Science G3

EWING PUBLIC SCHOOLS
2099 Pennington Road
Ewing, NJ 08618

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In accordance with The Ewing Public Schools' Policy 2230, Course Guides, this curriculum has been reviewed and found to be in compliance with all policies and all affirmative action criteria.

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Course Description and Rationale

Students in this course will learn to explain scientific phenomena. The Next Generation Science Standards (NGSS) performance expectations rely on three dimensions of learning to develop student understanding of scientific concepts. Core conceptual ideas are learned by engaging in scientific and engineering practices and considering crosscutting concepts. These three dimensions support students in developing useable knowledge to explain real world phenomena in the sciences.

In science, performance expectations at the elementary school level use three dimensional learning to foster student understanding of science concepts.

Students will use the following eight NGSS Science and Engineering Practices to demonstrate understanding of the disciplinary core ideas and develop critical thinking skills:

- Asking questions (science) and defining problems (engineering)
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using math and computational thinking
- Constructing explanations (science) and designing solutions (engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

The following seven crosscutting concepts support the development of a deeper understanding of the disciplinary core ideas:

- Patterns
- Cause and effect: mechanism and explanation
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter: flows, cycles and conservation
- Structure and function

The course is a year-long course that meets for 45 minutes per day, on average for half the days of each marking period. The course uses a project-based approach to exploring many concepts. Many of the core ideas will be applied to engineering problems, allowing students to also develop an understanding of the engineering design process. This will further develop problem-solving and critical thinking skills as students work to design, test, solve, and revise solutions to problems. The crosscutting concepts of patterns through structure and function are used as organizing concepts for these disciplinary core ideas. These performance expectations focus on students demonstrating proficiency in developing and using models, using mathematical thinking, and obtaining, evaluating and communicating information; and to use these practices to demonstrate understanding of the core ideas.

The course content is arranged into four units of study:

- Forces and Interactions
- Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms
- Inheritance and Variation of Traits: Life Cycles and Traits
- Weather and Climate

Career Readiness, Life Literacies, and Key Skills

During this course, students will work on developing, to an age appropriate level, the following Career Readiness, Life Literacies, and Key Skills:

Disciplinary Concepts:

- Career Awareness and Planning
    1. Different types of jobs require different knowledge and skills
- Creativity and Innovation
    1. Brainstorming can create new, innovative ideas.
- Critical Thinking and Problem-solving
    1. Critical thinkers must first identify a problem then develop a plan to address it in order to effectively solve a problem.
- Digital Citizenship
    1. Young people can have a positive impact on the natural world in the fight against climate change.
- Information and Media Literacy
    - Digital tools and media resources provide access to vast stores of information that can be searched.
    - Digital tools can be used to display data in various ways.
    - A variety of diverse sources, contexts, disciplines and cultures provide valuable and necessary information that can be used for different purposes.
    - Information is shared or conveyed in a variety of formats and sources.
- Technology Literacy
    - Digital tools have a purpose.
    - Collaboration can simplify the work an individual has to do and sometimes produce a better product.

Technology Integration

Computer Science and Design Thinking

During this course, students will work on developing, to an age appropriate level, the following Computer Science and Design Thinking Skills:

Disciplinary Concepts and Core Ideas:

- Data & Analysis
  - Individuals collect, use, and display data about individuals and the world around them.
  - Data can be used to make predictions about the world.
- Engineering Design
  - Engineering design is a creative process for meeting human needs or wants that can result in multiple solutions.
  - Limitations (constraints) must be considered when engineering designs.
- Interaction of Technology and Humans
  - Human needs and desires determine which new tools are developed.
  - Technology has changed the way people live and work.
  - Various tools can improve daily tasks and quality of life.
- Effects of Technology on the Natural World
  - The use of technology developed for the human designed world can affect the environment, including land, water, air, plants, and animals.
  - Technologies that use natural sources can have negative effects on the environment, its quality, and inhabitants.
  - Reusing and recycling materials can save money while preserving natural resources and avoiding damage to the environment.

