Curriculum

Content Area: Science

Grade Level(s): Grade 8

Date Revised: July, 2019

Date Adopted_____

Course Description:

Unit 1 Interactions Within Ecosystems: In this unit, students will ask questions, make observations, and gather information to explain how energy moves throughout organisms and the environment.

Unit 2 Life Structure and Function: In this unit, students will gather information to determine the characteristics of living things and how the parts of the cell work together in order to function. Explore how body systems are organized and interact in order to function.

Unit 3 Reproduction of Organisms: In this unit, students will gather information to describe how living things reproduce and determine the factors affect their growth.

Unit 4 Change Over Time: In this unit, students will use evidence to explain how organisms adapt for survival and provide evidence that supports the idea that things evolve over time.

Total Number of Units: 4

Pacing Guide

Unit	Week	Standard NJSLS	Skill What we want students to"DO"
1:Interactions Within Ecosystems	6 Days	**MS-LS1-6**	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
	5 Days	**MS-LS1-7**	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
	5 Days	**MS-LS2-3**	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
	3 Days	**MS-LS2-1**	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
	5 Days	**MS-LS2-2**	Construct an explanation that predicts patterns of interactions

			among organisms across multiple ecosystems.
	5 Days	**MS-LS2-4**	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
	18 Days	**MS-LS2-5** **MS-ETS1-1** **MS-ETS1-2** **MS-ETS1-3**	Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
2: Life Structure and Function	11 Days	**MS-LS1-1**	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
	7 Days	**MS-LS1-2**	Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
	21 Days	**MS-LS1-3**	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

	10 Days	**MS-LS1-8**	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
3: Reproduction of Organisms	4 Days	**MS-LS1-4**	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
	4 Days	**MS-LS1-5**	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
	9 Days	**MS-LS1-8**	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

	4 Days	**MS-LS3-2**	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
4: Change Over Time	5 Days	**MS-LS3-1**	Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
	3 Days	**MS-LS4-4**	Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
	2 Days	**MS-LS4-5**	Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.

	5 Days	**MS-LS4-6**	Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
	3 Days	**MS-LS4-1**	Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
	3 Days	**MS-LS4-2**	Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
	3 Days	**MS-LS4-3**	Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not

			evident in the fully formed anatomy.

Unit 1: Interactions Within Ecosystems **Time Frame: 66 Days**
Essential Questions
How do plants and animals obtain and process energy? How does energy move through an environment? How does matter cycle through the environment? How do limited resources affect populations and communities? How do organisms interact in symbiotic and nonsymbiotic relationships? How do natural and human disruptions to physical and biological components of ecosystems result in shifts in populations?
Standards
Standards / CPIs (cumulative Progress Indicators) taught and assessed: **PERFORMANCE EXPECTATIONS** **MS-LS1-6: Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.** [Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.] [Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis.]

MS-LS1-7: Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.]

MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.] [Assessment Boundary: Assessment does not include the use of chemical reactions to describe the processes.]

MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]

MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

MS-LS2-5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services.* [Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]

MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

DISCIPLINARY CORE IDEAS

- **LS1.C: Organization for Matter and Energy Flow in Organisms** Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use.
- **LS2.B: Cycle of Matter and Energy Transfer in Ecosystems** Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.
- **PS3.D: Energy in Chemical Processes and Everyday Life** The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary)
- **LS2.A: Interdependent Relationships in Ecosystems** Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. Growth of organisms and population increases are limited by access to resources.
- **LS2.A: Interdependent Relationships in Ecosystems** Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.
- **LS2.C: Ecosystem Dynamics, Functioning, and Resilience** Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.
- **LS2.C: Ecosystem Dynamics, Functioning, and Resilience** Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.
- **LS4.D: Biodiversity and Humans** Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling.(secondary)

- **ETS1.A: Defining and Delimiting Engineering Problems** The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions.
- **ETS1.B: Developing Possible Solutions** A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. Models of all kinds are important for testing solutions.
- **ETS1.C: Optimizing the Design Solution** Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.

