MENDHAM TOWNSHIP SCHOOLS

SCIENCE CURRICULUM

Grade 3

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Grade 3 Unit 1: Traits
Source NJSLS Traits Unit 4

Stage 1: Unit Summary

In this unit of study, students acquire an understanding that organisms have different inherited traits and that the environment can also affect the traits that an organism develops. The crosscutting concepts of patterns and cause and effect are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in analyzing and interpreting data, constructing explanations, and designing solutions. Students are also expected to use these practices to demonstrate an understanding of the core ideas.

NJSLS Science Unit Standards:

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. *[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.]* **(3-LS3-1)**

2) 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.]* **(3-LS3-2)**

Essential Questions:

- What kinds of traits are passed on from parent to offspring?
- What environmental factors might influence the traits of a specific organism?

Evidence Statements (Links to evidence statements in Appendix)
3-LS3-1
3-LS3-2

Interdisciplinary Connections:

ELA/Literacy:
NJSLA3.RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
NJSLA3.RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic.
NJSLA3.W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons.

Mathematics:
NJSLA3.MP.2 Reason abstractly and quantitatively.
NJSLA3.MP.4 Model with mathematics

Stage 2-Assessment

Part A: What types of traits are passed from parent to offspring?
Concepts

- Similarities and differences in patterns can be used to sort and classify natural phenomena (e.g., inherited traits that occur naturally).
- Many characteristics of organisms are inherited from their parents

- Different organisms vary in how they look and function because they have different inherited information.

Formative Assessment
Students who understand the concepts are able to:

- Sort and classify natural phenomena using similarities and differences. (Clarification: Patterns are the similarities and differences in traits shared between offspring and their parents or among siblings, with an emphasis on organisms other than humans).

- Analyze and interpret data to make sense of phenomena using logical reasoning.

- 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. (Assessment does not include genetic mechanisms of inheritance and prediction of traits, and is limited to *nonhumans.)*

Part B : What environmental factors might influence the traits of a specific organism?
Concepts

- Cause-and-effect relationships are routinely identified and used to explain change.
- Other characteristics, which can range from diet to learning, result from individuals' interaction with the environment.
- Other characteristics, which can range from diet to learning, result from individuals' interaction with the environment.
- Many characteristics involve both inheritance and environment
- The environment also affects the traits that an organism develops

Formative Assessment

- Identify cause-and-effect relationships in order to explain change.
- Use evidence (e.g., observations, patterns) to support an explanation.
- Use evidence to support the explanation that traits can be influenced by the environment. Examples of the environment's effect on traits could include:
    - Normally tall plants that grow with insufficient water are stunted
    - A pet dog that is given too much food and little exercise may become overweight.

Stage 3- Learning Plan

What it looks like in the classroom:
Scientists sort and classify organisms based on similarities and differences in characteristics or traits. Students can easily observe external traits of animals such as body coverings; type, shape, and number of external features; and type, shape, and color of eyes. Similarly, they can observe external traits of plants such as the type of root system or the shape, color, and average size of leaves. The characteristics that organisms inherit influence how they look and how they function within their environment. As students observe parents and their offspring, they will notice that parents and offspring share many traits. As they observe a larger number of organisms from the same group, they will notice similarities and differences in the traits of individuals within a group. Students can observe similarities and differences in the traits of organisms and use these observations as evidence to support the idea that offspring inherit traits from parents, but these traits do vary within a group of similar organisms.

Sometimes, variations among organisms within a group are due to the fact that individuals inherit traits from different parents. However, traits can also be influenced by an individuals' interaction with the environment. For example, all lions have the necessary inherited traits that allow them to hunt, such as sharp claws, sharp teeth, muscular body type, and speed. However, being a successful hunter also depends on the interaction that individual lions have with their parents and their environment. A lion cub raised in captivity without parents will have the same type of claws, teeth,

and muscular body as all other lions, but it may never have the opportunity to learn to use its traits to hunt. Additionally, the environment can affect an organism's physical development. For example, any plant that lacks sufficient nutrients or water will not thrive and grow as it should. It will most likely be smaller in size, have fewer leaves, and may even look sickly. Likewise, too much food and lack of exercise can result in an overweight dog.

To investigate how the environment influences traits, students can plant the same type of seedling in different locations, which will provide variations of light, water, or soil. Data can be collected about rates of growth, height, and heartiness of the plant. The information gathered can be analyzed to provide evidence as to how the environment influenced the traits of the plant. As students read about, observe, and discuss these ideas, they learn that even though every organism inherits particular traits from its parents, the environment can have a marked effect on those traits and the development of others.

Classroom Activities:

What traits are passed from parent to offspring?

- Introduce: What is heredity?
- What are traits? Student copies of interactive: PebbleGo interactive introduction to heredity
- Show video 2 PebbleGO compares adult chickens to chicks
- Students will plant seeds to observe
- Students will observe and record various animals parents vs offspring

What environmental factors might influence the traits of a specific organism?

- Move sprouted plants to various locations in classroom, compare results of low light, bright window, closet, watering level
- Animals experiencing environmental changes - Scholastic article Walking on Thin Ice - Will Polar bears survive melting arctic

Connections to STEM/Makerspace:

Stop the Global Change: Students will research how the change in the environment is affecting certain animals. For example, one group of students can research about polar bears and how global warming is affecting this species. Students think of ways that they can let people know about this problem.

