NCS Science Curriculum - Adopted & Approved October 2017 - Revised August 2019
Year at a Glance

Unit 1: Diversity of Life	Unit 2: Electromagnetic Force	Unit 3: Populations and Ecosystems
Approximately 65 Teaching Days September-January	**Approximately 50 Teaching Days January-March**	**March-June**
MS-LS1-1 MS-LS1-2 MS-LS1-3 MS-LS1-4 MS-LS1-5 MS-LS1-6 (foundational) MS-LS1-7 (foundational) MS-LS3–2	MS-PS2-2 MS-PS2-3 MS-PS2-5 MS-PS3-2 MS-PS3-5 MS–ETS1-1 MS–ETS1-2 MS–ETS1-3 MS–ETS1-4 MS-ESS3-4	MS-LS1-6 MS-LS1-7 MS-LS2-1 MS-LS2-2 MS-LS2-3 MS-LS2-4 MS-LS2-5 MS-ESS3-3 MS-ESS3-4 MS-ETS1-1 MS-ETS1-2

- **Standards are listed in a numerical order only and may be taught in any order within the unit.**
- **The Science and Engineering Practices are interwoven and should be addressed throughout the year in as many different units and tasks as possible in order to stress the natural connections that exist among mathematical concepts.**
- **FOSS kits are being utilized as the primary instructional material. Other materials and resources will also be used. These include but may not be limited to: websites, videos, reference books, textbooks, non-fictional and fictional literature, science based games.**
- **Although listed as units 1-3, the FOSS units may be taught in any order.**

NGSS Instructional Sequence

Unit 1 Life Science
Performance Expectations:
MS-LS1-1 MS-LS1-2 MS-LS1-3 MS-LS1-4 MS-LS1-5 MS-LS1-6 (foundational) MS-LS1-7 (foundational) MS-LS3–2

Essential Question(s):

- How do you know if something is living?
- How do objects appear when they are viewed through a microscope?
- How can we estimate the size of an object by looking at it through a microscope?
- What evidence can we find that brine shrimp are living organisms?
- What microscopic structures make up organisms such as elodea?
- How are elodea and paramecium alike and how are they different?
- Is there life in the mini habitats? If so, where did it come from?
- What microscopic structures make up organisms such as humans (you)?
- What are the building blocks of cell structures?
- What evidence is there that bacteria are living organisms?
- What evidence is there that fungi are living organisms?
- What are the characteristics of archae?
- What happened to the water?
- How does water travel through a plant?
- How do plants use water?
- How do the structural adaptations of seeds help them survive?
- How do environmental factors affect the germination and early growth of different food crops?
- What is the role of a flower?
- What adaptations do flowering plants have to accomplish pollination?

- How do traits pass from parents to offspring?

Terms:
dead, dormant, evidence, living, nonliving, organism, compound microscope, field of view, scale, asexual reproduction, cell, cell membrane, cell structure, cell wall, chlorophyll, chloroplast, cytoplasm, dormancy, elodea, mitochondrion, multicellular organism, nucleus, organelle, paramecium, protist, single-celled organism, archaea, atom, bacterium, classification, colony, control, culture, decomposer, domain, e. Coli, eukaryote, fungus, microorganism, molecule, penicillium, plasmid, prokaryote, spore, aerobic cellular respiration, guard cells, organ, organ system, phloem, photosynthesis, stoma, tissue, transpiration, vascular system, vein, xylem, adaptation, coevolve, egg, environmental factor, fertilize, flower, genetic factor, germination, pollination, pollination syndrome, pollinator, salinity, salt tolerant, seed, sexual reproduction, sperm, allele, characteristic, chromosome, cross, DNA, dominant, feature, filial, gene, generation, genotype, heredity, heterozygous, homozygous, inheritance, phenotype, population, Punnett square, recessive, trait, variation, behavior, function, structure, biodiversity, virus

Science and Engineering Practices:	**Disciplinary Core Ideas Addressed:**	**Crosscutting Concept**
1. Asking questions and defining problems • Ask questions to clarify and/or refine a model, an explanation, or an engineering problem. •Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources	• 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). • In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. • Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. • Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.	1. **Patterns:** Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them. • Patterns in rates of change and other numerical relationships can provide information about natural and human-designed systems. • Patterns can be used to identify cause-and-effect relationships. • Graphs, charts, and images can be used to identify patterns in data. 2. **Cause and effect:** Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering . • Cause-and-effect relationships may be used to predict phenomena in natural or designed systems. Scale, proportion, and quantity: In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional

and, when appropriate, frame a hypothesis based on observations and scientific principles. •Define a design problem that can be solved through the development of an object, tool, process, or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. 2. Developing and using models • Develop and/or use a model to predict and/or describe phenomena. • Develop a model to describe unobservable mechanisms. • Develop and/or use a model to generate data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs, and those	• In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues or organs that are specialized for particular body functions. • 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 release oxygen. These sugars can be used immediately or stored for growth or later use. • Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. • Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. • Genetic factors as well as local conditions affect the growth of the adult plant. • 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).	relationships between different quantities as scales change. • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. • Proportional relationships among different types of quantities provide information about the magnitude of properties and processes. • Scientific relationships can be represented through the use of algebraic expressions and equations. 3. **Systems and system models:** A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems. • Models can be used to represent systems and their interactions— such as inputs, processes, and outputs—and energy, matter, and information flows within systems. Energy and matter: Tracking energy and matter flows into, out of, and within systems helps to understand the system's behavior. • Within a natural (or designed) system, the transfer of energy drives the motion and/or cycling of matter. • The transfer of energy can be tracked as energy flows through a designed or natural system. 4. **Structure and function:** The way an object is shaped or structured determines many of its properties and its functions. • Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. 5. **Stability and change:** For both designed and natural systems, conditions that affect stability and factors that controls rates of change are critical elements to consider and understand.

at unobservable scales. 3. Planning and carrying out investigations • Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. • Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation. • Collect data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.	• 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. • Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. • 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.	• Stability might be disturbed either by sudden events or gradual changes that accumulate over time

4. Analyzing and interpreting data • Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships. • Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships. • Analyze and interpret data to provide evidence for phenomena. • Analyze and interpret data to determine similarities and differences in findings. • Analyze data to define an optimal operational range for a proposed object, tool, process or system that best meets criteria for success.		

5. Using mathematics and computational thinking • Use mathematical representations to describe and/or support scientific conclusions and design solutions. • Create algorithms (a series of ordered steps) to solve a problem. • Apply mathematical concepts and/or processes (e.g., ratio, rate, percent, basic operations, simple algebra) to scientific and engineering questions and problems. 6. Constructing explanations and designing solutions • Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena. • Construct a scientific explanation based on valid and reliable		

evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. • Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real-world phenomena, examples, or events. • Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system. • Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.		

7. Engaging in argument from evidence • Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. 8. Obtaining, evaluating, and communicating information • Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s). • Integrate qualitative and/or quantitative scientific and/or technical information in written text with that contained in media and visual displays to clarify claims and findings.		

Connections to NJSLS:

Reading—Literacy in Science and Technical Subjects

1. Cite specific textual evidence to support analysis of science and technical texts.

2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases.
5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
9. Compare and contrast the information gained from experiments, video, or multimedia sources with that gained from reading a text on the same topic.
10. Read and comprehend science/technical texts in grades 6–8 text independently and proficiently.

Speaking and Listening

1. Engage effectively in a range of collaborative discussions with diverse partners, building on others' ideas and expressing their own clearly.
2. Interpret and analyze information presented in diverse media and formats and evaluate the motives behind its presentation.
3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.
4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
5. Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
9. Draw evidence from informational texts to support analysis, reflection, and research.
3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.
4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Writing—Literacy in Science and Technical Subjects

5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

7. Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. 8. Gather relevant information from multiple print and digital sources, using search terms effectively. 9. Draw evidence from informational texts to support analysis, reflection, and research. **Language** 5. Demonstrate understanding of word relationships and nuances in word meaning 6. Acquire and use academic and domain-specific words and phrases.
Assessments: ● Entry Level Survey (Benchmark assessment) ● I-Checks: Investigation 1-3, Investigation 4, Investigation 5, Investigation 6, Investigation 7 ● Posttest ● Embedded Assessments

NGSS Instructional Sequence

Unit 2 Electromagnetic Force		
Performance Expectations:		
Engineering Design MS–ETS1-1 MS–ETS1-2 MS–ETS1-3 MS–ETS1-4	**Physical Sciences** MS-PS2-2 MS-PS2-3 MS-PS2-5 MS-PS3-2 MS-PS3-5	**Earth and Space Sciences** MS-ESS3-4

Essential Question(s):

- What makes things move?
- How does friction affect the force needed to move an object?
- How do multiple forces affect motion?
- What happens when magnets interact?
- How can we detect a magnetic field?
- What factors affect the force of attraction between magnets?
- What is required to complete an electric circuit?
- How does an electromagnet work?
- What modifications to an electromagnet will affect the strength of its magnetic field?
- How does an electric motor work?
- How can we generate electrical energy?
- What are the big ideas about electromagnetic force?