SCIENCE and ENGINEERING PRACTICES

Developing and Using Models

- Develop a simple model based on evidence to represent a proposed object or tool.

Constructing Explanations and Designing Solutions

- Construct a scientific explanation based on valid and reliable evidence obtained from sources

Analyzing and Interpreting Data Analyzing

- Analyze and interpret data to provide evidence for phenomena.

Constructing Explanations and Designing Solutions

- Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena.

Engaging in Argument from Evidence

- Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.

Scientific Knowledge is Based on Empirical Evidence

- Science disciplines share common rules of obtaining and evaluating empirical evidence.

Engaging in Argument from Evidence

- Evaluate competing design solutions based on jointly developed and agreed upon design criteria.

CROSS CUTTING CONCEPTS

Energy and Matter

- Within a natural system, the transfer of energy drives the motion and/or cycling of matter.

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Patterns

- Patterns can be used to identify cause and effect relationships.

Stability and Change

- Small changes in one part of a system might cause large changes in another part.

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

- The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.

Science Addresses Questions About the Natural and Material World

- Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes.

CONNECTIONS TO ELA

NJSLSA.R8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
NJSLSA.R10. Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.
NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
NJSLSA.W5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
NJSLSA.W6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

TECHNOLOGY:

8.2.2.C.4 Identify designed products and brainstorm how to improve one used in the classroom.
8.2.2.C.6 Investigate a product that has stopped working and brainstorm ideas to correct the problem.

8.2.2.D.1 Collaborate and apply a design process to solve a simple problem from everyday experiences.
8.2.2.D.2 Discover how a product works by taking it apart, sketching how parts fit, and putting it back together.
8.2.2.D.3 Identify the strengths and weaknesses in a product or system.

HIGHLIGHTED CAREER READY PRACTICES:
CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP6. Demonstrate creativity and innovation.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity

SEL PRACTICES & COMPETENCIES:
- Self-Management
- Social Awareness
- Responsible Decision-Making
- Relationship Skills
- Self Awareness

Overall Goal (What is the big idea?) Students will ask questions, make observations, and gather information to explain how matter and energy moves through organisms and the environment.

Pre-Assessment: Biodiversity in Ecosystem Unit 1 Pretest: Matter and Energy in Ecosystems

(SLO) Student Learning Objectives (with standards)	Student Learning Strategies	Formative Assessment ***suggested but not limited to the following***	Activities ***suggested but not limited to the following***	Modifications & Reflections ***suggested but not limited to the following***
We are learning how matter and energy moves	**Essential Vocabulary:** Photosynthesis, cellular respiration, glycolysis,	Science Probes; Claim, Evidence, Reasoning;	**Photosynthesis and Light Lab:** Students will	**RTI/Extra Support:** Have students connect key module concepts

through organisms and the environment. MS-LS1-6 MS-LS1-7 MS-LS2-3	producers, consumers, detritivores, food chain, food web, energy pyramid, The Carbon Cycle, condensation, precipitation, nitrogen fixation -Inquiry activities -Modeling -Diagrams -concrete examples -explain and elaborate -combining words and visuals -whole group -working with a partner -small group -higher level questioning -note taking **Instructional Strategies:** Anchor chart KWL chart Think-Pair-Share Evidence Notebook	Three-Dimensional Thinking checks	observe and quantify the rate of photosynthesis. **Breathe In, Breathe Out Lab:** Students observe that the air humans inhale differs from the air humans exhale. **Modeling Energy Flow Lab:** Students will model the relationships in a food chain. **Web of Life Lab:** Students will model the relationships in a food web. **Movin' Matter Lab:** Students will model part of the carbon cycle. **Rain Check Lab:** Students will understand how water and other matter moves through the environment.	and make a diagram that models the process of photosynthesis. Have them clearly illustrate the changes that might occur if some of the sunlight in one area is blocked. **ELL/ELD Strategy:** Utilize charts and graphic organizers to help students explore the transfer of matter and energy through living things and the environment. **Extension:** Challenge students to write down questions they have about matter and energy in ecosystems then share with a partner. Have each pair research a quick answer to one or more of the questions. **Suggested Strategies for Students with Special Needs:**