ELA Integration:

- **NJSLS.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) (3-LS2-1) (3-LS4-1) (3-LS4-3) (3-LS4-4) (3-PS2-1) (3-PS2-3)
- **NJSLS.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-LS4-3) (3LS4-4)
- **NJSLS.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) (3-LS4-1) (3-LS4-3) (3-LS4-4) (3-PS2-3)
- **NJSLS.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)
- **NJSLS.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). (3-PS2-3)
- **NJSLS.RI.3.9** Compare and contrast the most important points and key details presented in two texts on the same topic. (3-ESS2-2)
- **NJSLS.SL.3.3** Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. (3-PS2-3)

- **NJSLS.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) (3-LS4-2) (3-LS4-3) (3-LS4-4)
- **NJSLS.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)
- **NJSLS.W.3.1** Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-ESS3-1) (3-LS2-1) (3-LS4-1) (3-LS4-3) (3-LS4-4)
- **NJSLS.W.3.2** Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS3-1) (3-LS3-2)(3-LS4-1) (3-LS4-2) (3-LS4-3) (3-LS4-4)
- **NJSLS.W.3.7** Conduct short research projects that build knowledge about a topic. (3-ESS3-1) (3-PS2-1) (3-PS2-2)
- **NJSLS.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)
- **NJSLS.W.3.9** 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) (3-LS4-1)

Mathematics Integration:

- **NJSLS.MP.2** Reason abstractly and quantitatively. (3-ESS2-1) (3-ESS2-2) (3-ESS3-1) (3-LS4-1) (3-LS4-4) (3-PS2-1)
- **NJSLS.MP.4** Model with mathematics. (3-ESS2-1) (3-ESS2-2) (3-ESS3-1) (3-LS2-1) (3-LS4-1),(3-LS4-4)
- **NJSLS.MP.5** Use appropriate tools strategically. (3-ESS2-1) (3-LS4-1) (3-PS2-1)
- **NJSLS.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-PS2-1)
- **NJSLS.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-ESS2-1) (3-LS4-2) (3-LS4-3)
- **NJSLS.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) (3-LS4-1)
- **NJSLS.3.NBT** Number and Operations in Base Ten (3-LS1-1) (3-LS2-1)
- **NJSLS.3.NF** Number and Operations—Fractions (3-LS1-1)

Unit 1: Forces and Interactions

Recommended Pacing - 22 days

Why Is This Unit Important?

This unit targets three major areas of Forces and Interactions:

- Students are able to determine the effects of balanced and unbalanced forces on the motion of an object.
- Students are able to determine the cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
- Students are able to apply their understanding of magnetic interactions to define a simple design problem that can be solved with magnets.

Disciplinary Core Ideas:

- 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)
- 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)

Science and Engineering Practices:

- 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)
- 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)

Cross Cutting Concepts:

- Patterns of change can be used to make predictions. (3-PS2-2)
- 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)

Enduring Understandings:

- 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.
- 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.
- Objects in contact exert forces on each other.
- 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.
- Patterns of change can be used to make predictions.
- Cause and effect relationships are routinely identified, tested, and used to explain change.
- Science findings are based on recognizing patterns.
- Science investigations use a variety of methods, tools, and techniques.

Essential Questions:

- What is force?
- What is net force?
- How can you change the speed of an object?
- How can you change the direction of motion of an object?
- What are the ways that speed can change?
- What are contact forces?
- How can objects affect each other when not in contact?
- What is an electrical force?
- What is a magnetic force?
- What affects the size of a force?
- How do equal and unequal forces on an object affect the object?
- How can magnets be used?"