Integrated accommodations and modifications for students with IEP's 504s, ELLs, and gifted and talented students:

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

List of Core Instructional and Supplemental Materials:

PebbleGo - Heredity Scholastic article polar bear Mystery Science Brainpop TCI
Integration of 21st Century Skills and Life and Career Standard CRP1, 2, 4, 6, 8, 11
Integration of the Technology Standard **NJSLS.8.1**

Grade 3 Unit 2: Life Cycles **NJSLS Unit 5**
Stage 1: Unit Summary
In this unit of study, students develop an understanding of the similarities and differences in organisms' life cycles. In addition, students 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. The crosscutting concepts of patterns and cause and effect are called out as organizing concepts for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in developing and using models and constructing explanations and designing solutions. Students are also expected to use these practices to demonstrate an understanding of the core ideas.

NJSLS Science Unit Standards:

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.*]* **(3-LS1-1)**

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.]* **(3-LS4-2)**

Essential Questions:

- Do all living things have the same life cycle?
- Are there advantages to being different?

Evidence Statements

3-LS1-1

3-LS4-2

Interdisciplinary Connections:

ELA/Literacy:
NJSLA3.RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
NJSLA3.RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic.
NJSLA3.W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons.

Mathematics:
NJSLA3.MP.2 Reason abstractly and quantitatively.
NJSLA3.MP.4 Model with mathematics

Stage 2-Assessment

Concepts:

Part A: Do all living things have the same life cycle?

- Science findings are based on recognizing patterns.
- Similarities and differences in patterns can be used to sort and classify natural phenomena.
- Patterns of change can be used to make predictions.
- Reproduction is essential to the continued existence of every kind of organism.
- Plants and animals have unique and diverse life cycles

Assessment

Students who understand the concepts are able to:

- Sort and organisms (inherited traits) using similarities and differences in patterns.
- Make predictions using patterns of change.
- Develop models to describe phenomena.
- Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. (I.e., Changes organisms go through during their life form a pattern.) *(Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.)*

Concepts:

Part B: Are there advantages to being different?

- Cause-and-effect relationships are routinely identified and used to explain change.
- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing

Assessment:

- Identify cause-and-effect relationships in order to explain change.
- Use evidence (e.g., observations, patterns) to construct an explanation.
- 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 include:
  - ✔ Plants that have larger thorns than other plants may be less likely to be eaten by predators.
  - ✔ Animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.

Stage 3- Learning Plan

What it looks like in the classroom:

In third grade, students learn that the changes an organism goes through during its life form an observable pattern. Although different types of organisms have unique and diverse life cycles, they follow a pattern of birth, growth, reproduction, and death. While observing and studying life cycles, students should look closely for patterns of change and use these observed patterns to make predictions. They should also sort and classify a variety of organisms using the similarities and differences they observe. For example, flowering plants begin as seeds. With the right conditions, the seeds germinate and grow, from small seedlings to adult plants. Adult plants then produce flowers that, once pollinated, will produce seeds from which the next generation will grow.

Animals, likewise, go through observable patterns of change, which allow students to sort and classify them based on the stages of their life cycles. Some animals, for example, undergo complete metamorphosis; others go through incomplete metamorphosis; while others do not undergo metamorphosis at all. Some animals begin their life cycles with a live birth, while others hatch from eggs. Students should develop models to describe the unique and diverse life cycles of organisms. They can draw diagrams, build physical models, or create presentations to show the patterns of change that make up the life cycles of given organisms. As students become familiar with the stages in the life cycles of different types of plant and animals, they will come to understand that reproduction is essential to the continued existence of every kind of organism.

In the unit on t**raits**, students learned that organisms have traits that are inherited from their parents. This process occurs during reproduction. While observing and identifying traits of a specific species or type of organism, students also learned that there are differences in characteristics within the same species. In this unit, students learn that these

differences in characteristics among individuals of the same species sometimes provide advantages in survival, finding mates, and reproducing. For example, when comparing plants from the same species, those with larger or more abundant thorns may be less likely to be eaten by a predator. Likewise, animals with better camouflage coloration may be more likely to survive and therefore more likely to leave offspring. As students read about, observe, and discuss variations in organisms' characteristics, they should identify cause-and-effect relationships that help explain why any variation might give an advantage in surviving or reproducing to some members of a species over others.

Classroom Activities:

Do all living things have the same life cycle?

- Using butterfly garden in MTES OLC students can look for monarch eggs on milkweed
- Using butterfly garden in MTES OLC students can collect monarch caterpillars on milkweed
- Look for flower seeds in garden Echinacea, Wisteria, apples and pears
- Students will create a clay model of insect life cycle - use Ladybugs as a guide
- Students can compare and contrast various life cycles of different insects
- Students compare and contrast life cycles of mammals, reptiles, plants

Are there advantages to being different?

- Adaptations help animals survive - camouflage

Connections to STEM/Makerspace:

Environments for Living Things- In groups, students will choose between the 4 environments they have learned about (hot desert, coral reef, temperature forest, and tropical rainforest). Students can build the environment, create a diagram, or paint a picture of the environment that they choose and include at least 4 animals that would be living there.