				Work in cooperative groups or with partners. Allow students to respond orally or illustrate answers instead of responding in a written format. Use a combination of visual and auditory directions, such as the star board, charts, document camera, or pictures. When directions are complex, allow students to complete the first several steps before giving more directions.
We are learning how interacting populations of organisms affected by changes to ecosystems. MS-LS2-1 MS-LS2-2 MS-LS2-4	**Essential Vocabulary:** Biosphere, population, species, community, limiting factor,Biotic potential, Carrying capacity, overpopulation, symbiosis, commensalism, parasitism, mutualism, ecological succession, climax community, eutrophication, dynamic equilibrium	Science Probes; Claim, Evidence, Reasoning; Three-Dimensional Thinking checks	**Fishy Population Changes**: Students will model the exponential growth of a population and explore how this growth is limited under certain conditions. **Coral Colleagues:** Students will research, model, and present a type of symbiosis in a coral reef community.	**RTI/Extra Support** Have students pair off and list all the different relationships in a community. Encourage students to preview the following lessons and add the relationships there. Have students create a song, poem, or visual that compares the relationships. **ELL/ELD Strategy:**

	-Inquiry activities -Modeling -Diagrams -concrete examples -explain and elaborate - -combining words and visuals -whole group -working with a partner -small group -higher level questioning -note taking **Instructional Strategies:** KWL chart Think-Pair-Share Collaborative learning Evidence Notebook		**It's Sedimentary, My Dear Watson:** Students will model sediment runoff in an aquatic ecosystem and consider its implications for populations.	Make use of labeled diagrams to understand the content and develop vocabulary in context. Have students connect key scientific vocabulary with their non-scientific meanings by promoting dialogue about the terms at home with their families of caregivers. **Extension:** Have students write a short essay explaining which resource they think will become the most serious limiting factor for humans in the coming decades. **Suggested Strategies for Students with Special Needs:** Work in cooperative groups or with partners. Allow students to respond orally or illustrate answers instead of responding in a written format. Use a

				combination of visual and auditory directions, such as the star board, charts, document camera, or pictures. When directions are complex, allow students to complete the first several steps before giving more directions.
We are learning to explore why biodiversity is important and how it can be protected. **MS-LS2-5** **MS-ETS1-1** **MS-ETS1-2** **MS-ETS1-3**	**Essential Vocabulary:** Biodiversity, species, genetic diversity, species diversity, ecosystem diversity, dynamic equilibrium, resilience, desert, grassland, tropical rain forest, temperate, taiga, wetlands, estuaries, coral reef -Inquiry activities -Modeling -Diagrams -concrete examples -explain and elaborate - -combining words and visuals -whole group -working with a partner	Science Probes; Claim, Evidence, Reasoning; Three-Dimensional Thinking checks	**Bead Biodiversity Lab:** Students will use the biodiversity index to observe differences in the biodiversity of different ecosystems. **Turning Trash Into Treasure:** Students will understand how reusing resources decreases waste.	**RTI/Extra Support** Encourage students to examine the word biodiversity, pointing out that bio- means living. Have them use the information to anticipate and discuss what they might read about in the module. **ELL/ELD Strategy:** Help reinforce students' understanding of biodiversity in ecosystems through using, creating, and labelling visual support.. **Extension:**

	-small group -higher level questioning -note taking **Instructional Strategies:** KWL chart Think-Pair-Share Collaborative learning Evidence Notebook			Have students research and write a short report on biodiversity hot spots around the world. Have them share their reports with the class. **Suggested Strategies for Students with Special Needs:** Work in cooperative groups or with partners. Allow students to respond orally or illustrate answers instead of responding in a written format. Use a combination of visual and auditory directions, such as the star board, charts, document camera, or pictures. When directions are complex, allow students to complete the first several steps before giving more directions.