Acquired Knowledge:

- A force is a push or a pull
- Pushes and pulls have strength.
- Pushes and pulls can have a direction.
- Pushing or pulling on an object can change the speed and direction of its motion.
- The motion of an object is determined by the total of all forces on it.
- There are two types of magnetic poles; north and south
- Magnetic force is the push or pull between two magnetic poles.
- Opposite poles pull on each other; the same type of poles push on each other
- There are two types of charges; positive and negative.
- Electrical force is the push or pull between two magnetic poles.
- Opposite charges pull on each other; the same type of charges push on each other.
- The factors that affect the strength of a magnetic force are:
    - Magnetic pole strength
    - How close the poles are to one another
- The factors that affect the strength of an electrical force are:
    - Electric charge strength
    - How close the charges are to one another

Acquired Skills:

- Ask questions that can be investigated based on patterns such as cause and effect relationships.
- Define a simple problem that can be solved through the development of a new or improved object or tool.
- 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.
- 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.

Assessments:

Formative Assessments:

- Group discussions/presentations:
    - Propose higher order questions
    - Present information to students and ask a question
    - Have students discuss their answers with their peers at their table and discuss together as a group

Summative Assessments:

- Projects:
    - Determine Cause and Effect Relationships
    - Define and Solve a Design Problem

Benchmarks:

- Students will be assessed on their ability to plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. [Clarification Statement: 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.] [*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.*]
- Students will be assessed on their ability to make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. [Clarification Statement: 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.*]
- Students will be assessed on their ability to ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. [Clarification Statement: 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 paperclips, 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.*]
- Students will be assessed on their ability to define a simple design problem that can be solved by applying scientific ideas about magnets. [Clarification Statement: 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.]

Alternative Assessments:

- Modified project requirements and rubrics

Suggested Learning Experiences and Instructional Activities:

Anticipatory Sets:

- Forces and Interactions
    - Changing Direction

In-Class Activities and Laboratory Experiences:

- Motion
- Magnetic Force
- Electromagnets
- Electrical Forces

Closure and Reflection Activities:

- Career Exploration: Roller Coaster Designer

Instructional Materials:

- Exploring Science Cengage & National Geographic Learning; 2016

Technology Connections:

- http://www.funderstanding.com/educators/coaster/
- https://www.ck12.org/book/ck-12-third-grade-science/section/1.1/

Unit 2: Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms

Recommended Pacing - 22 days

Why Is This Unit Important?

This unit targets four major areas of Interdependent Relationships in Ecosystems:

- Students are expected to develop understanding of what plants and animals (including humans) need to survive and the relationship between their needs and where they live.
- Students are able to construct an explanation using evidence for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
- Students are expected to develop an understanding of types of organisms that lived long ago and also about the nature of their environments.
- Students are expected to develop an understanding of the idea that when the environment changes some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die.

Disciplinary Core Ideas:

- 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)*
- 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 *(Note: Moved from K–2)*. (3-LS2-1)
- Some kinds of plants and animals that once lived on Earth are no longer found anywhere. *(Note: moved from K-2)* (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)
- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3)
- Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4)

Science and Engineering Practices:

- Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS4-1)
- Construct an argument with evidence, data, and/or a model. (3-LS2-1)
- 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)

Cross Cutting Concepts:

- Cause and effect relationships are routinely identified and used to explain change. (3-LS2-1),(3-LS4-3)
- Observable phenomena exist from very short to very long time periods. (3-LS4-1)
- A system can be described in terms of its components and their interactions. (3-LS4-4)

Enduring Understandings:

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.
- Populations live in a variety of habitats, and change in those habitats affects the organisms living there.
- 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.
- 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.
- Cause and effect relationships are routinely identified and used to explain change.
- Some kinds of plants and animals that once lived on Earth are no longer found anywhere.
- Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.
- Observable phenomena exist from very short to very long time periods.
- A system can be described in terms of its components and their interactions.
- Knowledge of relevant scientific concepts and research findings is important in engineering.
- Science assumes consistent patterns in natural systems.

Essential Questions:

- How does the environment impact the organisms living in it?
- How can environments change?
- What happens to organisms when their environment changes?
- How can being part of a group help organisms?
- What is cause and effect?
- What can we learn from fossils?
- How are plants, animals, and environments of the past similar or different from current plants, animals, and environments?

