/;,rint
	Colorful Clams- htti;,s://betterlesson .com/lesson/630994/colorful-clams
	Animals that can't adapt htti;,s://betterlesson.com/lesson/631920/vanishing-vagu ita-in-the-sea-of-cortez
	Fish of the Same Species with different traits_ htti;,s://betterlesson.com/lesson/627426/fish-vertebrates-of-the-sea
	Awesome Bird Traits- htti;,s://betterlesson.com/lesson/627509/awesome-bird-traits
	What can we learn from a bird dog htti;,s://betterlesson.com/lesson/resource/3174805/bear-dogs-rlenagd-
	i;,assage
	Interpreting Fossil Records_ htti;,s://ag_i . betterlesson.com/mtg_/lesson/635846/ i;,rint
	How Our Land has Changed over Time_ http;1s://aQi.betterlesson.com/mtg/lesson/638823/grint
	Make a fossil model- http:g://serc.carleton.edu/sg/mnstie;,/activities /27092.html

	• What can fossils tell us about organisms and environments long ago? Video Intro: htti;,://stud .com/academy:/lesson/usingf-ossil-evidence-to-evaluate-changes-in-environment-life-conditons.html
Science and Engineering Practices	**Analyzing and Interpreting Data** · Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS4-1) **Constructing Explanations and Designing Solutions** · Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2) **Engaging in Argument from Evidence** · Construct an argument with evidence. (3-LS4-3) · Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-LS4-4)
Disciplinary Core Ideas	**LS2.C: Ecosystem Dynamics, Functioning, and Resilience** · When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (secondary to 3-LS4-4) **LS4.A: Evidence of Common Ancestry and Diversity** · Some kinds of plants and animals that once lived on Earth are no longer found anywhere. (3-LS4-1) · Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (3-LS4-1) **LS4.B: Natural Selection** · Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2) **LS4.C: Adaptation** · For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3)

	LS4.D: Biodiversity and Humans · Populations live in a variety of habitats and change in those habitats affects the organisms living there. (3-LS4-4)
Crosscutting Concepts	**Cause and Effect** · Cause and effect relationships are routinely identified and used to explain change. (3-LS4-2), (3-LS4-3) **Scale, Proportion, and Quantity** · Observable phenomena exist from very short to very long time periods. (3-LS4-1) **Systems and System Models** · A system can be described in terms of its components and their interactions. (3-LS4-4) · ***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** · Knowledge of relevant scientific concepts and research findings is important in engineering. (3-LS4-4) ***Connections to Nature of Science*** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** · Science assumes consistent patterns in natural systems. (3-LS4-1)

Connections to NJSLS	**English Language Arts** RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4) RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4) RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4) W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-LS4-1), (3-LS4-3), (3-LS4-4) W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4) W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-LS4-1) SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (3-LS4-2), (3-LS4-3), (3-LS4-4) **Mathematics** • MP.2 Reason abstractly and quantitatively. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4) • MP.4 Model with mathematics. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4) • MP.5 Use appropriate tools strategically. (3-LS4-1) • 3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. (3-LS4-2), (3-LS4-3) • 3.MD.B.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the

	horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters. (3-LS4-1)

Unit Name	**3-ESS2**: Earth's Systems
Estimated Timeline	4 weeks (April-May)
Standards	• **3-ESS2-1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.** Examples of data could include average temperature, precipitation, and wind direction. Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change. • **3-ESS2-2 Obtain and combine information to describe climates in different regions of the world.**
Essential Questions	• What is the average temperature and precipitation within a region? • What patterns in weather can be recorded across different times and areas? • What are typical weather conditions in different areas? • How can patterns in climate predict typical weather conditions?

Student Learning Objectives	• Students will represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. • Students will obtain and combine information to describe climates in different regions of the world. • Students will define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. • Students will 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. • Students will 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 projects, activities, labs used to support content	• Students will research and record data on the weather and climate in another region of the world. • Students will measure temperature, precipitation, and wind direction using weather tools. • Students will graph typical weather patterns for the region in which they live. • Students will predict weather patterns based on patterns and preview year's data.

Suggested Assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist
Science and Engineering Practices	**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 tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. (3-ESS2-1) ***Obtaining, Evaluating, and Communicating Information*** Obtain and combine information from books and other reliable media to explain phenomena. (3-ESS2-2)
Disciplinary Core Ideas	**ESS2.D: Weather and Climate** • Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1) • Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2)

Crosscutting Concepts	**Patterns** · Patterns of change can be used to make predictions. (3-ESS2-1), (3-ESS2-2)

Connections to NJSLS	**English Language Arts** • RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS2-1) • RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-ESS2-2) • RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic. (3-ESS2-2) • W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-ESS2-2) **Mathematics** • MP.2 Reason abstractly and quantitatively. (3-LS3-1), (3-LS3-2) • MP.2 Reason abstractly and quantitatively. (3-ESS2-1), (3-ESS2-2) • MP.4 Model with mathematics. (3-ESS2-1), (3-ESS2-2) • MP.5 Use appropriate tools strategically. (3-ESS2-1) • 3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (3-ESS2-1) • 3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in bar graphs. (3-ESS2-1)

Unit Name	**3-ESS3:** Earth and Human Activity
Estimated Timeline	2 weeks (May)
Standard	**• 3-ESS3-1 Make a claim about the merit of a design solution that reduces the impacts of climate change and/or a weather-related hazard.** Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.
Essential Questions	• How can humans take steps to help reduce the impacts of natural hazards? • What design solutions exist to help reduce the impacts of weather-related hazards? • What could you design to help reduce the impacts of a particular weather-related hazard?
Student Learning Objectives	• Students will make a claim about the merit of a design that reduces the impacts of a weather-related hazard. • Students will define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. • Students will 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. • Students will 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 projects, activities, labs used to support content	• Students will design solutions to prevent weather-related hazards (barriers for flooding, wind resistant roofs, etc.) • Identify hazards and problems caused by weather. • Identify cause and effect relationships associated with weather related hazards. • Research recent natural disasters and the hazardous effects. Identify solutions that were used to solve these issues.
Suggested Resources	• HMH Science Dimensions Book • Weather.gov • Discovery Education Website • National Geographic Website • Enchanted Learning • Mystery Science • Brain Pop and Brain Pop Jr.

Suggested Assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist

Science and Engineering Practices	**Engaging in Argument from Evidence** · Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-ESS3-1)
Disciplinary Core Ideas	**ESS3.B: Natural Hazards** · A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1) (Note: This Disciplinary Core Idea is also addressed by 4-ESS3-2.)
Crosscutting Concepts	**Cause and Effect** · Cause and effect relationships are routinely identified, tested, and used to explain change. (3-ESS3-1) ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Engineering, Technology, and Science on Society and the Natural World** · Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones). (3-ESS3-1) ***Connections to Nature of Science*** **Science is a Human Endeavor** · Science affects everyday life. (3-ESS3-1)

Connections to NJSLS	**English Language Arts** • RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-ESS3-1) • W.3.7 Conduct short research projects that build knowledge about a topic. (3-ESS3-1) **Mathematics** • MP.2 Reason abstractly and quantitatively. (3-ESS3-1) • MP.4 Model with mathematics. (3-ESS3-1)

Unit Name	**3-5-ETS1: Engineering Design**
Estimated Timeline	September-June
Standards	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.

Student Learning Objectives	· Create STEAM journal/notebook-explain routine of using the notebook to keep track of observations · Understand the roles of a scientist and engineer · Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. · Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. · Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
Suggested projects, activities, labs used to support content	· Students can draw diagrams of their planned derby cars and build them based on those drawings. · Students will design their own investigation based on the question they created about pill bugs. You can encourage students to create a model for a final product based on what they learned throughout their investigation.
Student Assessments	· Students can demonstrate competency with tasks such as: · developing and refining models · generating, discussing and analyzing data · constructing spoken and written scientific explanations · engaging in evidence-based argumentation · reflecting on their own understanding · journal entries · response sheets

Suggested Resources	• HMH Science Dimensions • Mystery Science • Jodie Turner Workshops (on Google Drive)
Science and Engineering Practices	**Asking Questions and Defining Problems** 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) **Planning and Carrying Out Investigations** · 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) **Constructing Explanations and Designing Solutions** · 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)

Disciplinary Core Ideas	**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	***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)

Connections to NJSLS	**English Language Arts** RI.5.1Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (3-5-ETS1-2) RI.5.7Draw 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. (3-5-ETS1-2) RI.5.9Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3-5-ETS1-2) W.5.7Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-1), (3-5-ETS1-3) W.5.8Recall 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. (3-5-ETS1-1), (3-5-ETS1-3) W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETS1-1), (3-5-ETS1-3) **Mathematics** MP.2 Reason abstractly and quantitatively. (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3) MP.4 Model with mathematics. (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)

Science: Grade 4

Course Description:

Energy: Students use evidence to demonstrate the relationship between the speed of an object and the energy in the object. Students make observations to provide evidence that energy can be transferred from one place to another by sound, light, heat, and electric current. Students design and test a device that converts energy from one form to another.

Waves and their Applications in Technologies for Information Transfer: Students describe the patterns and parts of a wave. Students demonstrate how waves affect the motion of an object and how light impacts the ability of objects to be seen. Students develop an understanding of reflection and refraction and how they affect how we see things.

From Molecules to Organisms: Structures and Processes, students will identify what plants and animals need to survive and how internal and external structures assist in supporting life. Students will learn what a "system' is and how structure/systems work together.

Earth's Place in the Universe: Evidence from patterns in rock formations and fossils in rock layers will be used to support explanations for changes in landscape over time in the unit on. Students will learn how wind, water, and ice shape the land and the difference between weathering and erosion.

Earth's Systems: Students make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

Earth and Human Activity, students will generate and compare multiple solutions to reduce the impacts of natural Earth processes and climate change on humans. Students will examine examples of renewable and nonrenewable energy resources and how their uses affect the environment.

Engineering Design: Students define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. Students generate and compare multiple solutions to a problem. Plan and carry out tests to identify aspects of a model or prototype that can be improved.

Unit Name	**4-PS3: Energy**
Estimated Timeline	November-January
Standards	**4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object.** Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy. **4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.** Assessment Boundary: Assessment does not include quantitative measurements of energy. **4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide.** Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact. **4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.** Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device. Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.
Essential Questions	• What is energy? • How is energy transferred between objects? • What are some examples of energy around you? • How can energy be converted from one form to another?