TCI Notebook- pg. 10

Integrated accommodations and modifications for students with IEP's 504s, ELLs, and gifted and talented students:

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

List of Core Instructional and Supplemental Materials:

PebbleGo
TCI
Place based-learning MTES OLC
Mystery Science

Brainpop NSTA Resources
Integration of 21st Century Skills and Life and Career Standard CRP1, 2, 4, 6, 8, 11
Integration of the Technology Standard **NJSLS.8.1**

Grade 3 Unit 3: Forces and Motion Source NJSLS Unit 2
Stage 1: Unit Summary
In this unit of study, students are able to determine the effects of balanced and unbalanced forces on the motion of an object. The crosscutting concepts of patterns and cause and effect are identified as organizing concepts for these disciplinary core ideas. In the third-grade performance expectations, students are expected to demonstrate grade-appropriate proficiency by planning and carrying out investigations. Students are expected to use these practices to demonstrate understanding of the core ideas. In this unit of study, students are able to determine the effects of balanced and unbalanced forces on the motion of an object. The crosscutting concepts of patterns and cause and effect are identified as organizing concepts for these disciplinary core ideas. In the third-grade performance expectations, students are expected to demonstrate

grade-appropriate proficiency by planning and carrying out investigations. Students are expected to use these practices to demonstrate understanding of the core ideas.

NJSLS Science Unit Standards:

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.*]* **(3-PS2-1)**

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.*]* **(3-PS2-2)**

Essential Questions:

- How do equal and unequal forces on an object affect the object?
- How do equal and unequal forces exerted on an object affect the object?

Evidence Statements

3-PS2-1

3-PS2-2

Interdisciplinary Connections

ELA/Literacy:

NJSLA3.RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

NJSLA3.RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic.

NJSLA3.W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons.

Mathematics:

NJSLA3.MP.2 Reason abstractly and quantitatively.

NJSLA3.MP.4 Model with mathematics

Stage 2-Assessment

Part A Concept:

- Science investigations use a variety of methods, tools, and techniques.
- Gravity is the force that pulls masses toward the center or Earth
- Cause-and-effect relationships are routinely identified.
- Objects in contact exert forces on each other.
- Each force that acts on a particular object has both strength and a direction.
- An object at rest typically has multiple forces acting on it, but they add to 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. *(Qualitative and conceptual, but not quantitative, addition of forces are used at this level.)*

Part A Assessment:

- Identify cause-and-effect relationships.
- Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence.
- Use fair tests in which variables are controlled and the number of trials considered.
- Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. *(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 also limited to gravity being addressed as a force that pulls objects down.) Examples could include:*
  - ✔ *An unbalanced force on one side of a ball can make it start moving.*
  - ✔ *Balanced forces pushing on a box from both sides*

Part B Concepts:

- Science findings are based on recognizing patterns.
- Patterns of change can be used to make predictions.
- The patterns of an object's motion in various situations can be observed and measured.
- When past motion exhibits a regular pattern, future motion can be predicted from it. *(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.)*

Assessment:

- Make predictions using patterns of change.
- Make observations and/or measurements to produce data to serve as the basis of evidence for an explanation of a phenomenon.
- Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. *(Assessment does not include technical terms such as period and frequency.) Examples of motion with a predictable pattern could include:*
  - ✔ *A child swinging in a swing.*
  - ✔ *A ball rolling back and forth in a bowl.*
  - ✔ *two children on a seesaw.*

Stage 3- Learning Plan

What it looks like in a classroom:

In this unit of study, students look for cause-and-effect relationships as they investigate the effects of balanced and unbalanced forces on the motion of an object. They learn that objects in contact exert forces on each other, and these forces have both strength and direction. When forces are balanced, there is no change in the motion or the position of an object. In other words, an object at rest typically has multiple forces acting on it, but the forces balance out to equal a zero net force on the object. For example, if two children stand with their hands together and push against each other, the pushing force each exerts balances to a net zero effect if neither child moves. Pushing a box from both sides also demonstrates a balanced force if the forces do not produce any change in motion or position of the box.

When forces are unbalanced, however, there is a change in the motion and/or position of the object the forces are acting on. If the same two children from the example above were pushing against each other, and one child moves his/her

hands, arms, or feet forward while the other child moves backward, this would demonstrate an unbalanced force. The first child is pushing with greater force than the second.

Through planning and conducting investigations, students will come to understand that forces that result in changes in an object's speed or direction of motion are unbalanced. Students can observe everyday examples on the playground, with seesaws and swings and by kicking and throwing soccer balls. As they conduct investigations and make observations, students should identify the cause-and-effect relationships at work and identify the objects that are exerting forces on one another. They should also use qualitative descriptions when identifying the relative strength (greater than, less than, equal) and direction of the forces, even if an object is at rest.

Investigating the effects of forces on objects will also give students opportunities to observe that patterns exist everywhere. Patterns are found in shapes, structures, natural environments, and recurring events. Scientists and engineers analyze patterns to make predictions, develop questions, and create solutions. As students have opportunities to observe forces interacting with objects, they will ask questions and analyze and interpret data in order to identify patterns of change in the motion of objects and to make predictions about an object's future motion. When students are on the playground, they can observe multiple patterns of change in the back-and-forth motion of a child swinging on a swing or in the up-and-down motion of a seesaw. In the classroom, students can observe a variety of objects, such as marbles rolling back and forth in bowls or tops spinning across the floor.