Acquired Knowledge:

- An ecosystem is a complex set of relationships where everything in it is dependent on each other.
- The fossil record shows us how environments change over time.
- When environments change, the organisms living in it change, move, or die.

Acquired Skills:

- Analyze and interpret data to make sense of phenomena using logical reasoning.
- Construct an argument with evidence, data, and/or a model.
- Construct an argument with 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.

Assessments:

Formative Assessments:

- Group discussions/presentations:
  - Propose higher order questions
  - Present information to students and ask a question
  - Have students discuss their answers with their peers at their table and discuss together as a group

Summative Assessments:

- Projects:
  - Compare solutions and make a change
  - Construct an argument

Benchmarks:

- Students will be assessed on their ability to construct an argument that some animals form groups that help members survive.
- Students will be assessed on their ability to analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. [Clarification Statement: 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.]
- Students will be assessed on their ability to 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. [Clarification Statement: 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.]

- Students will be assessed on their ability to 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.* [Clarification Statement: 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.]

Alternative Assessments:

- Modified project requirements and rubrics

Suggested Learning Experiences and Instructional Activities:

Anticipatory Sets:

- Ecosystem Change?

In-Class Activities and Laboratory Experiences:

- Sustainability Project – Beginning the Climate Change Conversation
- Living things make change
- People make change
- Investigate fossils

Closure and Reflection Activities:

- Fish in the Desert
- Plants in the Antarctic

Instructional Materials:

- Exploring Science Cengage & National Geographic Learning; 2016

Technology Connections:

- http://ngss-k-5-ausd.weebly.com/3interdependent-relationships-in-ecosystems.html
- https://www.pinterest.com/brittanyhicks/ecosystem-unit/
- http://thesciencepenguin.com/2015/01/7-ideas-teach-ecosystems-food-webs.html

Unit 3: Inheritance and Variation of Traits: Life Cycles and Traits

Recommended Pacing - 22 days

Why Is This Unit Important?

This unit targets two major areas of Inheritance and Variation of Traits: Life Cycles and Traits:

- Students are expected to develop an understanding of the similarities and differences of organisms' life cycles.
- Students are expected to develop an understanding that organisms have different inherited traits, and that the environment can also affect the traits that an organism develops.

Disciplinary Core Ideas:

- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)
- 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)
- 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)
- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)

Science and Engineering Practices:

- Develop models to describe phenomena. (3-LS1-1)
- Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1)
- Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2)
- Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)

Cross Cutting Concepts:

- Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1)
- Patterns of change can be used to make predictions. (3-LS1-1)
- Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2),(3-LS4-2)

Enduring Understandings:

- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles
- Many characteristics of organisms are inherited from their parents.
- Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.
- Different organisms vary in how they look and function because they have different inherited information.
- The environment also affects the traits that an organism develops.
- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.
- Similarities and differences in patterns can be used to sort and classify natural phenomena
- Patterns of change can be used to make predictions
- Cause and effect relationships are routinely identified and used to explain change.
- Science findings are based on recognizing patterns.

Essential Questions:

- What kind of plants and animals live in cold environments?
- What kind of plants and animals live in warm environments?
- What are some animals that must live in water?
- What are some animals that only live on land?
- How do plants change as they grow?
- How do you tell an adult ladybug from a much younger one?
- In what ways do you look like your parents?
- What traits do birds have in common?
- Why are some traits the same and others different?
- What is a trait?
- What is an inherited trait?
- What are variations?
- How can variations help in survival?
- How can variations help in mating?

Acquired Knowledge:

- Traits that are suited to temperatures
- Traits that are dependent on water amounts
- What a life cycle is
- Types of life cycles and their stages
- Difference between a trait and a variation
- How traits are inherited
- How variations can be inherited

Acquired Skills:

- Develop models to describe phenomena.
- Analyze and interpret data to make sense of phenomena using logical reasoning.
- Use evidence (e.g., observations, patterns) to support an explanation.
- Use evidence (e.g., observations, patterns) to construct an explanation.