Student Learning Objectives	• Students will use evidence to construct an explanation relating the speed of an object to the energy in that object. • Students will make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. • Students will ask questions and predict outcomes about the changes in energy that occur when objects collide. • Students will apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
Suggested projects, activities, resources, labs used to support content	• Students will design an experiment to test the energy in a moving object by measuring and evaluating the impact the moving object has on a second, stationary object. • Students will build spool racers that will transfer stored energy in a rubber band to kinetic energy in the moving spool racer. Students will write a reflection relating the speed of the racer (measured) to the amount of energy in the rubber band. https://www.teachengineering.org/activities/view/uced en ergy lesson01 activ1t y1 (spool racer design challenge) • Students will be provided materials to build model circuits converting energy in a battery into light. • Students will convert solar energy to produce workable oven_ https://www.homesciencetools.com/a/build-a-sola r-oven-project/ • Students will explore the amount of energy needed to bounce various types of balls at different heights(golf ball and ping pong ball activity, see attached Se model lesson plan • Students will demonstrate the transfer of energy from colored paper to an ice cube. See attached Se model lesson plan • Students will explore principles of energy related to electricity. https://educators.brainpop.com/lesson-plan/electrici ty-lesson-plan exploring-currents-circuits-electromagnetism/

	• How does height affect the distance a car
Suggested assessments	Students can demonstrate competency with tasks such as: • Designing, building and refining models • Generating, discussing and analyzing data • Constructing spoken and written scientific explanations • Writing arguments to support scientific evidence • Reflecting on their own understanding • Notebook entries • Response sheets • Focus question answers Science and engineering practices checklist
Science and Engineering Practices	**Asking Questions and Defining Problems** Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3) **Planning and Carrying Out Investigations** · Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2) **Constructing Explanations and Designing Solutions** · Use evidence (e.g., measurements, observations, patterns) to construct an explanation. (4-PS3-1) · Apply scientific ideas to solve design problems. (4-PS3-4)

Disciplinary Core Ideas	**PS3.A: Definitions of Energy** · The faster a given object is moving, the more energy it possesses. (4-PS3-1) · Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2), (4-PS3-3) **PS3.B: Conservation of Energy and Energy Transfer** · Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2), (4-PS3-3) · Light also transfers energy from place to place. (4-PS3-2) · Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2), (4-PS3-4) **PS3.C: Relationship Between Energy and Forces** · When objects collide, the contact forces transfer energy so as to change the objects' motions. (4-PS3-3) **PS3.D: Energy in Chemical Processes and Everyday Life** · The expression "produce energy "typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4) **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. (secondary to 4-PS3-4)
Crosscutting Concepts	**Energy and Matter** · Energy can be transferred in various ways and between objects. (4-PS3-1), (4-PS3-2), (4-PS3-3), (4-PS3-4) · ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Science, Engineering and Technology on Society and the Natural World** · Engineers improve existing technologies or develop new ones. (4-PS3-4) ***Connections to Nature of Science*** **Science is a Human Endeavor** · Most scientists and engineers work in teams. (4-PS3-4) · Science affects everyday life. (4-PS3-4)

Connections to NJSLS	**English Language Arts** RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS3-1) RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (4-PS3-1) RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS3-1) W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (4-PS3-1) W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-2), (4-PS3-3), (4-PS3-4) W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information and provide a list of sources. (4-PS3-1), (4-PS3-2), (4-PS3-3), (4-PS3-4) W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-PS3-1) **Mathematics** 4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. (4-PS3-4)

Unit Name	**4-ESS1: Earth's Place in the Universe**
Estimated Timeline	September-October
Standards	**4-ESS1-1** Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock. Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.
Essential Questions	• What can fossils tell us about history? • How do wind, water, and ice shape the land? • What is the difference between weathering and erosion? • How do fossils form? • What evidence of erosion can you see around you?
Student Learning Objectives	• Students will identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. • Students will make observations and measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

Suggested assessments	Students can demonstrate competency with tasks such as: • Designing, building and refining models • Generating, discussing and analyzing data • Constructing spoken and written scientific explanations • Writing arguments to support scientific evidence • Reflecting on their own understanding • Notebook entries • Response sheets • Focus question answers • Science and engineering practices checklist

Suggested projects, activities, labs used to support content with applicable resource links	• Students will examine samples of fossils, as well as photographs of rock layers, and write a story about how the landforms have changed over time, and what the landscapes may have been like many years ago. • Students will create fossils using plastic insects and clay - molding the clay with various amounts of weight. Determine the minimum amount of weight needed to create the ideal fossil impression. Discuss the relationship between the weight applied and the layers of sedimentary rock in the earth. • Students will create models of landforms and simulate the effect of different forms of erosion, changing variables for each simulation. Wind, water, and ice will be used on the model landforms to determine the features and effects created. (use stream tables) • Students will measure the effects of different forms of erosion from the models and draw conclusions based on the data. h ttp://www.discoveryeducation .com/teachers/free-lesson-plans/the grand-canyon.cfm • Students will watch a video comparing satellite views of the Earth over time. • Students will examine maps of the Earth and it's features. Look for patterns and identify features and where they occur. • Students will build sand castles with combinations of types of sand and glue and design an experiment to determine how well they hold up to weathering._ • Students will read/research the grand canyon and discuss impacts over time http://www.discoveryeducation .com/teachers/free-lesson plans/the-grand-canyon .cfm (examining the grand canyon) • Birth of rocks 4 week unit of study_ https://lmysteryscience.com/rocksr/ock-cycle-erosion-natural-hazards • Carving out the landscape, http://teachers.eqfi-k12 .org/road-warriors/

Science and Engineering Practices	**Constructing Explanations and Designing Solutions** · Identify the evidence that supports particular points in a explanation (4-ESS1-1)
Disciplinary Core Ideas	**ESS1.C: The History of Planet Earth** · Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layer were formed. (4-ESS1-1
Crosscutting Concepts	**Patterns** · Patterns can be used as evidence to support an explanation. (4-ESS1-1) ***Connections to Nature of Science*** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** · Science assumes consistent patterns in natural systems. (4-ESS1-1)
Connections to NJSLS-English Language Arts	· **W.4.7** Conduct short research projects that build knowledge through investigation of different aspects of a topic · **W.4.8** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information and provide a list of sources · **W.4.9** Draw evidence from literary or informational texts to support analysis, reflection, and research

Connections to NJSLS Mathematics	· **MP-2** Reason abstractly and quantitatively · **MP.4** Model with mathematics · **4.MD.A.1** Know relative sizes of measurement units within one system of units including km, m,cm; kg, g; lb, oz; l, ml; hr min, sec. Within a single system of measurement, express measurement in a larger unit in terms of smaller unit. Record measurement equivalents in a two-column table

Unit Name	**4-PS4: Waves and their Applications in Technologies for Information Transfer**
Estimated Timeline	**February-March**
Standards	**4-PS4-1Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.** Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves. Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength. **4-PS4-2Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.** Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works. **4-PS4-3Generate and compare multiple solutions that use patterns to transfer information.** Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.
Essential Questions	• What are waves? • How can you describe the patterns in waves? • What are the parts of a wave? • How can waves affect the motion of an object? • How does light (and changing light) impact the ability of objects to be seen? • What is reflection/refraction? How do they affect how we see things? • How do our eyes see objects?

Student Learning Objectives	• Students will develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. • Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. • Generate and compare multiple solutions that use patterns to transfer information.
Suggested projects, activities, labs used to support content	Students will model waves in water and describe the origin of the wave and the effect of the wave- https:f/www.eduglace.com/rdg/gen act/ocean/wave.html Students will demonstrate how force changes a waves amplitude and its ability to move an object._ https://betterlesson.com/ Students will apply their knowledge of waves (sound, light) to communicate through non verbal means_ httQs : //aQi.be tterlesson.com/mtg/lesson/63O476/Qrint Students will build/examine a model of the human eye and describe how light is responsible for seeing objects. Waves unit: https://learning-in-action.williams.edu/education-outreach/teaching-resources/4th-grade-waves-unit/ Unit lessons: httQ://ngss.nsta.org/DisQ!a Standard.asgx?view=toQic&id=16 Model waves in 2 liter bottles with a cork inside and examine what happens to the cork_ httgs://aQi . be tterlesson.com/mtg/lesson/6367O6/Qrint

Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data
Science and Engineering	**Developing and Using Models** · Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4-1) · Develop a model to describe phenomena. (4-PS4-2) **Constructing Explanations and Designing Solutions** · Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-PS4-3)
Disciplinary Core Ideas	**PS4.A: Wave Properties** · Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. (Note: This grade band end point was moved from K–2.)(4-PS4-1) · Waves of the same type can differ in amplitude (height of the wave)and wavelength (spacing between wave peaks). (4-PS4-1) **PS4.B: Electromagnetic Radiation** · An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2) **PS4.C: Information Technologies and Instrumentation** · Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. (4-PS4-3)

	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. (secondary to 4-PS4-3)
Crosscutting Concepts	**Patterns** · Similarities and differences in patterns can be used to sort and classify natural phenomena. (4-PS4-1) · Similarities and differences in patterns can be used to sort and classify designed products. (4-PS4-3) **Cause and Effect** · Cause and effect relationships are routinely identified. (4-PS4-2) · ***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** · Knowledge of relevant scientific concepts and research findings is important in engineering. (4-PS4-3) ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** · Science findings are based on recognizing patterns. (4-PS4-1)

Connections to NJSLS	**English Language Arts** RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS4-3) RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS4-3) SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-1), (4-PS4-2) **Mathematics** MP.4 Model with mathematics. (4-PS4-1), (4-PS4-2) 4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-1), (4-PS4-2)

Unit Name	**4-LS1: From Molecules to Organisms: Structures and Processes**
Estimated Timeline	April-June
Standards	**4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.** Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin. Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems. **4-LS1-2 Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.** Emphasis is on systems of information transfer. Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.
Essential Questions	• What do plants and animals need to survive? • How do internal and external structures support life? • What is a system? • How do these structures/systems work together? • Why do living things need to sense? • What do living things sense? • How does sensory information guide actions of a living thing? • What are sense receptors?