21st Century Theme Targeted – Global Awareness: Using 21st century skills to understand and address global issues					
21st Century Skills Targeted					
Creativity & Innovation	**Information Literacy**	**Media Literacy**	**Critical Thinking & Problem Solving**	**Communication & Collaboration**	**Life & Careers**

Ecosystems Webquest: Designing a Landscape	Lesson Check: Photosynthesis and Cellular Respiration Reading Essentials: Flow of Energy	Food Chains Food Webs	STEM Module Project: Sun Block	CER: Explain The Phenomenon	STEM Careers: A Day In The Life of a Wildlife Ecologist

Summative Assessments:
Unit 1 Summative Assessments: Matter and Energy in Ecosystems
Unit 1 Performance Task: Sun Block
Unit 1 Performance Task Scoring: Rubric
Students will apply the concepts they learned throughout the module to develop a presentation explaining how a reduction in sunlight would impact the flow of energy and the cycling of matter in an ecosystem.

Unit 2: Matter
Time Frame: 59 Days

Essential Questions

What the characteristics of living things?
What are the parts of cells and their functions, and how do the parts contribute to the function of the cell as a whole?
How does the organization of cells support life functions in multicellular organisms?
How are structure and support provided in multicellular organisms?
How do organisms obtain energy and remove waste?

Standards

Standards / CPIs (cumulative Progress Indicators) taught and assessed:

PERFORMANCE EXPECTATIONS

MS-LS1-1: Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. [Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.]

MS-LS1-2: Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] [Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]

MS-LS1-3: Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.]

MS-LS1-8: Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. [Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]

DISCIPLINARY CORE IDEAS

- **LS1.A: Structure and Function** All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).
- **LS1.D: Information Processing** Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.

SCIENCE and ENGINEERING PRACTICES

Planning and Carrying Out Investigations

- Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation.

Developing and Using Models

- Develop and use a model to describe phenomena.

Obtaining, Evaluating, and Communicating Information

- Gather, read, and synthesize information from multiple appropriate sources.

CROSS CUTTING CONCEPTS

Scale, Proportion, and Quantity

- Phenomena that can be observed at one scale may not be observable at another scale.

Structure and Function

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts.

Interdependence of Science, Engineering, and Technology

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural systems.

CONNECTIONS TO ELA

NJSLSA.R8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

NJSLSA.R10. Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.

NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
NJSLSA.W5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
NJSLSA.W6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

TECHNOLOGY:
8.2.2.C.4 Identify designed products and brainstorm how to improve one used in the classroom.
8.2.2.C.6 Investigate a product that has stopped working and brainstorm ideas to correct the problem.
8.2.2.D.1 Collaborate and apply a design process to solve a simple problem from everyday experiences.
8.2.2.D.2 Discover how a product works by taking it apart, sketching how parts fit, and putting it back together.
8.2.2.D.3 Identify the strengths and weaknesses in a product or system.

HIGHLIGHTED CAREER READY PRACTICES:
CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP6. Demonstrate creativity and innovation.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity

SEL PRACTICES & COMPETENCIES:
- Self-Management
- Social Awareness
- Responsible Decision-Making
- Relationship Skills
- Self Awareness

Overall Goal (What is the big idea?)
Students will describe the characteristics of living things, and how do the parts of a cell work together in order to function.