Terms:

energy, force, friction, interaction, kinetic energy, net force, newton, spring scale, attract, compass, gravitational force, induced magnetism, magnet, magnetic field, magnetism, permanent magnet, pole, potential energy, repel, temporary magnet, battery, circuit, component, constraint, contact point, core, criterion, electric current, electromagnet, electromagnetic force, electromagnetic radiation, electromagnetism energy transfer, engineer, filament, insulation, brush, commutator, fossil fuel, generator, motor, nonrenewable, renewable, rotate, shaft solar cell, acceleration, compress, force, friction, gravity, interaction, magnet, net force, newton, shaft, spring scale, weight**,** attract, compass gravitational field, induced magnetism, magnetic field, magnetism, particle, permanent magnet, pole, repel, temporary magnet, battery circuit, climate change, closed circuit, complete circuit, component, conductor, contact point, core, drag, electric current, electric force electromagnet, electromagnetic force, electromagnetism, electron, energy, engineer, filament, incandescent lightbulb, incomplete circuit insulator, lamp, maglev, motor, open circuit, semiconductor, static, automobile, brush, commutator, constraint, criterion, fossil fuel, fuel generator, greenhouse gas, nonrenewable, potential energy, power grid, renewable, solar cell, sustainable, turbine

Science and Engineering Practices:	Disciplinary Core Ideas Addressed:	Crosscutting Concept
1. Asking questions and defining problems • Ask questions to clarify and/or refine a model, an explanation, or an engineering problem. •Ask questions	• For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law).	1. **Patterns:** Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them. • Patterns in rates of change and other numerical relationships can provide

that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles. •Define a design problem that can be solved through the development of an object, tool, process, or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. 2. Developing and using models • Develop and/or use a model to predict and/or describe phenomena. • Develop a model to describe unobservable mechanisms. • Develop and/or use a model to generate data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs, and those at unobservable scales. 3. Planning and carrying out investigations • Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how	• The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. • All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. • Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. • Forces that act at a distance (electric and magnetic) can be explained by fields that extend through space and can be mapped by their effect on a test object (a ball, a charged object, or a magnet, respectively). • A system of objects may also contain stored (potential) energy, depending on their relative positions. • When the motion energy of an object changes, there is inevitably some other change in energy at the same time. • When two objects interact, each one exerts a force on the other that can cause	information about natural and human-designed systems. • Patterns can be used to identify cause-and-effect relationships. • Graphs, charts, and images can be used to identify patterns in data. 2. **Cause and effect:** Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering . • Cause-and-effect relationships may be used to predict phenomena in natural or designed systems. Scale, proportion, and quantity: In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change. • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. • Proportional relationships among different types of quantities provide information about the magnitude of properties and processes. • Scientific relationships can be represented through the use of algebraic expressions and equations. 3. **Systems and system models:** A system is an organized group of related objects or components; models can be used for

measurements will be recorded, and how many data are needed to support a claim. • Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation. • Collect data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. 4. Analyzing and interpreting data • Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships. • Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships. • Analyze and interpret data to provide evidence for phenomena. • Analyze and interpret data to determine similarities and differences in findings. • Analyze data to define an optimal operational range for a proposed object, tool, process or system that best meets criteria for success. 5. Using mathematics and computational thinking	energy to be transferred to or from the object. • 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. • 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. • Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. • Typically as human populations and per-capita consumption of natural resources increase, so do the negative	understanding and predicting the behavior of systems. • Models can be used to represent systems and their interactions— such as inputs, processes, and outputs—and energy, matter, and information flows within systems. Energy and matter: Tracking energy and matter flows into, out of, and within systems helps to understand the system's behavior. • Within a natural (or designed) system, the transfer of energy drives the motion and/or cycling of matter. • The transfer of energy can be tracked as energy flows through a designed or natural system. 4. **Structure and function:** The way an object is shaped or structured determines many of its properties and its functions. • Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. 5. **Stability and change:** For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand. • Stability might be disturbed either by sudden events or gradual changes that accumulate over time

• Use mathematical representations to describe and/or support scientific conclusions and design solutions. • Create algorithms (a series of ordered steps) to solve a problem. • Apply mathematical concepts and/or processes (e.g., ratio, rate, percent, basic operations, simple algebra) to scientific and engineering questions and problems. 6. Constructing explanations and designing solutions • Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena. • Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. • Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real-world phenomena, examples, or events. • Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system. • Undertake a design project, engaging in the design cycle, to construct and/or	impacts on Earth unless the activities and technologies involved are engineered otherwise.	

implement a solution that meets specific design criteria and constraints. 7. Engaging in argument from evidence • Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. 8. Obtaining, evaluating, and communicating information • Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s). • Integrate qualitative and/or quantitative scientific and/or technical information in written text with that contained in media and visual displays to clarify claims and findings.		