Assessments:

Formative Assessments:

- Group discussions/presentations:
  - Propose higher order questions
  - Present information to students and ask a question
  - Have students discuss their answers with their peers at their table and discuss together as a group

Summative Assessments:

- Project:
  - Construct an Explanation

Benchmarks:

- Students will be assessed on their ability to develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. [Clarification Statement: 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.]
- Students will be assessed on their ability to 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. [Clarification Statement: 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.]
- Students will be assessed on their ability to use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: 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.]
- Students will be assessed on their ability to 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. [Clarification Statement: 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.]

Alternative Assessments:

- Modified project requirements and rubrics

Suggested Learning Experiences and Instructional Activities:

Anticipatory Sets:

- Cold or Warm?
- Wet or Dry?
- Light or Dark?

In-Class Activities and Laboratory Experiences:

- Analyze and interpret data
- Construct an argument
- Investigate life cycles
- Develop a model
- Inherited traits: Looks; analyze and interpret data
- Inherited traits: Functions; analyze and interpret data
- Investigate environment and traits

Closure and Reflection Activities:

- Career Exploration: Marine Ecologist

Instructional Materials:

- Exploring Science Cengage & National Geographic Learning; 2016

Technology Connections:

- http://ngss-k-5-ausd.weebly.com/3inheritance-and-variation-of-traits-life-cycles-and-traits.html
- http://www.internet4classrooms.com/grade_level_help/life_science_inherited_characteristics_third_3rd_grade_science.htm
- https://whyy.pbslearningmedia.org/subjects/science/life-science/genetics-and-heredity/inherited-traits/

Unit 4: Weather and Climate

Recommended Pacing - 22 days

Why Is This Unit Important?

This unit targets two major areas of weather and climate:

- Students are able to organize and use data to describe typical weather conditions expected during a particular season.
- By applying their understanding of weather-related hazards, students are able to make a claim about the merit of a design solution that reduces the impacts of such hazards.

Disciplinary Core Ideas:

- 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)
- 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.)*

Science and Engineering Practices:

- Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. (3-ESS2-1)
- 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)
- Obtain and combine information from books and other reliable media to explain phenomena. (3-ESS2-2)

Cross Cutting Concepts:

- Patterns of change can be used to make predictions. (3-ESS2-1),(3-ESS2-2)
- Cause and effect relationships are routinely identified, tested, and used to explain change. (3-ESS3-1)

Enduring Understandings:

- 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.
- Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.
- A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.
- Patterns of change can be used to make predictions.
- Cause and effect relationships are routinely identified, tested, and used to explain change.
- 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).
- Science affects everyday life.

Essential Questions:

- How do we describe weather?
- How does weather change from day to day?
- Do seasons have a set pattern?
- What is typical weather in different parts of the world and during different times of the year?
- How do climate and weather differ?
- What are weather-related hazards an?
- Which weather related hazards are we more likely to have in Ewing?
- How can the impact of weather-related hazards be reduced?

Acquired Knowledge:

- Definition of weather
- The function and use of the following weather measurement tools:
    - Thermometer
    - Wind vane
    - Rain gauge
    - Barometer
- Types of precipitation
- Air pressure and the difference between high and low
- Seasonal pattern changes and how they different in different parts of the world
- The difference between weather and climate
- Weather related hazards

Acquired Skills:

- Ask questions based on observations to find more information about the world.
- Make observations (firsthand or from media) to collect data that can be used to make comparisons.
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.
- Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem.
- Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world.

Assessments:

Formative Assessments:

- Group discussions/presentations:
  - Propose higher order questions
  - Present information to students and ask a question
  - Have students discuss their answers with their peers at their table and discuss together as a group

Summative Assessments:

- Project:
  - Think Like an Engineer: Make a Claim

Benchmarks:

- Students will be assessed on their ability to represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. [Clarification Statement: 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.]
- Students will be assessed on their ability to obtain and combine information to describe climates in different regions of the world.
- Students will be assessed on their ability to make a claim about the merit of a design solution that reduces the impacts of climate change and/or a weather-related hazard.* [Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.]