Pre-Assessment: Unit 2 Pretest: Cells and Life Body Systems

(SLO) Student Learning Objectives (with standards)	**Student Learning Strategies**	**Formative Assessment ***suggested but not limited to the following***	**Activities ***suggested but not limited to the following***	**Modifications & Reflections ***suggested but not limited to the following***
We are learning to describe and explain the characteristics of living things. **MS-LS1-1** **MS-LS1-2**	**Essential Vocabulary:** Cells, cell theory, light microscope, electron microscope, reproduction, homeostasis, prokaryotic, eukaryotic, organelles, cell membrane, cytoplasm, cell wall, proteins, chloroplasts, nucleus -explore properties of cells -Inquiry activities -modeling -diagrams -concrete examples -explain and elaborate -combining words and visuals -whole group -working with a partner	Science Probes; Claims, Evidence, Reasoning; Three Dimensional Thinking Checks	**A Closer Look At Life Lab:** Students will investigate cells, the building blocks of life. **Magnify It Lab:** Students will design a solution for magnifying objects. **Investigating Cell Membranes:** Students will model a cell membrane. **Plant and Animal Cells Lab:** Students will use microscopes to compare plant and animal cells.	**RTI/Extra Support**. Have students use diagrams as they read the information in the lesson. **ELL/ELD Strategy:** Point out all labels, pictures, captions and headings throughout the lesson. Discuss real-life connections to content and provide hands-on examples of materials when possible. **Extension:** Have students create a T-chart and record questions about cells and answers they find as they read. Encourage students to research any questions.

	-small group -identifying similarities and differences -higher level questioning -note taking **Instructional Strategies:** Evidence Notebook Think-Pair-Share KWL chart Cooperative learning			**Suggested Strategies for Students with Special Needs:** Work in cooperative groups or with partners. Allow students to respond orally or illustrate answers instead of responding in a written format. Use a combination of visual and auditory directions, such as the star board, document camera, charts, or pictures. When directions are complex, allow students to complete the first several steps before giving more directions.
We are learning how body systems are organized in organisms and how they interact in order to perform life functions. **MS-LS1-3** **MS-LS1-8**	**Essential Vocabulary:** Cell differentiation, tissues, organs, organ systems, muscle, joint, ligaments, hydrostatic skeleton, exoskeleton, cardiac muscle, smooth muscle, calorie, nutrients -Inquiry activities	Science Probes; Claims, Evidence, Reasoning; Three Dimensional Thinking Checks	**Organism Organization Lab:** Students will model the levels of organization in a multicellular organism. **Make No Bones About It Lab:** Students will discover the skeletal	**RTI/Extra Support:** Allow students to explore prior knowledge. Have them review the text and create a poster including drawings, labels, captions, and definitions. **ELL/ELD Strategy:**

	-Modeling -Diagrams -concrete examples -explain and elaborate -combining words and visuals -whole group -working with a partner -small group -higher level questioning -note taking **Instructional Strategies:** Evidence Notebook Think-Pair-Share Cooperative learning		system's protective function. **Types of Muscles Lab:** Students will observe and compare different types of muscle cells. **Filtering Waste Lab:** Students will model how the kidneys filter waste substances. **Modeling Blood Cells Lab:** Students will model the blood cells and vessels of the circulatory system. **Skin Sensitivity Lab:** Students will explore differences in sensitivity of touch receptors in the skin.	Point out all labels, pictures, captions and headings throughout the lesson. Create opportunities for peer review. Discuss real-life connections to content and provide hands-on examples of materials when possible. **Extension:** Have students create safe experiments that show how reflexes work as well as how stimuli affects all parts of the human body. **Suggested Strategies for Students with Special Needs:** Work in cooperative groups or with partners. Allow students to respond orally or illustrate answers instead of responding in a written format. Use a combination of visual and auditory directions, such as the star board, document camera,

				charts, or pictures. When directions are complex, allow students to complete the first several steps before giving more directions.

21st Century Theme Targeted –Global Awareness: Using 21st century skills to understand and address global issues

21st Century Skills Targeted

Creativity & Innovation	Information Literacy	Media Literacy	Critical Thinking & Problem Solving	Communication & Collaboration	Life & Careers
Lab: Exploring Earthworm Movement Cell Travel Brochure	Characteristics of Life Levels of Organization	Intro To The Characteristict of Life Cell Organelles	Explain The Phenomenon Is It Living?	How Are Cells Organized in the Body?	STEM Careers: A Day In The Life of a Microbiologist

Summative Assessments: (include rubrics & exemplars)
Unit 2 Summative: Body Systems Assessment
Unit 2 Performance Task: Body of Evidence
Unit 2 Performance Task Scoring: Rubric
Students will apply the concepts learned throughout the module to prepare to debate a classmate who thinks the body is made of independent subsystems that do not interact.