Student Learning Objectives	• Students will construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. • Students will use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in a different way.
Suggested projects, activities, labs used to support content	- Students will identify structures useful to animals and describe their functions in survival. - Create a diagram of plant structures. - Students will identify structures useful to plants and describe their functions in survival. - Students will watch brain pop videos on various human body systems and play guts and bolts to connect the systems so that they function in a working order. - Students will make a model lung and describe its function in the body and how it assists in a larger system needed for survival Students will examine camouflage through an activity designed to hide worm from a "bird" based on their color - Students will use information they know and have learned about bones to apply to an unknown creature by assembling the bone structure and making inferences - Students will use their sense of touch only, to describe unknown httgs://aQi.betterlesson.com/mtr2/le sson/631974/!;!rint objects htt!;!s://a!;!i.b etterlesson.com/mt!;!/l esson/615769!/;!rint "Dissect a Lima Bean" activity: httg://buggyandbuddy,'.com/dissect-a-bean-seed-science-invit ation-saturday/ - Use this bird beak adaptation activity to have students examine how easily different shaped beaks pick up food for birds. This is a 7th grade activity, adapt to 4th grade_ 1.htmht! !;!://www .vrml.k12.1a.us/7th/7SC By Unit/unit5/act1/7SC Un5Act

Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist
Science and Engineering Practices	**Developing and Using Models** · Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2) **Engaging in Argument from Evidence** · Construct an argument with evidence, data, and/or a model. (4-LS1-1)
Disciplinary Core Ideas	**LS1.A: Structure and Function** · Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1) **LS1.D: Information Processing** · 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. (4-LS1-2)

Crosscutting Concepts	**Systems and System Models** · A system can be described in terms of its components and their interactions. (4-LS1-1), (4-LS1-**2**)
Connections to NJSLS	**English Language Arts** W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1) SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-LS1-2) **Mathematics** 4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)

Unit Name	**4-ESS2: Earth's Systems**
Estimated Timeline	April-June
Standards	**4-ESS1-1 Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.** Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock. Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time. **• 4-ESS2-2 Analyze and interpret data from maps to describe patterns of Earth's features.** Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.
Student Learning Objectives	- Students will make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
Suggested projects, activities, labs used to support content and resources	- Students organize data using graphical displays (e.g., table, chart, graph) from maps of Earth's features (e.g., locations of mountains, continental boundaries, volcanoes, earthquakes, deep ocean trenches, ocean floor structures). - Students identify patterns in the location of Earth features, including the locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes. These relationships include: Volcanoes and earthquakes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges.

	- Students use logical reasoning based on the organized data to make sense of and describe* a phenomenon. In their description*, students include that Earth features occur in patterns that reflect information about how they are formed or occur (e.g., mountain ranges tend to occur on the edges of continents or inside them, the Pacific Ocean is surrounded by a ring of volcanoes, all continents are surrounded by water [assume Europe and Asia are identified as Eurasia]).
Suggested Assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist
Science and Engineering Practices	**Planning and Carrying Out Investigations** · Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) **Analyzing and Interpreting Data** · Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2)

Disciplinary Core Ideas	**ESS2.A: Earth Materials and Systems** · Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) **ESS2.B: Plate Tectonics and Large-Scale System Interactions** · The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2) **ESS2.E: Biogeology** · Living things affect the physical characteristics of their regions. (4-ESS2-1)
Crosscutting Concepts	**Patterns** · Patterns can be used as evidence to support an explanation. (4-ESS2-2) **Cause and Effect** · Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1)

Connections to NJSLS	**English Language Arts** •RI.4.7Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (4-ESS2-2) •W.4.7Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS2-1) •W.4.8Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS2-1) **Mathematics** • MP.2 Reason abstractly and quantitatively. (4-ESS2-1) • MP.4 Model with mathematics. (4-ESS2-1) • MP.5 Use appropriate tools strategically. (4-ESS2-1) •4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. (4-ESS2-1) •4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. (4-ESS2-1), (4-ESS2-2)

Unit Name	**4-ESS3: Earth and Human Activity**
Estimated Timeline	April-June
Standards	**4-ESS3-1 Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.** Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels. **4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes and climate change have on humans.** Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity. Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.
Student Learning Objectives	Students gather information from books and other reliable media about energy resources and fossil fuels (e.g., fossil fuels, solar, wind, water, nuclear), including: - How they are derived from natural sources (e.g., which natural resource they are derived from) [note: mechanisms should be limited to grade appropriate descriptions*, such as comparing the different ways energy resources are each derived from a natural resource). - How they address human energy needs. - The positive and negative environmental effects of using each energy resource.
Suggested projects, activities, labs used to support content and resources	Students combine the obtained information to provide evidence about: - The effects on the environment of using a given energy resource. - Whether the energy resource is renewable.

	- The role of technology, including new and improved technology, in improving or mediating the environmental effects of using a given resource. Students use the information they obtained and combined to describe* the causal relationships between: - Energy resources and the environmental effects of using that energy source. - The role of technology in extracting and using an energy resource.
Suggested Assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist
Science and Engineering Practices	**Constructing Explanations and Designing Solutions** · Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.(4-ESS3-2) **Obtaining, Evaluating, and Communicating Information** · Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)

Disciplinary Core Ideas	**ESS3.A: Natural Resources** · Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable overtime, and others are not. (4-ESS3-1) **ESS3.B: Natural Hazards** · A variety of hazards result from natural processes (e.g.,earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) **ETS1.B: Developing Possible Solutions** · Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)
Crosscutting Concepts	**Cause and Effect** · Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-1) · Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS3-2) ***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** · Knowledge of relevant scientific concepts and research findings is important in engineering. (4-ESS3-1) **Influence of Science, Engineering and Technology on Society and the Natural World** · Over time, people's needs and wants change, as do their demands for new and improved technologies. (4-ESS3-1) · Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2)

Connections to NJSLS	**English Language Arts:** •RI.4.1Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-ESS3-2) •RI.4.9Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-ESS3-2) •W.4.7Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS3-1) •W.4.8Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS3-1) •W.4.9Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-ESS3-1) **Mathematics** • MP.2 Reason abstractly and quantitatively. (4-ESS3-1), (4-ESS3-2) • MP.4 Model with mathematics. (4-ESS3-1), (4-ESS3-2) •4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. (4-ESS3-1), (4-ESS3-2)

Unit Name	**3-5-ETS1: Engineering Design**
Estimated Timeline	September-June **INTEGRATE THROUGHOUT THE YEAR https://docs.google.com/document/d/1mbbnduE5gsRYEKMoRz4PO1rbX2tmuGKHXA3Gym1pDeY/edit
Standards	**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.**
Student Learning Objectives	• Create STEAM journal/notebook-explain routine of using the notebook to keep track of observations • Understand the roles of a scientist and engineer • Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. • Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. • Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
Suggested projects, activities, labs used to support content	1. Identifying the problem to be solved - Students use given scientific information and information about a situation or phenomenon to define a simple design problem that includes responding to a need or want.

	- The problem students define is one that can be solved with the development of a new or improved object, tool, process, or system. - Students describe that people's needs and wants change over time. 2. Defining the boundaries of the system - Students define the limits within which the problem will be addressed, which includes addressing something people want and need at the current time. 3. Defining the criteria and constraints - Based on the situation people want to change, students specify criteria (required features) of a successful solution. - Students describe the constraints or limitations on their design, which may include: cost, material, and time
Student Assessments	• Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • journal entries • response sheets

Science and Engineering Practices	**Asking Questions and Defining Problems** • 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) **Planning and Carrying Out Investigations** • 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) **Constructing Explanations and Designing Solutions** • 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)

Disciplinary Core Ideas	**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	**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)

Connections to NJSLS	**English Language Arts** · RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (3-5-ETSI-2) · RI.5.1 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. (3.5-ETSI-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-ETSI-2) · W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETSI-1). (3-5-ETSI-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. (3-5-ETSI-1), (3-5-ETSI-3) · W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETSI-1), (3-5-ETSI-3) **Mathematics** · MP.2 Reason abstractly and quantitatively. (3-5-ETSI-1), (3-5-ETSI-2). (3-5-ETSI-3) · MP.4 Model with mathematics. (3-5-ETSI-1). ((3-5-ETSI-2), (3-5-ETSI-3) · MP.5 Use appropriate tools strategically. (3-5-ETSI-2), (3-5-ETSI-2), (3-5-ETSI-3) · 3-5.OA Operations and Algebraic Thinking (3-5-ETSI-1), (3-5-ETSI-2)

Science
Grade 5

Course Description:

Matter and Its Interactions: Students develop models to show that all matter is composed of particles too small to be seen. Students measure and graph quantities to provide evidence that weight of matter is conserved regardless of the type of change that occurs when heating, cooling, or mixing substances.

Motion and Stability: Forces and Interactions: Students find evidence to support an argument that the gravitational force exerted by the Earth on objects is directed downward.

From Molecules to Organisms: Structures and Processes: Students find evidence to support an argument that plants get the materials they need for growth chiefly from air and water.

Ecosystems: Interactions, Energy and Dynamics: Students examine and develop a model that describes the movement of matter among plants, animals, decomposers, and the environment.

Earth's Place in the Universe: Students find evidence to support an argument that differences in the apparent brightness of the sun compared to other stars is due to the relative distances from Earth. Students create graphical displays to demonstrate daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Earth's Systems: Students develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or other atmosphere interact. Describe and graph the amounts of saltwater and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

Earth and Human Activity: Students find information about ways individual communities use science ideas to protect the Earth's resources, environment, and address climate change issues.

Engineering Design: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. Generate and compare multiple solutions to a problem and 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.

Unit Name	Matter and Its Interactions
Estimated Timeline	April - June
Standards	**5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen.** 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 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.** Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances. Assessment does not include distinguishing mass and weight. **•5-PS1-3 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; density is not intended as an identifiable property. 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.**
Student Learning Objectives	• Develop a model to describe that matter is made of particles too small to be seen. • 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. • Make observations and measurements to identify materials based on their properties. • Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Essential Questions	• What makes up matter? • Does matter still exist if you cannot see it? • How can matter be broken down? • How is matter affected when it changes form? • Describe the properties of matter. • What is the difference between a physical change and a chemical change? • How are mixtures separated?
Suggested projects, activities, labs used to support content, and resources	• Separating a Mixture*: Students will be given a mixture of gravel, powder, salt, and magnetite. Students will use screens, filters, magnets, and evaporation dishes to separate the mixture, without being told what the mixture consists of. • Saturation*: Students will saturate three 50 ml bottles of water with salt, Epsoms salt, and citric acid. Students will use solubility and crystals shape (through evaporation) to identify the three materials. • Chemical Reactions*: Students will use three substances (calcium chloride, baking soda, and citric acid) to make three different combinations of two substances. They will add water and observe the changes that occur. The new products that form (a gas and a white precipitate) are identified as evidence of a chemical reaction. • Reaction Products*: Students will use filtering and evaporation to separate the products of the chemical reactions listed above and identify the products by testing with vinegar (chalk) and evaporation (salt) to identify the products. • Conservation of Mass: Students will use a balance and mass pieces to show that matter is conserved when making a salt water solution. Students will sort and categorize cards of different images of matter. The goal is to get students to identify solid, liquid, and gas. www.strangematterexhibti.com/index.html • Mystery Matter : Students receive a bag with a mystery item in it. They will have to gather data on the properties of matter in order to present it to the class. • Mystery Powder Investigation: Students observe the chemical properties of matter. • Mixing Substances Investigation: Students conduct experiments to tell if mixing two or more substances will result in a new substance. *Students will need to know the difference between physical and chemical changes.* • Trap and Store: Students will stimulate a smoke stack by combining vinegar and baking soda. Working as a team, they will design, build, and test a way to collect the carbon dioxide that their smoke stack
Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets

	• focus question answers • science and engineering practices checklist
Science and Engineering Practices	**Developing and Using Models** • Develop a model to describe phenomena. (5-PS1-1) **Planning and Carrying Out Investigations** • 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) • 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** • Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)
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)
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)

Connections to NJSLS	**English Language Arts** •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) **Mathematics** • 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)

Unit Name	**5-PS2 Motion and Stability: Forces and Interactions**
Estimated Timeline	April - June
Standards	**5-PS2-1. 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. Assessment does not include mathematical representation of gravitational force.