Throughout this unit, as students plan and carry out investigations, it is extremely important that they routinely identify cause-and-effect relationships and look for patterns of change as objects interact. As students interact with objects, such as when they push a door closed, bounce a ball, or roll a ball down a ramp, they may ask, "What caused the changes that I observed? How can I change the way in which the object moved?" Students need to have many experiences in order to deepen their understanding of the cause-and-effect relationships between balanced and unbalanced forces on the motion of an object, and they should be guided to plan and conduct fair tests, testing only one variable at a time.

Classroom Activities:

- Introduce concept of a force
- Demonstrate book on desk
- Demonstrate student in chair, other student pushing against chair
- Introduce investigation
- Discuss variables
- Demonstrate objects showing force on one another
- Students plan investigations
    - materials: balls, marbles
- Students identify what caused object to move or exert force

Integrated accommodations and modifications for students with IEP's 504s, ELLs, and gifted and talented students:

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.

- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (**http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA**)

Connections to STEM/Makerspace:

Marble Maze- The students use their knowledge of forces and create a maze using a marble. Students get to choose the materials that they will need in order to create the maze. Students have to get the marble from one side to the next.

Design Carts for distance trials

List of Core Instructional and Supplemental Materials:

FOSS Balance & Motion Investigation 2 (NGSS Edition)
Mystery Science
Pebble Go PebbleGo
Mystery Science
Brainpop

Integration of 21st Century Skills and Life and Career Standard
CRP1, 2, 4, 6, 8, 11

Integration of the Technology Standard
NJSLS.8.1

Grade 3 Unit 4: Forces and Motion
Source NJSLS Forces and motion Unit 3

Stage 1: Unit Summary

In this unit of study, students determine the effects of balanced and unbalanced forces on the motion of an object and the cause-and-effect relationships of electrical or magnetic interactions to define a simple design problem that can be solved with magnets. The crosscutting concept of *cause and effect*, and the *interdependence of science, engineering, and technology, and the influence of engineering, technology, and science on society and the natural world* are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *asking questions and defining problems*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

NJSLS Science Unit Standards:

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.]* **(3-PS2-3)**

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.]* **(3-PS2-4)**

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-ETS1-1)

Essential Questions:

- What are the relationships between electrical and magnetic forces?
- How can our understandings about magnets be used to solve problems?

Evidence Statements:

3-PS2-3

3-PS2-4

3-5-ETS1-1

Interdisciplinary Connections:

ELA/Literacy:

NJSLA3.RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

NJSLA3.RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic.

NJSLA3.W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons.

Mathematics:

NJSLA3.MP.2 Reason abstractly and quantitatively.

NJSLA3.MP.4 Model with mathematics

Stage 2-Assessment

Part A Concepts:

- Cause-and-effect relationships are routinely identified, tested, and used to explain change.
- 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

Part A Assessment :

- Identify and test cause-and-effect relationships in order to explain change.
- Ask questions that can be investigated based on patterns such as cause-and-effect relationships.
- Ask questions to determine cause-and-effect relationships in electric or magnetic interactions between two objects not in contact with each other. *(Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.)*
- Magnetic forces could include:
  - ✔ The force between two permanent magnets;
  - ✔ The force between an electromagnet and steel paperclips;
  - ✔ The force exerted by one magnet versus the force exerted by two magnets.

- Cause-and-effect relationships could include:
  - ✔ How the distance between objects affects the strength of the force
  - ✔ How the orientation of magnets affects the direction of the magnetic force.

Part B Concepts:

- Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process.
- People's needs and wants change over time, as do their demands for new and improved technologies.
- 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.
- For forces between two magnets, the size of the force depends on their orientation relative to each other.
- 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.

Part B Assessment:

- Define a simple problem that can be solved through the development of a new or improved object or tool.
- Define a simple design problem that can be solved by applying scientific ideas about magnets (e.g., constructing a latch to keep a door shut or creating a device to keep two moving objects from touching each other).
- Define a simple design problem that can be solved through the development of an object, tool, process, or system, and include several criteria for success and constraints on material, time, or cost.
- Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

Stage 3- Learning Plan

What it looks like in the classroom:

After investigating electrical and magnetic forces, students will engage in a portion of the engineering design process in order to define a simple design problem that can be solved by applying scientific ideas about magnets. This process should include the following steps:

- ✔ As a class, create a list of the properties of magnets. (See content descriptions above)
- ✔ Brainstorm a list of everyday objects that use magnets, and discuss the function of the magnet(s) in each object. For example, electric can openers have a strong magnet that attaches a can to the device as it cuts through (opens) the top of the can.
- ✔ In small groups or pairs, students discuss possible everyday problems that might be solved using magnets. For example, they could construct a latch to keep a door shut.
- ✔ As a class, determine possible criteria that might be used to determine how successful the devices might be, and discuss possible constraints (on materials, time, or cost) that might affect each group's design solution.

- ✔ Small groups or pairs should have the opportunity to create a presentation (poster, PowerPoint, drawings, or actual physical model, if time permits) to share both the design problem and solution with the class.