Unit 3: Reproduction of Organisms
Time Frame: 26 Days

Essential Questions

How are traits passed from one generation to the next?
How do multicellular organisms reproduce?
How do genetic and environmental factors affect reproduction and growth in animals?
How do plants reproduce and grow?

Standards

Standards / CPIs (cumulative Progress Indicators) taught and assessed:

PERFORMANCE EXPECTATIONS

MS-LS1-4: Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]

MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.]

MS-LS1-8: Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. [Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]
MS-LS3-2: Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]

DISCIPLINARY CORE IDEAS

- **LS1.B: Growth and Development of Organisms** Animals engage in characteristic behaviors that increase the odds of reproduction. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.
- **LS1.B: Growth and Development of Organisms** Genetic factors as well as local conditions affect the growth of the adult plant.
- **LS1.D: Information Processing** Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.
- **LS1.B: Growth and Development of Organisms** Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary)
- **LS3.A: Inheritance of Traits** Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.
- **LS3.B: Variation of Traits** In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.

SCIENCE and ENGINEERING PRACTICES

Science and Engineering Practices Engaging in Argument from Evidence

- Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.

Constructing Explanations and Designing Solutions

- Construct a scientific explanation based on valid and reliable evidence obtained from sources.

Obtaining, Evaluating, and Communicating Information

- Gather, read, and synthesize information from multiple appropriate sources.

Developing and Using Models

- Develop and use a model to describe phenomena.

CROSS CUTTING CONCEPTS

Cause and Effect

- Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

CONNECTIONS TO ELA

NJSLSA.R8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
NJSLSA.R10. Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.
NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
NJSLSA.W5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
NJSLSA.W6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

TECHNOLOGY:

8.2.2.C.4 Identify designed products and brainstorm how to improve one used in the classroom.
8.2.2.C.6 Investigate a product that has stopped working and brainstorm ideas to correct the problem.
8.2.2.D.1 Collaborate and apply a design process to solve a simple problem from everyday experiences.
8.2.2.D.2 Discover how a product works by taking it apart, sketching how parts fit, and putting it back together.
8.2.2.D.3 Identify the strengths and weaknesses in a product or system.

HIGHLIGHTED CAREER READY PRACTICES:

CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP6. Demonstrate creativity and innovation.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity

SEL PRACTICES & COMPETENCIES:

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

Overall Goal (What is the big idea?) Students will gather information to explain how living things reproduce and determine which factors affect their growth.
Pre-Assessment: Unit 3 Pretest: **Reproduction of Organisms**

(SLO) Student Learning Objectives (with standards)	Student Learning Strategies	Formative Assessment ***suggested but not limited to the following***	Activities ***suggested but not limited to the following***	Modifications & Reflections ***suggested but not limited to the following***
We are learning to explain how living things reproduce and determine the factors that affect their growth. MS-LS1-4	**Essential Vocabulary:** phenotype, heredity, genetics, dominant, recessive, gene, alleles, genotype, homozygous, heterozygous, pedigree, regeneration, vegetative reproduction, asexual	Science Probes; Claim, Evidence, Reasoning; Three-Dimensional Thinking checks	**Beetles Genes Lab:** Students will model the genotype of beetles using collected data. **Modeling Offspring Lab**: Students will	**ELL/ELD Strategy:** Have students use Punnett Squares to predict the outcome of offspring when given the alleles.