Essential Questions	• How can one explain and predict interactions between objects and within systems of objects? • What are the two factors that determine the strength of gravitational force? • Why do objects on Earth move toward the surface? • What are the two components to force? • How do forces interact with non moving objects? • How can we predict future motion? • How can one predict an object's continued motion, changes in motion, or stability? • What underlying forces explain the variety of interactions observed? • Why are some physical systems more stable than others?
Student Learning Objectives	Students identify a given claim to be supported about a phenomenon. The claim includes the idea that the gravitational force exerted by Earth on objects is directed down toward the center of Earth.
Suggested projects, activities, labs used to support content, and resources	Students use reasoning to connect the relevant and appropriate evidence to support the claim with argumentation. Students describe* a chain of reasoning that includes: - If Earth is spherical, and all observers see objects near them falling directly "down" to the Earth's surface, then all observers would agree that objects fall toward the Earth's center. - Since an object that is initially stationary when held moves downward when it is released, there must be a force (gravity) acting on the object that pulls the object toward the center of Earth.
Suggested Assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist
Science and Engineering Practices	**Engaging in Argument from Evidence** • Support an argument with evidence, data, or a model. (5-PS2-1)
Disciplinary Core Ideas	**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)
Crosscutting Concepts	**Cause and Effect** • Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1)

Connections to NJSLS	**English Language Arts** • 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) • 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) • W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-PS2-1)

Unit Name	**5-PS3: Energy**
Estimated Timeline	September – November
Standards	**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.** Examples of models could include diagrams, and flow charts.
Essential Questions	- What is the relationship between plants and the energy they get from sunlight to produce food? - What is the relationship between animals and the food they eat, which is either other animals or plants (or both), to obtain energy for bodily functions and materials for growth and repair?
Student Learning Objectives	- Identify sunlight as the original source of energy for all life on Earth - Recognize that the storage of energy as plant matter is a chemical process involving air and water - Recognize the role of producers and consumers (of various levels) in transforming energy of some form into energy more suited for transfer (e.g., producers transform Sun into plant matter and 1st-level consumers transform plant matter into animal proteins)
Suggested projects, activities, labs used to support content, and resources	Students use models to describe a phenomenon that includes the idea that energy in animals' food was once energy from the sun. Students identify and describe the components of the model that are relevant for describing the phenomenon, including: - Energy - The sun - Animals, including their bodily functions (e.g., body repair, growth, motion, body warmth maintenance). - Plants
Suggested Assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries

	• response sheets • focus question answers
Science and Engineering Practices	**Developing and Using Models** • Use models to describe phenomena. (5-PS3-1)
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) **LS1.C: Organization for Matter and Energy Flow in Organisms** • 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)
Crosscutting Concepts	**Energy and Matter** • Energy can be transferred in various ways and between objects. (5-PS3-1)
Connections to NJSLS	**English Language Arts** • 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-PS3-1) • 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-PS3-1)

Unit Name	**5-LS1: From Molecules to Organisms: Structures and Processes**
Estimated Timeline	September – November
Standards	**5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.** Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.
Student Learning Objectives	- 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). Energy Flow in Organisms 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)
Essential Questions	- How do cells contribute to the function of living organisms and how do organisms grow and reproduce? - What are the connections between environmental and genetic factors in organism growth, behavior, and reproduction.
Suggested projects, activities, labs used to support content, and resources	- Summative Assessment: Imagine that a science museum is making a very large version of your model (the diorama) for a museum display. Write three captions explaining the model for members of the public who will view the display. The captions should describe: – how the energy is produced or used by the producer and one other organism – the cycling and conservation of matter between abiotic and biotic parts of the ecosystem – the source, flow, and loss of energy from abiotic and biotic parts of the ecosystem
Suggested Assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers

Science and Engineering Practices	**Engaging in Argument from Evidence** • Support an argument with evidence, data, or a model. (5-LS1-1)
Disciplinary Core Ideas	**LS1.C: Organization for Matter and Energy Flow in Organisms** • Plants acquire their material for growth chiefly from air and water. (5-LS1-1)
Crosscutting Concepts	**Energy and Matter** • Matter is transported into, out of, and within systems. (5-LS1-1)
Connections to NJSLS	**English Language Arts** • 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) **Mathematics** • MP.2 Reason abstractly and quantitatively. (5-LS1-1) • MP.4 Model with mathematics. (5-LS1-1) • 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)

Unit Name	**5-LS2: Ecosystems: Interactions, Energy, and Dynamics**
Estimated Timeline	September – November
Standards	**5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.** 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 does not include molecular explanations.
Essential Questions	• How do plants get the food they need? • What factors determine how animals meet their basic needs? • How are the components that make up an ecosystem interdependent? • How does matter and energy transfer and cycle within an ecosystem? • What are the components and interactions within a given ecosystem?
Student Learning Objectives	• Use models to describe that energy in animals' food was once energy from the sun. • Justify that animals' food is used for body repair, growth, motion, & to maintain body warmth. • Defend that energy can be transferred in various ways and between objects. • Develop a model to demonstrate phenomena of mechanisms for natural events. • Construct a model that represents the interdependent relationships in an Ecosystem. • Create a representation of matter and energy transfer in an ecosystem. • Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. • 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. • 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 projects, activities, labs used to support content, and resources	• Plant nutrition*: Students will plant wheat seeds in a dark environment and a light environment to observe that plants getthe materials they need for growth mainly from air and water. • Food Chain Digital Challenges: https:1/ecokid s.ca/swf-files/gamesPage/chain reaction.swf http://www.iknowthat.com/ScienceIllustrations/foodcha

	• Ecosystem Design Challenge: Students design and create a model of a sustainable environment for a specific organism. • Conduct research to create a food web utilizing technology software, Inspiration. • Food Fight Game: Digitally build an environment in which animals complete for resources:_ https://www.brainpop.com/games/foodfighVEcogame.swf • Research Endangered Species:_ http://www.kidsplanet.org/factsheets/ma.phtml • Exploring Animal Survival Activity
Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist
Science and Engineering Practices	**Developing and Using Models** • Develop a model to describe phenomena. (5-LS2-1)
Disciplinary Core Ideas	**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)

Crosscutting Concepts	**Systems and System Models** • A system can be described in terms of its components and their interactions. (5-LS2-1) **Connections to Nature of Science** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** • Science explanations describe the mechanisms for natural events. (5-LS2-1)
Connections to NJSLS	**English Language Arts** • 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) • 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) **Mathematics** • MP.2 Reason abstractly and quantitatively. (5-LS2-1) • MP.4 Model with mathematics. (5-LS2-1)

Unit Name	**5-ESS1: Earth's Place in the Universe**
Estimated Timeline	September – November
Standards	**• 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 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.** 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 does not include causes of seasons.

Essential Questions	- What effect does Earth's gravitational force have on objects? - What effect does the relative distance from Earth have on the apparent brightness of the sun and other stars? - What patterns do we notice when observing the sky?
Student Learning Objectives	- 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. - Students are expected to demonstrate grade-appropriate proficiency in analyzing and interpreting data and engaging in argument from evidence. - Students explore the effects of gravity and determine the effect that relative distance has on the apparent brightness of stars. They also collect and analyze data in order to describe patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
Suggested projects, activities, labs used to support content, and resources	Gravity and Falling Objects: PBS Learning Media lesson where students investigate the force of gravity and how all objects, regardless of mass, fall to the ground at the same rate. NASA's Solar System Exploration website contains several resources that educators and students can use to make sense of the night sky. Our Super Star: PBS Learning Media lesson that guides students to understand the basic facts about the Sun, model the mechanics of day and night, and use solar energy to make a tasty treat.
Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist
Science and Engineering Practices	**Analyzing and Interpreting Data** • Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (5-ESS1-2) **Engaging in Argument from Evidence** • Support an argument with evidence, data, or a model. (5-ESS1-1)
Disciplinary Core Ideas	**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)
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) **Scale, Proportion, and Quantity** • Natural objects exist from the very small to the immensely large. (5-ESS1-1)
Connections to NJSLS	**English Language Arts** • 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. (5-ESS1-1) • 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-ESS1-1) • 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) • RI.5.9 Integrate and reflect on (e.g. practical knowledge, historical/cultural context, and background knowledge) information from several texts on the same topic in order to write or speak about the subject knowledgeably. (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-ESS1-2) **Mathematics** • MP.2 Reason abstractly and quantitatively. (5-ESS1-1),(5-ESS1-2) • MP.4 Model with mathematics. (5-ESS1-1),(5-ESS1-2) • 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)

Unit Name	**5-ESS2: Earth's Systems**
Estimated Timeline	December – March
Standards	**5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.** 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 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 is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.
Essential Questions	- 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?
Student Learning Objectives	• Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. • Describe and graph the amounts of saltwater and freshwater in various reservoirs to provide evidence about the distribution of water on Earth. • Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. • Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time or cost. • Research an environmental issue, steps that have already been done to correct it, and activities 5th graders could do to help it.