Connections to NJSLS:

Reading—Literacy in Science and Technical Subjects

1. Cite specific textual evidence to support analysis of science and technical texts.
2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases.
5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

9. Compare and contrast the information gained from experiments, video, or multimedia sources with that gained from reading a text on the same topic.

10. Read and comprehend science/technical texts in grades 6–8 text independently and proficiently.

Speaking and Listening

1. Engage effectively in a range of collaborative discussions with diverse partners, building on others' ideas and expressing their own clearly.
2. Interpret and analyze information presented in diverse media and formats and evaluate the motives behind its presentation.

3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

5. Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

9. Draw evidence from informational texts to support analysis, reflection, and research.

3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Writing—Literacy in Science and Technical Subjects

5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

7. Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

8. Gather relevant information from multiple print and digital sources, using search terms effectively.

9. Draw evidence from informational texts to support analysis, reflection, and research.

Language

5. Demonstrate understanding of word relationships and nuances in word meaning

6. Acquire and use academic and domain-specific words and phrases.

Assessments:

- Entry Level Survey (Benchmark assessment)
- I-Checks: Investigation 1-3, Investigation 4, Investigation 5, Investigation 6, Investigation 7
- Posttest
- Embedded Assessments

NGSS Instructional Sequence

Life Science
Performance Expectations:
Students who demonstrate understanding can:

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
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.]
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-LS2-3.	**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-LS2-4.	**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-ESS 3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating) s reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]
MS-ESS 3-4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth’s systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]

MS-ETS 1-1.	**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-ETS 1-2.	**Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.**

Science and Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concept:
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6. ● Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2) ● Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-LS1-6)	**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,	**Patterns** ● Patterns can be used to identify cause and effect relationships. (MS-LS2-2) **Stability and Change** ● Small changes in one part of a system might cause large changes in another part. (MS-LS2-5) ● - ***Connections to Engineering, Technology, and Applications of Science*** **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. Thus technology

Engaging in Argument from Evidence ● Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-LS2-5) ● Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS2-4) **<u>Developing and Using Models</u>** ● Develop a model to describe phenomena. (MS-LS2-3) ● Develop a model to describe unobservable mechanisms. (MS-LS1-7) ● Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4) **Asking Questions and Defining Problems** ● Define a design problem that can be solved through the development of an object, tool,	both living and nonliving, are shared. (MS-LS2-2) ● Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1) ● 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. (MS-LS2-1) ● Growth of organisms and population increases are limited by access to resources. (MS-LS2-1) **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	use varies from region to region and over time. (MS-LS2-5) - ***Connections to Nature of Science*** **Science Addresses Questions About the Natural and Material World** ● Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS2-5) **Cause and Effect** ● Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1) **Energy and Matter** ● Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7) ● Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1-6) ● The transfer of energy can be tracked as energy flows through a natural system. (MS-LS2-3) **Stability and Change** ● Small changes in one part of a system might cause large changes in another part. (MS-LS2-4) - ***Connections to Nature of Science*** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems**

process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1) **Analyzing and Interpreting Data** ● Analyze and interpret data to provide evidence for phenomena. (MS-LS2-1) ● Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3) - ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** ● Science knowledge is based upon logical connections between evidence and explanations. (MS-LS1-6) ● Science disciplines share common rules of obtaining 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. (MS-LS2-3) **LS2.C: Ecosystem Dynamics, Functioning, and Resilience** ● Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or a biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)	● Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS2-3) **Influence of Science, Engineering, and Technology on Society and the Natural World** ● All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1) ● The uses of technologies and 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. (MS-ETS1-1)

evaluating empirical evidence. (MS-LS2-4)	• 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. (MS-LS2-5) **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 to MS-LS2-5)* **ETS1.B: Developing Possible Solutions** • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. *(secondary to MS-LS2-5)*	

	LS1.C: Organization for Matter and Energy Flow in Organisms ● Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6) ● Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7) **PS3.D: Energy in Chemical Processes and Everyday Life** ● The chemical reaction by which plants produce complex food molecules (sugars) requires an energy	

	input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. *(secondary to MS-LS1-6)* **Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. *(secondary to MS-LS1-7)*** **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. (MS-ETS1-1) **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. (MS-ETS1-4) ● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3) ● Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) ● Models of all kinds are important for testing solutions. (MS-ETS1-4) **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. (MS-ETS1-3) ● 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. (MS-ETS1-4)	