In this unit, students are not expected to build and test their design solutions or to optimize their designs; however, they can compare different proposals for solutions on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. The overall goal is for students to understand that engaging in engineering design will help them understand that scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process, and that as people's needs and wants change over time, so do their demands for new and improved technologies.

Engineering design is an important part of this unit of study. Students are expected to define a simple design problem that can be solved by applying scientific ideas and determine possible success criteria and constraints on time, materials, and cost. They should also compare different proposals for solutions based on how well the proposed solutions meet the criteria for success or how well each takes the constraints into account.

Classroom Activities:

- Properties of Magnets
- Magnetic Attraction
- Calculate the magnetic attraction of objects at a distance

Integrated accommodations and modifications for students with IEP's 504s, ELLs, and gifted and talented students:

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

Connections to STEM/Makerspace

- MAGLEV Train construction - EIE kit
- Makerspace - design an everyday solution to an everyday problem using a magnet

List of Core Instructional and Supplemental Materials:

FOSS Balance & Motion Investigation 3 (NGSS Edition)
PebbleGo
Mystery Science
NSTA Resources
Brainpop

Integration of 21st Century Skills and Life and Career Standard
CRP1, 2, 4, 6, 8, 11

Integration of the Technology Standard
NJSLS.8.1

Grade 3 Unit 5: Weather and Climate
Source NJSLS Weather and Climate Unit 3

Stage 1: Unit Summary

In this unit of study, students 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. The crosscutting concepts of *patterns, cause and effect*, and the *influence of engineering, technology, and science on society and the natural world* are called out as organizing concepts for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in a*sking questions and defining problems, analyzing and interpreting data, engaging in argument from evidence*, and *obtaining, evaluating, and communicating information*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

NJSLS Science Unit Standards:

Develop a model using an analogy, to describe how weather and climate are related**. (ESS2.D)** *[Note: This SLO is based on the disciplinary core ideas found in the Framework. It is intended to serve as a scaffold to 3-ESS2-1.]*

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.]* **(3-ESS2-1)**

Obtain and combine information to describe climates in different regions of the world. (3-ESS2-2)

Make a claim about the merit of a design solution that reduces the impacts of 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.]* **(3-ESS3-1)**

Essential Questions:

- Can we predict the kind of weather that we will see in the spring, summer, autumn, or winter?
- How can climates in different regions of the world be described?

- How can we protect people from natural hazards such as flooding, fast wind, or lightening?

Evidence Statements:

ESS2.D

3-ESS2-1

3-ESS2-2

3-ESS3-1

Interdisciplinary Connections:

ELA/Literacy:
NJSLA3.RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
NJSLA3.RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic.
NJSLA3.W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons.

Mathematics:
NJSLA3.MP.2 Reason abstractly and quantitatively.
NJSLA3.MP.4 Model with mathematics

Stage 2-Assessment

Part A Concepts:

- Patterns of change can be used to make predictions.
- People record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.

Part A Assessments:

- Make predictions using patterns of change.
- Represent data in tables, bar graphs, and pictographs to reveal patterns that indicate relationships.
- Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. *(Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.)* Examples of data could include:
  - ✔ Average temperature
  - ✔ Precipitation
  - ✔ Wind direction

Part B Concepts:

- Patterns of change can be used to make predictions.
- Climate describes the range of an area's typical weather conditions and the extent to which those conditions vary over years

Part B Assessments:

- Make predictions using patterns of change.
- Obtain and combine information from books and other reliable media to explain phenomena.

Part B2 Concepts:

- Cause-and-effect relationships are routinely identified, tested, and used to explain change.
- Science affects everyday life.
- People's needs and wants change over time, as do their demands for new and improved technologies.
- A variety of natural hazards result from natural processes (e.g., *flooding, fast wind, or lightening).*
- Humans cannot eliminate natural hazards but can take steps to reduce their impacts.
- Engineers improve 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).
- 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 criteria for success or how well each takes the constraints into account.

Part B2 Assessments:

- Identify and test cause-and-effect relationships to explain change.
- 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.
- Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. Examples of design solutions to weather-related hazards could include:
  - ✔ Barriers to prevent flooding
  - ✔ Wind-resistant roofs
  - ✔ Lightning rods
- Define a simple design problem that can be solved through the development of an object, tool, process, or system and include several criteria for success and constraints on materials, time, or cost.
- Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

Stage 3- Learning Plan

What it looks like in the classroom:

In this unit of study, students organize and use data to describe typical weather conditions expected during a particular season. They notice patterns as they analyze and interpret weather data, and they use this data to determine cause-and-effect relationships. By applying their understanding of weather-related hazards, students make claims about the merit of a design solution that reduces the impacts of such hazards, using evidence to support their claims.

Initially, students learn that scientists record patterns of weather across different times and locations in order to make predictions about future weather conditions. To understand how scientists use weather data, students need time, tools, and resources (both print and digital) to collect weather data. They can use a variety of tools (e.g., thermometers, anemometers, rain gauges) to collect firsthand data and multiple resources (e.g., Weather Bug, NOAA) to gather weather data that has been collected over longer periods of time. Multiple units of measurement (e.g., m, cm, °C, km/hr)

should be used when recording weather conditions such as temperature, types and amounts of precipitation, and wind direction and speed. To organize the data they collect, students create graphical displays (bar graphs and pictographs) and tables. Once a sufficient amount of data is collected, students need opportunities to analyze data, looking for patterns of change that can be used to make predictions about typical weather conditions for a particular region and time of year. As they collect and analyze data over time, students learn that certain types of weather tend to occur in a given area and that combinations of weather conditions lead to certain types of weather (e.g., it is always cloudy when it rains or snows, but not all types of clouds bring precipitation).