Suggested projects, activities, labs used to support content, and resources	• Students will be given data for pairs of cities with similar latitude, with one city being closer to the ocean. They will analyze the data to determine the effect of proximity to an ocean on climate. • Students will be given data for pairs of cities, with one city being in the rain shadow of a mountain range. They will analyze the data to determine the effect of mountain ranges on climate. • Students will model distribution of Earth's water using different size beakers and graduated cylinders. They will then make a graph (pie, bar, etc.) to show the distribution of water on earth. • Students will design a prototype to convert saltwater to freshwater. Provide criteria and constraints for prototype. • Students will construct a model to show the interaction between two of earth's systems. • FOSS Water Cycle Game • Water Cycle Model
Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers science and engineering practices checklist
Science and Engineering Practices	**Developing and Using Models** • Develop a model using an example to describe a scientific principle. (5-ESS2-1) **Using Mathematics and Computational Thinking** • Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2)
Disciplinary Core Ideas	**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 Process** • 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)

Crosscutting Concepts	**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-ESS2-1)
Connections to NJSLS	**English Language Arts** •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-ESS2-1), (5-ESS2-2) •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-ESS2-1), (5-ESS2-2) **Mathematics** • MP.2 Reason abstractly and quantitatively. (5-ESS2-1), (5-ESS2-2) • MP.4 Model with mathematics. (5-ESS2-1), (5-ESS2-2) •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)

Unit Name	**5-ESS3: Earth and Human Activity**
Estimated Timeline	December – March
Standards	**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.**
Essential Questions	- What are the positive and negative effects on the environment as a result of human activities? - How can individual communities use scientific ideas and a scientific understanding of interactions between components of environmental systems to protect a natural resource and the environment in which the resource is found?
Student Learning Objectives	Students will explore the following Phenomena or Contexts Note that the list in this section is not exhaustive. Pollution Acid precipitation Soil erosion Habitat destruction Invasive species Recycling Restoration and protection of natural habitats Environmental regulations Water conservation
Suggested projects, activities, labs used to support content, and resources	- Students obtain information from books and other reliable media about: 1. How a given human activity (e.g., in agriculture, industry, everyday life) affects the Earth's resources and environments. 2. How a given community uses scientific ideas to protect a given natural resource and the environment in which the resource is found.
Suggested assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers science and engineering practices checklist

Science and Engineering Practices	**Obtaining, Evaluating, and Communicating Information** • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1)
Disciplinary Core Ideas	**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	**Systems and System Models** • A system can be described in terms of its components and their interactions. (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)
Connections to NJSLS	**English Language Arts** 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. (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-ESS2-1), (5-ESS2-2) RI.5.9 Integrate and reflect on (e.g. practical knowledge, historical/cultural context, and background knowledge) information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS3-) 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-ESS3-1) W.5.9 Draw evidence from literary or informational textsto support analysis, reflection, and research. (5-ESS3-1) **Mathematics** • MP.2 Reason abstractly and quantitatively. (5-ESS3-1) • MP.4 Model with mathematics. (5-ESS3-1)

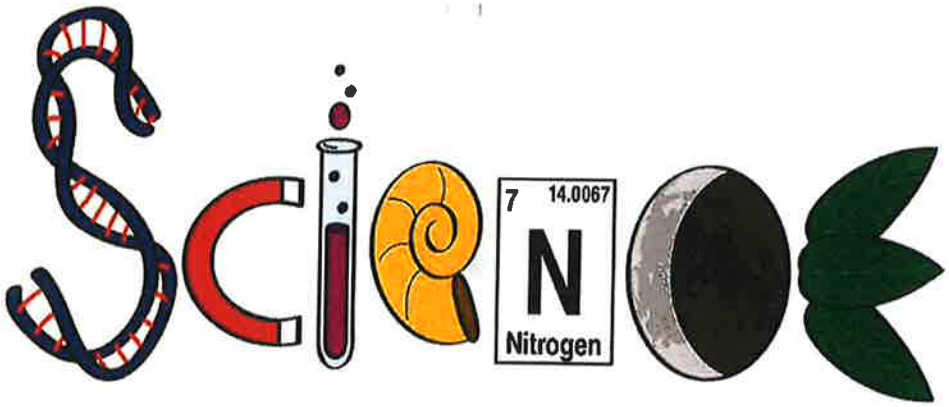
Unit Name	**3-5-ETS1: Engineering Design**
Estimated Timeline	September-June **INTEGRATE THROUGHOUT THE YEAR https://docs.google.com/document/d/1mbbnduE5gsRYEKMoRz4PO1rbX2tmuGKHXA3Gym1pDeY/edit
Standards	**3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria 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.**
Student Learning Objectives	• Create STEAM journal/notebook-explain routine of using the notebook to keep track of observations • Understand the roles of a scientist and engineer • Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. • Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. • Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
Suggested projects, activities, labs used to support content	• Students can draw diagrams of their planned derby cars and build them based on those drawings. • Students will design their own investigation based on the question they created about pill bugs. You can encourage students to create a model for a final product based on what they learned throughout their investigation.
Student Assessments	• Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • journal entries • response sheets

Science and Engineering Practices	**Asking Questions and Defining Problems** • 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) **Planning and Carrying Out Investigations** • 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) **Constructing Explanations and Designing Solutions** • 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)
Disciplinary Core Ideas	**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	**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)

Connections to NJSLS	**English Language Arts** RI.5.1 Quote accurately from a text 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. (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) W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects 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. (3-5-ETS1-1), (3-5-ETS1-3) W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETS1-1), (3-5-ETS1-3) **Mathematics** MP.2 Reason abstractly and quantitatively. (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3) MP.4 Model with mathematics. (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)

North Caldwell Public Schools

Science Curriculum K-6



Adopted:

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North Caldwell
Science Curriculum

I. Science

Scientific and technological advances have proliferated and now permeate most aspects of life in the 21st century. It is increasingly important that all members of our society develop an understanding of scientific and engineering concepts and processes. Learning how to construct scientific explanations and how to design evidence-based solutions provides students with tools to think critically about personal and societal issues and needs. Students can then contribute meaningfully to decision-making processes, such as discussions about climate change, new approaches to health care, and innovative solutions to local and global problems.

II. Mission

All students will possess an understanding of scientific concepts and processes required for personal decision-making, participation in civic life, and preparation for careers in STEM fields (for those that chose).

III. Vision

Prepare students to become scientifically literate individuals who can effectively:

- Apply scientific thinking, skills, and understanding to real-world phenomena and problems;
- Engage in systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned;
- Conduct investigations, solve problems, and engage in discussions;
- Discuss open-ended questions that focus on the strength of the evidence used to generate claims;
- Read and evaluate multiple sources, including science-related magazine and journal articles and web-based resources to gain knowledge about current and past science problems and solutions and develop well-reasoned claims; and
- Communicate ideas through journal articles, reports, posters, and media presentations that explain and argue.

IV. COURSE DESCRIPTION:

The New Jersey Student Learning Standards for Science (NJSLS-S) describe the expectations for what students should know and be able to do, as well as promote three-dimensional science instruction across the three science domains (i.e. physical sciences, life science, Earth and space sciences). From the earliest grades, the expectation is that students will engage in learning experiences that enable them to investigate phenomena, design solutions to problems, make sense of evidence to construct arguments, and critique and discuss those arguments (in appropriate ways relative to their grade level)

The foundation of the NJSLS-S reflects three dimensions – science and engineering practices, disciplinary core ideas, and crosscutting concepts. The performance

expectations are derived from the interplay of these three dimensions. Within each standard, the three dimensions are intentionally presented as integrated components to foster sensemaking and designing solutions to problems. Because the NJSLS-S is built on the notions of coherence and contextuality, each of the science and engineering practices and crosscutting concepts appear multiple times across topics and at every grade level. Additionally, the three dimensions should be an integral part of every curriculum unit and should not be taught in isolation.

Disciplinary Core Ideas:

Physical Science:

- PS1: Matter and Its Interaction
  - PS1.A: Structure and Properties of Matter
  - PS1.B: Chemical Reactions
  - PS1.C: Nuclear Processes

- PS2: Motion and Stability: Forces and Interactions
  - PS2.A: Forces and Motion
  - PS2.B: Types of Interactions
  - PS2.C: Stability and Instability in Physical Systems

- PS3: Energy
  - PS3.A: Definitions of Energy
  - PS3.B: Conservation of Energy and Energy Transfer
  - PS3.C: Relationship Between energy and Forces
  - PS3.D: Energy in Chemical Processes and everyday Life

- PS4: Waves and Their Applications in Technologies for Information Transfer
  - PS4.A: Wave Properties
  - PS4.B: Electromagnetic Radiation
  - PS4.C: Information Technologies and Instrumentation

Life Science:

- LS1: From Molecules to Organisms: Structures and Processes
  - LS1.A: Structure and Function
  - LS1.B: Growth and Development of Organisms
  - LS1.C: Organization for Matter and Energy Flow in Organisms
  - LS1.D: Information Processing

- LS2: Ecosystems: interactions, Energy, and Dynamics
  - LS2.A: Interdependent Relationships in Ecosystems
  - LS2.B: Cycles of Matter and Energy Transfer in ecosystems
  - LS2.C: Ecosystem Dynamics, Functioning and Resilience
  - LS2.D: Social Interactions and Group Behavior

- LS3: Heredity: Inheritance and Variation of Traits
  - LS3.A: Inheritance of Traits
  - LS3.B: Variation of Traits

- LS4: Biological Evolution Unity and Diversity
  - LS4.A: Evidence of Common Ancestry and Diversity

- LS4.B: Natural Selection
- LS4.C: adaptation
- LS4.D: Biodiversity and Humans

Earth and Space Science

- ESS1: Earth's Place in the Universe
  - ESS1.A: The Universe and Its Stars
  - ESS1.B: Earth and the Solar System
  - ESS1.C: The History of Planet Earth

- ESS2: Earth's Systems
  - ESS2.A: Earth Materials and Systems
  - ESS2.B: Plate Tectonics and Large-Scale System Interactions
  - ESS2.C: The Roles of Water in Earth's Surface Processes
  - ESS2.D: Weather and Climate
  - ESS2.E: Biogeology
  -

- ESS3: Earth and Human Activity
  - ESS3.A: Natural Resources
  - ESS3.B: Natural Hazards
  - ESS3.C: Human Impacts on Earth Systems
  - ESS3.D: Global Climate Change

Engineering Technology, and the Application of Science

- ETS1: Engineering Design
  - ETS1.A: Defining and Delimiting an Engineering Problem
  - ETS1. B: Developing Possible Solutions
  - ETS1.C: Optimizing the Design Solution

- ETS2: Links Among Engineering, technology, Science, and Society
  - ETS2.A: Interdependence of Science, Engineering, and Technology
  - ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World

Scientific and Engineering Practices

- Asking Questions and Defining Problems
- Planning and Carrying Out Investigations
- Analyzing and Interpreting Data
- Developing and Using Models
- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence
- Using Mathematics and Computational thinking
- Obtaining, Evaluating, and Communicating Information

Crosscutting Concepts

- Patterns
- Cause and Effect: Mechanism and Explanation

- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Structure and Function
- Stability and Change

V.TEXTS/RESOURCES

A. https:l/www.wastatelaser.org/science-notebooks/

B. www.NSTA.org

C. www.nextgenscience.org

D. www.njctl.org

E. www.eie.org Engineering is Elementary

VII. EVALUATIONS/ASSESSMENTS

A combination of formative and summative assessments will be utilized in this course including, but not limited to teacher observations, student work and reflections, projects, quizzes and tests, and writing tasks.