Alternative Assessments:

- Modified project requirements and rubrics

Suggested Learning Experiences and Instructional Activities:

Anticipatory Sets:

- Weather Measurements

In-Class Activities and Laboratory Experiences:

- Investigate Weather
- Represent Data
- Obtain and Combine Information

Closure and Reflection Activities:

- Career Exploration: Severe Storms Researcher

Instructional Materials:

- Exploring Science Cengage & National Geographic Learning; 2016

Technology Connections:

- https://climatekids.nasa.gov/menu/play/
- http://ngss-k-5-ausd.weebly.com/3weather-and-climate.html
- http://interactivesites.weebly.com/seasons--weather.html

Sample Standards Integration

Career Readiness, Life Literacies, & Key Skills

9.4.5.CI.1.

For example, in Unit 2, students will investigate 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.

9.4.5.CI.2

For example, in Unit 2, students will begin investigating climate change in their sustainability project.

9.4.5.CT.1

For example, in Unit 1, students will plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

9.4.5.IML.2

For example, in Unit 3, students create visuals representations, organizing information about the merit of a design solution that reduces the impacts of a weather-related hazard.

8.1 Computer Science and Design Thinking

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

For example in Unit 2, students will access, manage, evaluate, and synthesize information to 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.

Interdisciplinary Connections

NJSLS.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) (3-LS2-1) (3-LS4-1) (3-LS4-3) (3-LS4-4) (3-PS2-1) (3-PS2-3)

NJSLS.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-LS4-3) (3LS4-4)

NJSLS.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) (3-LS4-1) (3-LS4-3) (3-LS4-4) (3-PS2-3)

NJSLS.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)

NJSLS.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). (3-PS2-3)

NJSLS.RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic. (3-ESS2-2)

NJSLS.SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. (3-PS2-3)

NJSLS.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) (3-LS4-2) (3-LS4-3) (3-LS4-4)

NJSLS.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)

NJSLS.W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-ESS3-1) (3-LS2-1) (3-LS4-1) (3-LS4-3) (3-LS4-4)

NJSLS.W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS3-1) (3-LS3-2) (3-LS4-1) (3-LS4-2) (3-LS4-3) (3-LS4-4)

NJSLS.W.3.7 Conduct short research projects that build knowledge about a topic. (3-ESS3-1) (3-PS2-1) (3-PS2-2)

NJSLS.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)

NJSLS.W.3.9 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) (3-LS4-1)

These standards are met through the completion of the benchmark performances in all 3 units. For example, in Unit 2, students will read texts and use media t*o* 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.

NJSLS.MP.2 Reason abstractly and quantitatively. (3-ESS2-1) (3-ESS2-2) (3-ESS3-1) (3-LS4-1) (3-LS4-4) (3-PS2-1)

NJSLS.MP.4 Model with mathematics. (3-ESS2-1) (3-ESS2-2) (3-ESS3-1) (3-LS2-1) (3-LS4-1),(3-LS4-4)

NJSLS.MP.5 Use appropriate tools strategically. (3-ESS2-1)(3-LS4-1) (3-PS2-1)

These standards are met through the completion of the benchmark performances in all 3 units. For example, in Unit 3, students will have to reason both abstractly and quantitatively to *d*evelop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

NJSLS.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-PS2-1)

NJSLS.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-ESS2-1) (3-LS4-2) (3-LS4-3)

NJSLS.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) (3-LS4-1)

These standards are met through the completion of the benchmark performances in all 3 units. For example, in Unit 1, students will *m*ake observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

NJSLS.3.NBT Number and Operations in Base Ten (3-LS1-1) (3-LS2-1)

NJSLS.3.NF Number and Operations—Fractions (3-LS1-1)

These standards are met through the completion of the benchmark performance in Unit 3, students will develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.