Weather is a combination of sunlight, wind, precipitation, and temperature in a particular region at a particular time. Climate describes the range of an area's typical weather conditions and the extent to which those conditions vary over the years. After learning to analyze and use data to make weather predictions, students use long-term patterns in weather to describe climates in a variety of regions around the world. To accomplish this, students use books and other reliable media to obtain information and weather data collected over a long period of time for a variety of regions. With guidance, students analyze the available data and information in order to describe the climate (e.g., average temperatures, average precipitation, average amount of sunlight) in each region.

Science affects everyday life. Whenever people encounter problems, engineers use scientific knowledge to develop new technologies or improve existing ones to solve our day-to-day problems.

After studying weather and climate, students investigate how weather-related hazards can be reduced. Students learn that there are a variety of natural hazards that result from severe weather. Severe weather, such as high winds, flooding, severe thunderstorms, tornados, hurricanes, ice or snowstorms, dust storms, or drought, has the potential to disrupt normal day-to-day routines and cause damage or even loss of life. While humans cannot eliminate natural hazards, they can take steps to reduce their impact. Students can use trade books and media resources to research types of severe weather hazards and their effects on communities and find examples of how communities solve problems caused by severe weather. As a class, students determine the types of severe weather that are common to the local area and discuss the effects on the community. (Define the problem.) In pairs or small groups, students can research ways that the community reduces the effects of severe weather. (Determine ways in which the problem is solved.) Given criteria, groups can determine how well each solution reduces the effects of severe weather. Groups can also prepare a presentation that

- Describes the solution that the group thinks is best for reducing the effects of a given type of weather hazard,
- Lists evidence to support their thinking, and
- Lists at least one possible constraint, such as materials, time, or cost.

Classroom Activities:

Cross curricular unit ELA/Science/Math

Integrated accommodations and modifications for students with IEP's 504s, ELLs, and gifted and talented students:

- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.

- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

List of Core Instructional and Supplemental Materials:

FOSS Water and Climate Investigation 4 for reference
Nasa Precipitation Station Ground Validation and Olympex Webquest
Foss Unit 6 Waterworks (enrichment)
Brainpop
PebbleGo
NSTA Resources

Integration of 21st Century Skills and Life and Career Standard

CRP1, 2, 4, 6, 8, 11

Integration of the Technology Standard

NJSLS.8.1

Grade 3 Unit 6: Organisms and the Environment
Source: NJSLS Organisms and the Environment Unit 6

Stage 1: Unit Summary

In this unit of study, students 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. The crosscutting concepts of *cause and effect* and the *interdependence of science, engineering, and technology* are called out as organizing concepts for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in *engaging in argument from evidence*. Students are also expected to use this practice to demonstrate understanding of the core ideas.

NJSLS Science Unit Standards:

Construct an argument that some animals form groups that help members survive. (3-LS2-1)

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.]* **(3-LS4-3**)

Essential Questions:

- In a particular habitat, why do some organisms survive well, some survive less well, and some not survive at all?
- How do some animals form groups that help members survive?
- How do fossils provide evidence of the organisms and the environments in which they lived long ago?
- How do plants and animals change when the environment changes?
- How do organisms grow and develop?
- How does genetic variation among organisms affect survival and reproduction

Evidence Statements:

Construct an argument that some animals form groups that help members survive. (3-LS2-1)

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.]* **(3-LS4-3)**

Interdisciplinary Connections:

ELA

Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS2-1), (3-LS4-3) **RI.3.1**

Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS4-3) **RI.3.2**

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-LS4-3) **RI.3.3**

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

Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS4-3) **W.3.2**

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-LS4-3) **SL.3.4**

MATH

Model with mathematics. (3-LS2-1),(3-LS4-3) **MP.4**

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

Stage 2-Assessment

Part A Concepts:

- Cause-and-effect relationships are routinely identified and used to explain change.
- Knowledge of relevant scientific concepts and research findings is important in engineering.
- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.
- Organisms and their habitat make up a system in which the parts depend on each other.

Part A Assessment :

- Identify cause-and-effect relationships in order to explain change.
- Construct an argument with evidence.
- Construct an argument with evidence (e.g., needs and characteristics of the organisms and habitats involved) that in a particular habitat, some organisms can survive well, some can survive less well, and some cannot survive at all.

Stage 3- Learning Plan

What it looks like in the classroom:

Organisms and their habitats make up a system in which they are interdependent. Environmental factors affect the growth and survival of every type of organism, and organisms in turn affect the environment. The focus of this unit of study is identifying cause-and-effect relationships between the environment and organisms' ability to survive and reproduce.