VIII. Interdisciplinary Connections

Science, engineering, and technology influence and permeate every aspect of modern life. Some knowledge of science and engineering is required to engage with the major public policy issues of today as well as to make informed everyday decisions. In addition, understanding science and the extraordinary insights it has produced can be meaningful and relevant on a personal level, opening new worlds to explore and offering lifelong opportunities for enriching people's lives. In these contexts, learning science is important for everyone, even those who eventually choose careers in fields other than science or engineering.

Science, math, and language arts should complement each other as often as possible. Students will benefit from this cross-curricular relationship as they learn more about the world through exploration, experimentation, and collaboration.

IX. Integration of the Technology Standard through NJSLS 8

In this ever-changing digital world where citizenship is being re-imagined, our students must be able to harness the power of technology to live, solve problems and learn in college, on the job and throughout their lives. Enabled with digital and civic citizenship skills, students are empowered to be responsible members of today's diverse global society.

Readiness in this century demands that students actively engage in critical thinking, communication, collaboration, and creativity. Technology empowers students with real-world data, tools, experts and global outreach to actively

engage in solving meaningful problems in all areas of their lives. The power of technology discretely supports all curricular areas and multiple levels of mastery for all students.

X. Integration of 21st century skills through NJSLS 9

Creativity is a driving force in the 21st century global economy, with the fastest growing jobs and emerging industries relying on the ability of workers to think unconventionally and use their imaginations. Experience with and knowledge of the science, technology, engineering, arts, and math are essential components of the P-12 curriculum in the 21st century. As the state of New Jersey works to transform public education to meet the needs of a changing world and the 21st century workforce, capitalizing on the unique ability of science to unleash creativity and innovation in our students is critical for success.

XI. Integration of 21st century Life and Career skills through Career Education

For students to be college and career ready they must have opportunities to understand career concepts and financial literacy. This includes helping students make informed decisions about their future personal, educational, work, and financial goals. By integrating Standard 9 into instruction, New Jersey students will acquire the necessary academic and life skills to not only achieve individual success but also to contribute to the success of our society. For example: Career Day event, exposure to a variety of careers in the science field, exploration of technology career options, school-wide science fair and science related field trips (e.g. Liberty Science Center, Buehler Science Center and Environmental Centers)

Career Ready Practices:

These practices outline the skills that all individuals need to have to truly be adaptive, reflective, and proactive in life and careers. These are researched practices that are essential to career readiness.

Personal Financial Literacy:

Fiscal knowledge, habits, and skills must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

Career Awareness, Exploration, and Preparation:

This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.

Career and Technical Education:

For students to be college and career ready they must have opportunities to understand career concepts and financial literacy. This includes helping students make informed decisions about their future personal, educational, work, and financial goals. By integrating Standard 9 into instruction, New Jersey students will acquire the necessary academic and life skills to not only achieve individual success but also to contribute to the success of our society.

XII. Integrated accommodations and modifications for students with: IEP and 504:

(For students with disabilities, appropriate accommodations, instructional adaptations, and/or modifications should be determined by the IEP or 504 team)

Modifications for Classroom

- Use multisensory instruction. Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Give repetition and practice exercises
- Model skills/techniques to be mastered
- Give extended time to complete class work
- Provide copy of class notes
- Determine if preferential seating would be beneficial
- Provide access to a computer
- Provide copies of textbooks
- Provide access to books on tape/CD/digital media, as available and appropriate'
- Assign a peer helper in the class setting
- Provide oral reminders and check student work during independent work time
- Assist student with long- and short-term planning of assignments
- Encourage student to proofread assignments and tests Provide regular parent/school communication

Modifications for Homework and Assignments

- Provide extended time to complete assignments
- Break down assignments into manageable chunks with definite time lines
- Provide the student with clearly stated (written) expectations and grading criteria for assignments
- Implement RAFT activities as they pertain to the types/modes of communication (role, audience, format, topic)

Modifications for Assessments

- Provide extended time on classroom tests and quizzes
- Provide alternate setting as needed
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests
- Establish procedures for accommodations /modifications for assessments

Differentiation for High End Learners:

- Allow students to pursue independent projects based on their individual interests
- Provide enrichment activities that include more advanced material
- Allow team-teaching opportunities and collaboration
- Set individual goals
- Conduct research and provide presentation of appropriate topics
- Design surveys to generate and analyze data to be used in discussion
- Use Higher-Level Questioning Techniques
- Provide assessments at a higher level of thinking

English Language Learners: Modifications for Classroom

- Pair visual prompts with verbal presentations
- Provide repetition and practice
- Model skills/techniques to be mastered

Modifications for Homework/Assignments

- Provide Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)
- Provide extended time for assignment completion as needed
- Chunk assignments into units with definite time lines
- Highlight key vocabulary
- Use graphic organizers

Science
Grade 6

Earth's Place in the Universe: Students develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and season. Students develop and use models to describe the role of gravity in the motions within galaxies and solar systems. Students construct a scientific explanation based on evidence from rock stata for how the geologic time scale is used to organize Earth's history.

Earth's Systems: Students develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. Students construct an evidence based explanation for how geoscience processes have changed Earth's surface and analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. Students gather data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.

Earth and Human Activity: Students construct a scientific explanation based on evidence for how the uneven distribution of earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. Students analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. Students construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

From Molecules to Organisms: Structure and Processes: Students conduct an investigation to provide evidence tat living things are made of cells and use models to describe the function of a cell as a whole and ways parts of cells contribute to the function. Students will collect evidence to support an argument that the body is a system of interacting subsystems composed of groups of cells. Students will find evidence to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants.

Heredity: Inheritance and Variation of Traits: Students develop and use a model to describe why structural changes to genes located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effect to the structure and function of the organism. Students develop a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

Biological Evolution: Unity and Diversity: Students analyze and interpret data for patterns in the fossil records that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth. Students analyze pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. Students gather information to construct an argument that describes how genetic variation of traits in a population increases some individuals' probability of surviving and reproducing in a specific environment.

Unit Name	**MS-ESS1: Earth's Place in the Universe**
Estimated Timeline	**September - November**
Standards	**MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.** Examples of models can be physical, graphical, or conceptual. **MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.** Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state). Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth. **MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.** Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models. Assessment does not include recalling facts about properties of the planets and other solar system bodies. **MS-ESS1-4 Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.** Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions. Assessment does not include recalling the names of specific periods or epochs and events within them.

Essential Questions	• What is the universe, and what is Earth's place in it? • What are the predictable patterns caused by Earth's movement in the solar system? • Why does the Sun's position change over time? • What causes the Sun's position to change during the year? • How does the position of the Earth and Sun affect seasonal patterns? • What causes the phases of the moon? • What causes solar and lunar eclipses? • What determines the gravitational pull on an object? • How does gravity hold planets in orbit? • How do objects in our solar system compare? • How do scientists study our solar system?
Suggested projects, activities, labs used to support content	• Students will use models to predict the lunar phase given the positions of Earth, Moon, and the Sun. Students will manipulate their models to show locations where a solar or lunar eclipse will take place. • Students will use a light and moon model to determine the phases of the moon, and make a phases of the moon chart to summarize their results. • Students will use a model to describe that gravity is an inward pulling force that can keep smaller/less massive objects in orbit around larger/more massive objects. Given different scenarios, students will determine which scenario would have the greatest gravitational pull. • Students will calculate how much they would weigh on other planets and how far they could jump on other plants. They will use this data to come to a conclusion about gravitational pull and mass. • Students will design a model or diagram that shows two ways gravitational pull exists between Earth and the Moon. • Students will organize data on solar system objects to design diagrams, graphs, or physical models. • Students will use quantitative analyses to describe similarities and differences among solar system objects by describing patterns of features. • Students will identify advances in solar system science made possible by improved engineering. • Students will interpret quantitative and qualitative data to draw their own conclusions about patterns in the solar system (ex.: outer planets have the greatest size).
Suggested Assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist

Science and Engineering Practices	**Developing and Using Models** • Develop and use a model to describe phenomena. (MS-ESS1-1), (MS-ESS1-2) **Analyzing and Interpreting Data** • Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3) **Constructing Explanations and Designing Solutions** • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-ESS1-4)
Disciplinary Core Ideas	**ESS1.A: The Universe and Its Stars** • Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1) • Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2) **ESS1.B: Earth and the Solar System** • The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2), (MSESS1-3) • This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1) • The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2) **ESS1.C: The History of Planet Earth** • The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4)
Crosscutting Concepts	**Patterns** • Patterns can be used to identify cause and effect relationships. (MS-ESS1-1) **Scale, Proportion, and Quantity** • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3), (MS-ESS1-4) **Systems and System Models** • Models can be used to represent systems and their interactions. (MS-ESS1-2) ***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** • Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. (MS-ESS1-3)

	Connections to Nature of Science **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** • Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-ESS1-1), (MS-ESS1-2)
Connections to NJSLS	**English Language Arts** •RST.6-8.1Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS2-2), (MS-ESS2-3), (MS-ESS2-5) •RST.6-8.1Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-3), (MS-ESS1-4) •RST.6-8.7Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS1-3) •WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS1-4) •SL.8.5Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS1-1), (MS-ESS1-2) **Mathematics** • MP.2 Reason abstractly and quantitatively. (MS-ESS1-3) • MP.4 Model with mathematics. (MS-ESS1-1), (MS-ESS1-2) •6.RP.A.1Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS1-1), (MS-ESS1-2), (MS-ESS1-3) •7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-ESS1-1), (MS-ESS1-2), (MS-ESS1-3) •6.EE.B.6Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS1-2), (MS-ESS1-4) •7.EE.B.6Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS1-2), (MS-ESS1-4)

Unit Name	**MS-ESS2: Earth's Systems**
Estimated Timeline	**December-February**
Standards	**MS-ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.** Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials. Assessment does not include the identification and naming of minerals. **MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.** Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate. **MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.** Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches). Assessment : Paleomagnetic anomalies in oceanic and continental crust are not assessed. **MS-ESS2-4 Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.** Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical Assessment: A quantitative understanding of the latent heats of vaporization and fusion is not assessed. **MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.** Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation.

	Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations. **MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.** Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations. Assessment does not include the dynamics of the Coriolis effect.
Essential Questions	• How and why is Earth constantly changing? • How do Earth's major systems interact? • Why do the continents move, and what causes earthquakes and volcanoes? • How do the properties and movements of water shape Earth's surface? • What regulates weather and climate? • What is the sun's role in the water cycle and how does that affect us? • How does energy from the Sun affect wind on Earth? • What happens when two areas of air have different pressures? • What factors do meteorologists use to forecast the weather? Why can't meteorologists predict weather with 100% certainty? • What is density? • What affects the direction that ocean water flows? • How does the weather differ between locations? • How does the ocean affect climate on land? • How does energy from the Sun affect weather and climate on Earth? • How does latitude affect an area's weather and climate?
Suggested projects, activities, labs used to support content	• After watching a video of severe weather, students discuss in small groups and the whole class reaches a consensus on the factors that constitute weather. Students begin monitoring local weather conditions, using tools. • Students review local weather reports and determine the factors that combine to produce what we know as weather. They are introduced to, and use, a thermometer, barometer, hygrometer, compass, and anemometer. outdoors and develop a plan for acquiring daily data and sharing them with the class. • Students work with syringes and tubing to discover that air takes up space and is compressible. They work in small groups to design demonstrations to show that air has mass. They study the atmosphere, a mixture of gases, using diagrams, photos, and a reading. • Students investigate how the shape of Earth and its relationship to the Sun affect the weather around the world. They use light sources and

	globes to model the length of the day throughout the year. • Students investigate what happens to different earth materials (sand, soil, water, air) when placed in sunshine and then in shade to show radiation. They set up an experiment and collect and analyze the data by observing the differential heating of earth materials, one factor that contributes to weather. • Students observe two examples of heat transfer by conduction: movement of heat from a container of hot water to a container of cold water, and movement of heat from one end of a metal strip to the other. • Students make a density column to investigate density of fluids by layering colored salt solutions in a straw. They determine the relative densities of the salt solutions by comparing the masses of equal volumes. They calculate the density of each solution, using the ratio of mass to volume. • Students observe the interaction of colored water of different temperatures to determine that warm water rises and cold water descends. • Students design investigations to show that water vapor is in the air around them. Materials are provided, and each group plans an investigation, conducts it, and reports to the class in a short presentation. • Students measure temperature change that occurs during evaporation, using wet- and dry-bulb thermometers to be introduced to humidity as the measure of water vapor in the air. • To explore the temperature at which water vapor condenses into drops of liquid water, students determine the dew-point temperature for their classroom and use wet-bulb and dry-bulb thermometers and a hygrometer to measure humidity. • Students investigate the relationship between pressure and temperature, using 2-liter soda bottles and thermometer strips. They discover that, the greater the pressure in a gas, the higher the temperature. They use this understanding of pressure and temperature to explore cloud formation. • Students observe a demonstration that shows how Earth's water is distributed. They participate in a game that simulates the travels of a water molecule through the water cycle. They compare the results of the game to their understanding of how the water cycle operates on Earth. • Students investigate the relationship between changing air pressure and wind. They assemble and explore a pressure indicator and learn about barometers. Using knowledge developed in previous investigations, they come up with models of wind. They build an anemometer to measure local wind and use pressure maps to make weather predictions. • Students observe a solar hot-air balloon and consider it as a model for a warm air mass to introduce the concept of how air masses form. • They compare different climate regions around the world, using a multimedia database. • Students will model the Coriolis Effect to explain its influence on the wind and water current on earth, by using a balloon and a marker. One student turns the balloon, while the other tries to draw a straight line from the North Pole to the equator, and South Pole to the equator.

	• Analyze an air pressure map. • Research and analyze data for two cities of similar lat/long, one coastal, one inland. Look for patterns and draw a conclusion. • Research and analyze data for groups of cities at different latitudes. Look for patterns and draw a conclusion. • Students investigate the effect of the ocean on climate by observing the effects of the layering of warm and cold water and water that is more or less saline than the normal. They will do this by creating saline solutions of different colors that mimic ocean salinity, are more saline than ocean water, and are less saline than ocean water and pouring the different solutions into a basin that shows how the different solutions can model layering in the ocean. The student will combine the results of the two separate exercises and predict which of the conditions might prevail.
Suggested Assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist
Science and Engineering Practices	**Developing and Using Models** • Develop and use a model to describe phenomena.(MS-ESS2-1), (MS-ESS2-6) • Develop a model to describe unobservable mechanisms. (MS-ESS2-4) **Planning and Carrying Out Investigations** • Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. (MS-ESS2-5) **Analyzing and Interpreting Data** • Analyze and interpret data to provide evidence for phenomena.(MS-ESS2-3) **Constructing Explanations and Designing Solutions** • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future. (MS-ESS2-2)
Disciplinary Core Ideas	**ESS1.C: The History of Planet Earth** • Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE)(secondary to MS-ESS2-3) **ESS2.A: Earth's Materials and Systems** • All Earth processes are the result of energy flowing and matter

	cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1) • The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2) **ESS2.B: Plate Tectonics and Large-Scale System Interactions** • Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3) **ESS2.C: The Roles of Water in Earth's Surface Processes** • Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.(MS-ESS2-4) • The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5) • Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4) • Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6) • Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2) **ESS2.D: Weather and Climate** • Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MSESS2-6) • Because these patterns are so complex, weather can only be predicted probabilistically. (MSESS2-5) • The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6)
Crosscutting Concepts	**Patterns** • Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3) **Cause and Effect** • Cause and effect relationships maybe used to predict phenomena in natural or designed systems. (MS-ESS2-5) **Scale Proportion and Quantity** • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS2-2) **Systems and System Models** • Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6)

	Energy and Matter • Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4) **Stability and Change** • Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale.(MS-ESS2-1) • ***Connections to Nature of Science*** **Scientific Knowledge is Open to Revision in Light of New Evidence** • Science findings are frequently revised and/or reinterpreted based on new evidence. (MS-ESS2-3)
Connections to NJSLS	**English Language Arts** •RST.6-8.1Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS2-2), (MS-ESS2-3), (MS-ESS2-5) •RST.6-8.7Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS2-3) •RST.6-8.9Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ESS2-3), (MS-ESS2-5) •WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS2-2) •WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS2-5) •SL.8.5Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS2-1), (MS-ESS2-2), (MS-ESS2-6) **Mathematics** • MP.2 Reason abstractly and quantitatively. (MS-ESS2-2), (MS-ESS2-3), (MS-ESS2-5) •6.NS.C.5Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-ESS2-5) •6.EE.B.6Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS2-2), (MS-ESS2-3) •7.EE.B.4Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS2-2), (MS-ESS2-3)

<u>Unit Name</u>	**MS-ESS3: Earth and Human Activity**
Estimated Timeline	**February - March**
Standards	**MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.** Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock). **MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.** Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts). **MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.** Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land). **MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.**

	Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes. **MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused climate change over the past century.** Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.
Suggested projects, activities, labs used to support content	• Students map greenhouse gas emissions where they live by researching what greenhouse gasses are and using an online resource (website of the epa) to find the most common greenhouse gasses for where they live and their sources. They will graph the data. They will use their knowledge to determine ways that facilities can reduce their emissions and how they and their families can reduce their emissions. • Students will create green initiative presentations based on finding solutions to help mitigate the effects of climate change in the future. • Students consider severe weather in relation to air masses and fronts. Climate is introduced and climate regions are discussed. Students compare a water-cycle multimedia simulation with the global-warming variation, in which Earth's average temperature has increased 2–5°C. They analyze the results and make predictions of the continued effect of global warming on Earth.
Suggested Assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist
Science and Engineering Practices	**Asking Questions and Defining Problems** • Ask questions to identify and clarify evidence of an argument. (MS-ESS3-5)

	• Analyze and interpret data to determine similarities and differences in findings. (MS-ESS3-2) **Constructing Explanations and Designing Solutions** • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-ESS3-1) • Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3) **Engaging in Argument from Evidence** • Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-ESS3-4)
Disciplinary Core Ideas	**ESS3.A: Natural Resources** • Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1) **ESS3.B: Natural Hazards** • Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (MS-ESS3-2) **ESS3.C: Human Impacts on Earth Systems** • Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3) • Typically, as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MS-ESS3-3), (MS-ESS3-4) **ESS3.D: Global Climate Change** • Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)
Crosscutting Concepts	**Patterns** • Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2) **Cause and Effect** • Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3) • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-1), (MS-ESS3-4)

	Stability and Change • Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5) ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Science, Engineering, and Technology on Society and the Natural World** • All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ESS3-1), (MS-ESS3-4) • The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time. (MS-ESS3-2), (MS-ESS3-3) ***Connections to Nature of Science*** **Science Addresses Questions About the Natural and Material World** • Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-ESS3-4)
Connections to NJSLS	**English Language Arts** •RST.6-8.1Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-1), (MS-ESS3-2), (MS-ESS3-4), (MS-ESS3-5) •RST.6-8.7Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS3-2) •WHST.6-8.1 Write arguments focused on discipline content. (MS-ESS3-4) •WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS3-1) •WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ESS3-3) •WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS3-3) •WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1),(MS-ESS3-4) **Mathematics** • MP.2 Reason abstractly and quantitatively. (MS-ESS3-2), (MS-ESS3-5) •6.RP.A.1Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS3-3), (MS-ESS3-4) •7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-ESS3-3), (MS-ESS3-4) •6.EE.B.6Use variables to represent numbers and write expressions when

	solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS3-1), (MS-ESS3-2), (MS-ESS3-3), (MS-ESS3-4), (MS-ESS3-5) •7.EE.B.4Use variables to represent quantities in a real-world or mathematical problem and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS3-1), (MS-ESS3-2), (MS-ESS3-3), (MS-ESS3-4), (MS-ESS3-5)

Unit Name	**MS-LS1: From Molecules to Organisms: Structures and Processes**
Estimated Timeline	**April-May**
Standards	**MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.** Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells. **MS-LS1-2Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.** Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall. Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts. **MS-LS1-3Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.** Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems. Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems. **MS-LS1-4Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.** Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury. **MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.**

	Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds. Assessment does not include genetic mechanisms, gene regulation, or biochemical processes. **MS-LS1-6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.** Emphasis is on tracing movement of matter and flow of energy. Assessment does not include the biochemical mechanisms of photosynthesis. **MS-LS1-7 Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.** Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released. Assessment does not include details of the chemical reactions for photosynthesis or respiration. **MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.** Assessment does not include mechanisms for the transmission of this information.
Essential Questions	• What are the building blocks of life? • How does each part of a cell function? • How is the body a system of interacting subsystems composed of groups of cells? • What are the fundamental differences between animal and plant cells pertaining to cell reproduction? • How do organisms detect, process, and use information about the environment? • How do our sensory receptors send information to our brain? • How do organisms live, grow, respond to their environment, and reproduce? • How do organisms obtain and use the matter and energy they need to live and grow? • How do the structures of organisms enable life's functions? • How do organisms grow and develop?