MS-LS1-5 MS-LS1-8 MS-LS3-2	reproduction, budding, sexual reproduction, polination -Inquiry activities -Modeling -Diagrams -concrete examples -explain and elaborate - -combining words and visuals -whole group -working with a partner -small group -higher level questioning -note taking **Instructional Strategies:** KWL chart Think-Pair-Share Collaborative learning Evidence Notebook **Instructional Strategies:** KWL chart Concept web Evidence Notebook Think-Pair-Share		model sexual reproduction by using beads to show how genetic materials from two parents combine in offspring. **Seeds of Thought Lab:** Students will compare the seeds of a flowering and nonflowering plant.	**Extension:** Have students research the types of animals that can reproduce and write a paragraph explaining why they think humans cannot reproduce through regeneration.. **Suggested Strategies for Students with Special Needs:** Work in cooperative groups or with partners. Allow students to respond orally or illustrate answers instead of responding in a written format. Use a combination of visual and auditory directions, such as the star board, charts, document camera, or pictures. When directions are complex, allow students to complete the first several steps before giving more directions.

21st Century Theme Targeted – Global Awareness: Using 21st century skills to understand and address global issues					
21st Century Skills Targeted					
Creativity & Innovation	**Information Literacy**	**Media Literacy**	**Critical Thinking & Problem Solving**	**Communication & Collaboration**	**Life & Careers**
Genetics Simulation	**Classical Genetics** **How Can You Predict What Offspring Will Look Like?**	**Punnett Squares** **Encounter the Phenomenon: Inheritance**	**Look Both Ways Before Crossing the Seed**	**3D Thinking: Why Do Offspring look like their parents?**	**A Day In The Life of a Genetic Counselor**
Summative Assessments: **Unit 3 Summative Reproduction of Organisms** **Unit 3 Performance Task : STEM Module Project: Get Your Game Face On** **Unit 3 Performance Task Scoring: Rubric** Students will apply the concepts learned to develop and test a game that models the difference in the offspring produced through asexual and sexual reproduction.					

Unit 4: Change Over Time **Time Frame: 33 Days**
Essential Questions
How do changes to genetic material alter proteins and thereby, traits? How can variations in a population result in an adaption as a consequence of its interactions with its environment over time? How can humans selectively alter the traits of organisms? What can fossils tell us about evolution? What evidence for evolution can living organisms provide?
Standards

Standards / CPIs (cumulative Progress Indicators) taught and assessed:

PERFORMANCE EXPECTATIONS

MS-LS3-1: Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. [Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]

MS-LS4-4: Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

MS-LS4-5: Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.]

MS-LS4-6: Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]

MS-LS4-1: Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. [Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]

MS-LS4-2: Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. [Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]

MS-LS4-3: Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. [Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of

diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]

DISCIPLINARY CORE IDEAS

- **LS3.A: Inheritance of Traits** Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits.
- **LS3.B: Variation of Traits** Some changes are beneficial, others harmful, and some neutral to the organism.
- **LS4.B: Natural Selection** Natural selection leads to the predominance of certain traits in a population, and the suppression of others.
- **LS4.C: Adaptation** Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions.

SCIENCE and ENGINEERING PRACTICES

Developing and Using Models

- Develop and use a model to describe phenomena.

Constructing Explanations and Designing Solutions

- Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena.

Obtaining, Evaluating, and Communicating Information

- Gather, read, and synthesize information from multiple appropriate sources and describe how they are supported or not supported by evidence

Using Mathematics and Computational Thinking

- Use mathematical representations to support scientific conclusions and design solutions.

CROSS CUTTING CONCEPTS

Structure and Function

- Structures/systems can be analyzed to determine how they function.

Cause and Effect

- Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

Interdependence of Science, Engineering, and Technology

- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems.

Science Addresses Questions About the Natural and Material World

- Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes.

CONNECTIONS TO ELA

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SEL PRACTICES & COMPETENCIES:

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

Overall Goal (What is the big idea?) Students will use evidence to explain how organisms adapt for survival.
Pre-Assessment: Unit 4 Pretest Natural Selection and Adaptation Evidence of Evolution