In this unit, students first learn that all organisms have a variety of behaviors and traits that enable them to survive. One of these behaviors includes forming groups. Groups serve different functions and can vary dramatically in size. Animals may form groups to obtain food, to defend themselves, and/or to cope with changes in their environment. Students should have opportunities to conduct research on animals that form groups in order to understand how being part of a group is beneficial to survival and reproduction. Students might begin with studying animals that are indigenous to the local environment (e.g., squirrels, coyotes, deer, birds, or fish), and then investigate other animals of interest, such as (but not limited to) lions, sea turtles, or penguins. For each animal that is studied, students should identify the social structure of the group and how this structure supports individuals in their need to obtain food, defend themselves, and reproduce.

Topics to focus on might be the roles of males and females within a group as well as the interactions between parents and offspring. For example, within some groups of animals, the offspring leave the nest or pack early while others remain for longer periods of time. Those that stay within the group for longer periods of time may do so because of the benefits provided by the group structure. As students compare group structures of different animals and the functions that define each, they should also think about how the size of the group and the roles of individuals within the group affect the animals' overall ability to obtain food, defend themselves, and reproduce. Students will construct arguments with evidence, using cause-and-effect relationships to show why some animals form groups and how this is advantageous to survival and reproduction.

In this unit, students also learn that for any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. As students explore the components of a given environment, they learn that each environment has a particular climate as well as finite sources of water and space. Each environment will support organisms (both plants and animals) with structures and behaviors that are best suited to the climate and resources available. Students will need opportunities to investigate the organisms (plants and animals) that live in certain environments and determine what traits and behaviors allow these organisms to survive and reproduce in that environment. In addition, students should identify some examples of organisms that would survive less well, or not at all, in that environment, and give evidence to support their thinking. Students construct arguments with evidence, using cause-and-effect relationships, to show how the needs and characteristics of the organisms are not well suited for the given environment.

Classroom Activities:
TCI Unit Lessons
Interactive Journal Activities

Integrated accommodations and modifications for students with IEP's 504s, ELLs, and gifted and talented students:

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

Connections to STEM/Makerspace:
STEM Project: A Slick Solution: Cleaning an Oil Spill EIE

List of Core Instructional and Supplemental Materials:
PebbleGo
MysteryScience
TCI
Brainpop

Ultimate Fossil Kit Book: Fossils Tell of Long Ago by Aliki
Integration of 21st Century Skills and Life and Career Standard CRP1, 2, 4, 6, 8, 11
Integration of the Technology Standard NJSLS.8.1

Grade 3 Unit 7: Using Evidence to Understand Change in the Environment
Source: NJSLS Using Evidence to Understand Change and the Environment Unit 7

Stage 1: Unit Summary

In this unit of study, students develop an understanding of the types of organisms that lived long ago and also about the nature of their environments. Students 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. The crosscutting concepts of *systems and system models*; *scale, proportion, and quantity*; and *the influence of engineering, technology, and science on society and the natural world* are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *asking questions and defining problems*, *analyzing and interpreting data*, and *engaging in argument from evidence*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

NJSLS Science Unit Standards:

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.*]* **(3-LS4-1)**

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.*]* **(3-LS4-4)**

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-ETS1-1)

Essential Questions:

- What do fossils tell us about the organisms and the environments in which they lived?
- What happens to the plants and animals when the environment changes?

Evidence Statements:

3-LS4-1

3-LS4-4

3-5-ETS1-1

Interdisciplinary Connections:

ELA/Literacy:

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),(3-LS4-1),(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-LS4-3),(3LS4-4)
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-LS2-1),(3-LS4-1),(3-LS4-3),(3-LS4-4)
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)
W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-LS2-1),(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-LS4-3),(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- 3),(3-LS4-4)
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)
RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (3-5-ETS-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-ETS-2)
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)*
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.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research (3-5-ETS1-1) (3-5-ETS1-3)
SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. *(3-PS2-3)*

Mathematics:

NJSLAMP.2 Reason abstractly and quantitatively

3-5.OA Operations and Algebraic Thinking

Stage 2-Assessment

Part A Concepts:

- Observable phenomena exist from very short to very long periods of time.
- Science assumes consistent patterns in natural systems.
- 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

Part A Assessment :

- Observe that phenomena exist from very short to very long periods of time.
- Analyze and interpret data to make sense of phenomena using logical reasoning.
- Analyze and interpret data from fossils (e.g., type, size, distributions of fossil organisms) to provide evidence of the organisms and the environments in which they lived long ago. *(Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.)* Examples of fossils and environments could include:
  - ✔ Marine fossils found on dry land;
  - ✔ Tropical plant fossils found in Arctic areas; or
  - ✔ Fossils of extinct organisms.

Part B Concepts:

- A system can be described in terms of its components and their interactions.
- People's needs and wants change over time, as do their demands for new and improved technologies.
- 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, others move into the transformed environment, and some die.
- 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

Part B Assessments:

- Describe a system in terms of its components and interactions.

- 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 a problem.
- 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. (Assessment is limited to a single environmental change and does not include the greenhouse effect or climate change.) Examples of environmental changes could include changes in
  - ✔ Land characteristics,
  - ✔ Water distribution
  - ✔ Temperature,
  - ✔ Food, or
  - ✔ Other organisms.
- Define a simple design problem that can be solved through the development of an object, tool, process, or system and that includes several criteria for success and constraints on materials, time, or cost.
- Define a simple design problem reflecting a need or want that includes specified criteria for success and constraints on materials, time, or cost.