Suggested projects, activities, labs used to support content	• Students investigate cells using a compound microscope • Students use microscopes to explore unicellular and multicellular organisms, and plant and animal cells. • Students use interactive website to explore the components within a cell and how they work together • Develop a model in which they identify the parts (components: nucleus, chloroplast, cell wall, mitochondria, cell membrane, the function of a cell as a whole) of cells • Project: "A cell is like a _____ " Students create a poster/model to display their analogy relating each organelle to something in their project *(ex.city, park, school, etc)*
Suggested Assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist
Science and Engineering Practices	**Developing and Using Models** • Develop and use a model to describe phenomena. (MS-LS1-2) • Develop a model to describe unobservable mechanisms. (MS-LS1-7) **Planning and Carrying Out Investigations** • Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. (MS-LS1-1) **Constructing Explanations and Designing Solutions** • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-LS1-5), (MS-LS1-6) **Engaging in Argument from Evidence** • Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. (MS-LS1-3) • Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS1-4) **Obtaining, Evaluating, and Communicating Information** • Gather, read, and synthesize information from multiple appropriate

	sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS1-8)
Disciplinary Core Ideas	**LS1.A: Structure and Function** • All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1) • Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2) • In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3) **LS1.B: Growth and Development of Organisms** • Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4) • Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4) • Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5) **LS1.C: Organization for Matter and Energy Flow in Organisms** • Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. **(MS-LS1-6)** • Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7) **LS1.D: Information Processing** • Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. (MS-LS1-8) **PS3.D: Energy in Chemical Processes and Everyday Life** • The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6) • Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. (secondary to MS-LS1-7)

Crosscutting Concepts	**Cause and Effect** • Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8) • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4), (MS-LS1-5) **Scale, Proportion, and Quantity** • Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1) **Systems and System Models** • Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3) **Energy and Matter** • Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7) • Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1-6) **Structure and Function** • Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2) ***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** • Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS1-1) ***Connections to Nature of Science*** **Science is a Human Endeavor** • Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3) **Scientific Knowledge is Based on Empirical Evidence** • Science knowledge is based upon logical connections between evidence and explanations. (MS-LS1-6)
Connections to NJSLS	**English Language Arts** •RST.6-8.1Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-3), (MS-LS1-4), (MS-LS1-5), (MS-LS1-6) •RST.6-8.2Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-5), (MS-LS1-6) •RI.6.8Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-3), (MS-LS1-4) •WHST.6-8.1Write arguments focused on discipline content. (MS-LS1-3),

	(MS-LS1-4) •WHST.6-8.2Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS1-5), (MS-LS1-6) •WHST.6-8.7Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-LS1-1) •WHST.6-8.8Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-LS1-8) •WHST.6-8.9Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5), (MS-LS1-6) •SL.8.5Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2, (MS-LS1-7) **Mathematics** •6.EE.C.9Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1), (MS-LS1-2), (MS-LS1-3), (MS-LS1-6) •6.SP.A.2Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4), (MS-LS1-5) •6.SP.B.4Summarize numerical data sets in relation to their context. (MS-LS1-4), (MS-LS1-5)

Unit Name	**MS-LS3: Heredity: Inheritance and Variation of Traits**
Estimated Timeline	**April-May**
Standards	**MS-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism** Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins. Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations. **MS-LS3-2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.** Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.

Essential Questions	• How do organisms reproduce? • How are characteristics of one generation passed to the next? • How can individuals of the same species and even siblings have different characteristics? • What is the difference between sexual and asexual reproduction? • Why do individuals of the same species vary in how they look, function, and behave? • How can an organism's behavior increase its chance of survival and reproduction? • What structures or mechanisms aid in plant reproduction? • How does the environment contribute to successful reproduction or growth? • How do genetic factors influence the growth of organisms? • How do natural differences in organisms increase survival and reproduction?
Suggested projects, activities, labs used to support content	• Students make a claim to support a given explanation of an adaptation/behavior (ex.: nest building, colorful plumage to attract mates, bright flowers). In their claim, students will include the idea that characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.Students will identify evidence, evaluate the evidence, and use reasoning to connect appropriate evidence to claim. • Students will articulate a statement that relates the given phenomenon to a scientific idea, including the idea that both environmental and genetic factors influence the growth of organisms.Students identify and describe evidence (e.g., from students' own investigations, observations, reading material, archived data) necessary for constructing the explanation. • Students will research and develop a model to show how a mutation can have harmful, beneficial, or neutral effects. • Students will develop a model (e.g., Punnett squares, diagrams, simulations) for a given phenomenon involving the differences in genetic variation that arise from sexual and asexual reproduction. In the model, students identify and describe the relevant components. Students use the model to describe an account for why sexual and asexual reproduction result in different amounts of genetic variation in offspring relative to their parents. • Students will use cause-and-effect relationships found in the model between the type of reproduction and the resulting genetic variation to predict that more genetic variation occurs in organisms that reproduce sexually compared to organisms that reproduce asexually. • Students will gather information about at least two technologies that have changed the way humans influence the inheritance of desired traits in plants and animals through artificial selection by choosing desired parental traits determined by genes, which are then often

	passed on to offspring. Examples could include gene therapy, genetic modification, and selective breeding of plants and animals.
Suggested Assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist
Science and Engineering Practices	**Developing and Using Models** • Develop and use a model to describe phenomena. (MS-LS3-1),(MS-LS3-2)
Disciplinary Core Ideas	**LS1.B: Growth and Development of Organisms** • **Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2)** **LS3.A: Inheritance of Traits** • Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes(mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1) • Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.(MS-LS3-2) **LS3.B: Variation of Traits** • In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2) • In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)

Crosscutting Concepts	**Cause and Effect** • Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2) **Structure and Function** • Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1)
Connections to NJSLS	**English Language Arts** •RST.6-8.4Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. (MS-LS3-1), (MS-LS3-2) •RST.6-8.7Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS3-1), (MS-LS3-2) •SL.8.5Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS3-1), (MS-LS3-2) **Mathematics** • MP.4 Model with mathematics. (MS-LS3-2) • 6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS3-2)

Unit Name	**MS-LS4: Biological Evolution: Unity and Diversity**
Estimated Timeline	**May-June**
Standards	**MS-LS4-1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.** Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers. Assessment does not include the names of individual species or geological eras in the fossil record. **MS-LS4-2 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.** Emphasis is on explanations of the evolutionary relationships among

	organisms in terms of similarity or differences of the gross appearance of anatomical structures. **MS-LS4-3 Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.** Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures. Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development. **MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.** Emphasis is on using simple probability statements and proportional reasoning to construct explanations. **MS-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.** Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries. **MS-LS4-6 Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.**
Essential Questions	• What evidence exists to show that different species are related? • How does genetic variation among organisms affect survival and reproduction? • How does the environment influence populations of organisms over multiple generations? • How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms? • What Is Biodiversity, how do humans affect it,and how does it affect humans?
Suggested projects, activities, labs used to support content	• Research report based around current events in genetic modifications. • Fossilized Mammal assessment. Students will go through the fossilized mammal assessment to identify an extinct species' closest living relative. • Evolutionary relationship project.

Suggested Assessments	Students can demonstrate competency with tasks such as: • developing and refining models • generating, discussing and analyzing data • constructing spoken and written scientific explanations • engaging in evidence-based argumentation • reflecting on their own understanding • notebook entries • response sheets • focus question answers • science and engineering practices checklist
Science and Engineering Practices	**Analyzing and Interpreting Data** • Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3) • Analyze and interpret data to determine similarities and differences in findings.(MS-LS4-1) **Using Mathematics and Computational Thinking** • Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6) **Constructing Explanations and Designing Solutions** • Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events.(MS-LS4-2) • Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. (MS-LS4-4) **Obtaining, Evaluating, and Communicating Information** • Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS4-5)
Disciplinary Core Ideas	**LS4.A: Evidence of Common Ancestry and Diversity** • The collection of fossils and their placement in chronological order (e.g., through the location of these sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.(MS-LS4-1) • **Anatomical similarities and differences between various** organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2) • Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy.(MS-LS4-3) **LS4.B: Natural Selection** • Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4) • In artificial selection, humans have the capacity to influence certain

	characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed onto offspring. (MS-LS4-5) **LS4.C: Adaptation** • Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)
Crosscutting Concepts	**Patterns** • Patterns can be used to identify cause and effect relationships.(MS-LS4-2) • Graphs, charts, and images can be used to identify patterns in data.(MS-LS4-1), (MS-LS4-3) **Cause and Effect** • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4),(MS-LS4-5), (MS-LS4-6) ***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** • Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5) ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** • Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-LS4-1) **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** • Science assumes that objects and events in natural systems occur inconsistent patterns that are understandable through measurement and observation.(MS-LS4-1), (MS-LS4-2) **Science Addresses Questions About the Natural and Material World** • Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS4-5)
Connections to NJSLS	**English Language Arts** •RST.6-8.1Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-LS4-1), (MS-LS4-2), (MS-LS4-3), (MS-LS4-4), (MS-LS4-5) •RST.6-8.7Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS4-1), (MS-LS4-3) •RST.6-8.9Compare and contrast the information gained from experiments,

	simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-3), (MS-LS4-4) •WHST.6-8.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (MS-LS4-2), (MS-LS4-4) •WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-LS4-5) •WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2),(MS-LS4-4) •SL.8.1Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS4-2), (MS-LS4-4) •SL.8.4Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS4-2), (MS-LS4-4) **Mathematics** • MP.4 Model with mathematics. (MS-LS4-6) •6.RP.A.1Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-LS4-4), (MS-LS4-6) •6.SP.B.5Summarize numerical data sets in relation to their context. (MS-LS4-4), (MS-LS4-6) •6.EE.B.6Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-LS4-1), (MS-LS4-2) •7.RP.A.2Recognize and represent proportional relationships between quantities. (MS-LS4-4), (MS-LS4-6)