(SLO) Student Learning Objectives (with standards)	Student Learning Strategies	Formative Assessment ***suggested but not limited to the following***	Activities ***suggested but not limited to the following***	Modifications & Reflections ***suggested but not limited to the following***
We are learning to explain how organisms adapt for survival. MS-LS3-1 MS-LS4-4 MS-LS4-5 MS-LS4-6	**Essential Vocabulary:** DNA, nucleotide, replication, RNA, transcription, translation, mutation, variations, natural selection, selective breeding, adaptation, genetic engineering -Inquiry activities -Modeling -Diagrams	Science Probes; Claim, Evidence, Reasoning; Three-Dimensional Thinking checks	**Model DNA Lab:** Students will model a molecule of DNA with paper clips and chenille stems. **Classroom Variations Lab:** Students will model how the distribution of traits varies in a class of students.	**RTI/Extra Support:** Have students pair up and design a concept map that summarizes the process of natural selection. Encourage them to add details to help remember what they learned. **ELL/ELD Strategy:** Use charts and graphic organizers to help

	-concrete examples -explain and elaborate -combining words and visuals -whole group -working with a partner -small group -higher level questioning -note taking **Instructional Strategies:** Evidence Notebook Think-Pair-Share Cooperative learning Question-answer relationship (QAR)		**Population Variation Lab:** Students will observe and analyze variations within a plant population. **Survival of the Fittest Lab:** Students will model camouflage and explore how it enables an organism to survive. **Developing Dogs Lab:** Students will model selective breeding.	students understand how genetic mutations. **Extension:** Have students choose an animal and find out how its adaptations affect its survival. Have them give an oral report on what they learned. **Suggested Strategies for Students with Special Needs:** Work in cooperative groups or with partners. Allow students to respond orally or illustrate answers instead of responding in a written format. Use a combination of visual and auditory directions, such as the star board, charts, document camera, or pictures. When directions are complex, allow students to complete the first several steps before giving more directions.

We are learning to use evidence to support the idea that living things evolve over time. **MS-LS4-1** **MS-LS4-2** **MS-LS4-3**	**Essential Vocabulary:** Fossil record, geologic time scale, extinction, transitional fossil, homologous, comparative anatomy, analogous structures, vestigial structures, embryology, -Inquiry activities -Modeling -Diagrams -concrete examples -explain and elaborate -combining words and visuals -whole group -working with a partner -small group -higher level questioning -note taking **Instructional Strategies:** Evidence Notebook Think-Pair-Share Cooperative learning	Science Probes; Claim, Evidence, Reasoning; Three-Dimensional Thinking checks	**It's Time For A Change Lab:** Students will hypothesize, illustrate, and explain the intermediate stages of a species' biological change over time. **Spoon Something Up Lab:** Students will observe that although spoons are similar in structure, they have differences that serve different functions.	**RTI/Extra Support** Ask students to brainstorm some ways scientists might learn about changes in living things over time and record responses. **ELL/ELD Strategy:** Point out all labels, pictures, captions and headings throughout the lesson to assist students with strategies to summarize chunks of content. **Extension:** Challenge students to research and write a short report on a species that has recently become extinct. Have them share what they learn with the class. **Suggested Strategies for Students with Special Needs:** Work in cooperative groups or with partners. Allow students to respond orally or

				illustrate answers instead of responding in a written format. Use a combination of visual and auditory directions, such as the star board, charts, document camera, or pictures. When directions are complex, allow students to complete the first several steps before giving more directions.

21st Century Theme Targeted – Global Awareness: Using 21st century skills to understand and address global issues					
21st Century Skills Targeted					
Creativity & Innovation	**Information Literacy**	**Media Literacy**	**Critical Thinking & Problem Solving**	**Communication & Collaboration**	**Life & Careers**
STEM Project: It's All Relative	What Can Fossils Tell Us About Time?	Natural Selection	Discovering Fossils How Does DNA Affect Traits? How DNA replicates	The Origins of Birds WebQuest	A Day In The Life of a Paleontologist
Summative Assessments: **Unit 4 Summative** Natural Selection **Unit 4 Performance Task:** Population Probabilities **Unit 4 Performance Task Scoring:** Rubric Students will apply the concepts learned to design and perform an activity that explains how natural selection changes the frequency of a trait in a population over time.