Stage 3- Learning Plan

What it looks like in the classroom:

In this unit, students will study fossils or organisms that lived long ago. Students will use that understanding to make a claim about the merit of a solution to problem created by some environmental change. (Assessment is limited to one change.) Additionally, they will learn that solutions are limited by available resources (constraints), and that the success of a solution is determined by considering the desired features of a solution (criteria). This process is outlined in greater detail in the previous section.

Students gather evidence from fossils to learn about the types of organisms that lived long ago and the nature of their environments. As they learn about organisms from long ago, they come to understand that when the environment changes, some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die.

To begin the progression of learning in this unit, students need multiple opportunities to study fossils. If actual fossils are not available, pictures and diagrams found in books and other media sources can be used. Students should observe fossils of a variety of organisms, both plant and animal, and they should observe diagrams of fossils within layers of rock. As students examine each fossil, they should be asked to identify whether the organism lived on land or in water and to give evidence to support their thinking. As students examine diagrams of fossils in layers of rock, they should be asked to identify the type of environment that existed when the layers of rock were formed. Students should consider the types of organisms that are fossilized in the rock layers in order to provide evidence to support their thinking.

If the type of environment in which the fossil was found is different from the type of environment that might have existed when the organism lived (e.g., marine fossils found on dry land, or tropical plant fossils found in Arctic areas), this would provide the opportunity to ask students to think about the types of changes that might have occurred in the environment and what effects these changes might have had on the organisms that lived in the environment as it changed over time. As students observe and analyze fossils, they learn that fossils provide evidence about the types of organisms that lived long ago and the nature of their environments. They also learn that some kinds of plants and animals that once lived on Earth are no longer found anywhere, and that this could be a result of changes that occurred in the environment.

During this unit, students also learn that populations of organisms 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 will survive and reproduce, some will move to new locations, others will move into the transformed environment, and others will die.

Students will need the opportunity to engage in a portion of the engineering design process in order to investigate the merit of solutions to problems caused when the environment changes. This process should include the following steps:

- ✔ Students brainstorm a list of environmental changes that might affect the organisms that live in the environment. This could include changes inLand characteristics,
- ✔ Water distribution,
- ✔ Temperature,
- ✔ Food,
- ✔ Other organisms.
- ✔ As a class or in small groups, students define a problem that occurs when the environment changes. For example, if the distribution of water changes, the available water may no longer support the types of organisms that are found in the environment.
- ✔ As a class, determine criteria that can be used to weigh a possible solution's viability. For example, the response (solution) to the problem should not result in the extinction of a species.
- ✔ Small groups conduct research, using books and other reliable media sources, to determine possible solutions/ways in which organisms can solve the problem. For example, if the available water supply is no longer adequate for the organisms in the environment, there are a number of ways in which organisms respond (i.e., solve the problem); these include:
- ✔ Plants do not grow as large as before (shorter plant, smaller or fewer leaves);
- ✔ Fewer seeds germinate, thereby resulting in a smaller population;
- ✔ Herd animals may move to another environment where the water supply is adequate;
- ✔ Populations of some species may decrease, either through lower rate of reproduction or death;
- ✔ Some populations completely die out; or
- ✔ Other organisms (plants and animals) that require less water to survive may move into the environment.
- ✔ Students make claims about the merit of each of the various responses (solutions) by organisms based on how well the responses meet criteria; students use research data as evidence to support their thinking.
- ✔ At every stage, communicating with peers is an important part of the design process. Students should identify cause-and-effect relationships throughout the process and use these relationships to explain the changes that might occur in the environment and in the populations of organisms that live there.

Classroom Activities:
TCI Unit Lessons
Interactive Journal Activities

Integrated accommodations and modifications for students with IEP's 504s, ELLs, and gifted and talented students:

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).

- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

Connections to STEM/Makerspace:
STEM Project: A Slick Solution: Cleaning an Oil Spill EIE

List of Core Instructional and Supplemental Materials:

PebbleGo
MysteryScience
TCI
Brainpop
Ultimate Fossil Kit
Book: Fossils Tell of Long Ago by Aliki

Integration of 21st Century Skills and Life and Career Standard
CRP1, 2, 4, 6, 8, 11

Integration of the Technology Standard
NJSLS.8.1

Science Gr. 3 Pacing Guide

Unit Topic	NJSLS	Marking Period	Duration (Weeks)
1 Heredity/Traits	3-LS3 Heredity: Inheritance and Variation of Traits	1	4 weeks
2 Continuing the Cycle	3-LS1 From Molecules to Organisms: Structures and Processes	1	5 weeks
3 Forces	3-PS2 Motion and Stability: Forces and Interactions	2	7 weeks
4 Electricity/ Magnetism	3-PS2 Motion and Stability: Forces and Interactions 3-5-ETS1 Engineering Design	2	5 weeks
5 Weather/ climate	3-ESS2 Earth's Systems	3	7 weeks
6 Organisms and the Environment	3-LS4 Biological Evolution: Unity and Diversity 3-LS2 Ecosystems: Interactions, Energy, and Dynamics	3	5 weeks
7 Fossils	3-LS4 Biological Evolution: Unity and Diversity	4	4 weeks