

Middle School Life Sciences

Students in middle school develop understanding of key concepts to help them make sense of the life sciences. These ideas build upon students' science understanding from earlier grades and from the disciplinary core ideas, science and engineering practices, and crosscutting concepts of other experiences with physical and earth sciences. There are five life science topics in middle school: 1) Structure, Function, and Information Processing, 2) Growth, Development, and Reproduction of Organisms, 3) Matter and Energy in Organisms and Ecosystems, 4) Interdependent Relationships in Ecosystems, and 5) Natural Selection and Adaptations. The performance expectations in middle school blend core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge across the science disciplines. While the performance expectations in middle school life science couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many science and engineering practices integrated in the performance expectations. The concepts and practices in the performance expectations are based on the grade-band endpoints described in A Framework for K-12 Science Education (NRC, 2012).

The Performance Expectations in **Structure, Function, and Information Processing** help students formulate an answer to the question, "How do the structures of organisms contribute to life's functions?" Middle school students can plan and carry out investigations to develop evidence that living organisms are made of cells and to determine the relationship of organisms to the environment. Students can use understanding of cell theory to develop physical and conceptual models of cells. They can construct explanations for the interactions of systems in cells and organisms and how organisms gather and use information from the environment. By the end of their studies, students understand that all organisms are made of cells, that special structures are responsible for particular functions in organisms, and that for many organisms the body is a system of multiple interacting subsystems that form a hierarchy from cells to the body. Crosscutting concepts of cause and effect, structure and function, and matter and energy are called out as organizing concepts for these core ideas.

The Performance Expectations in **Growth, Development, and Reproduction of Organisms** help students formulate an answer to the question, "How do organisms grow, develop, and reproduce?" Students understand how the environment and genetic factors determine the growth of an individual organism. They also demonstrate understanding of the genetic implications for sexual and asexual reproduction. Students can develop evidence to support their understanding of the structures and behaviors that increase the likelihood of successful reproduction by organisms. They have a beginning understanding of the ways humans can select for specific traits, the role of technology, genetic modification, and the nature of ethical responsibilities related to selective breeding. At the end of middle school, students can explain how selected structures, functions, and behaviors of organisms change in predictable ways as they progress from birth to old age. Students can use the practices of analyzing and interpreting data, using models, conducting investigations and communicating information. Crosscutting concepts of structure and function, change and stability, and matter and energy flow in organisms support understanding across this topic.

The Performance Expectations in **Matter and Energy in Organisms and Ecosystems** help students formulate answers to the questions: "How do organisms obtain and use matter and energy? How do matter and energy move through an ecosystem?" Middle school students can use conceptual and physical models to explain the transfer of energy and cycling of matter as they construct explanations for the role of photosynthesis in cycling matter in ecosystems. They can construct explanations for the cycling of matter in organisms and the interactions of organisms to obtain the matter and energy from the ecosystem to survive and grow. Students have a grade-appropriate understanding and use of the practices of investigations, constructing arguments based on evidence, and oral and written communication. They understand that sustaining life requires substantial energy and matter inputs and the structure and functions of organisms contribute to the capture, transformation, transport, release, and elimination of matter and energy. Adding to these crosscutting concepts is a deeper understanding of systems and system models that ties the performances expectations in this topic together.

The Performance Expectations in **Interdependent Relationships in Ecosystems** help students formulate an answer to the question, "How do organisms interact with other organisms in the physical environment to obtain matter and energy? To answer the question, middle school students construct explanations for the interactions in ecosystems and the scientific, economic, political, and social justifications used in making decisions about maintaining biodiversity in ecosystems. Students can use models, construct evidence-based explanations, and use argumentation from evidence. Students understand that organisms and populations of organisms are dependent on their environmental interactions both with other organisms and with nonliving factors. They also understand the limits of resources influence the growth of organisms and populations, which may result in competition for those limited resources. Crosscutting concepts of matter and energy, systems and system models, and cause and effect are used by students to support understanding the phenomena they study.

The Performance Expectations in **Natural Selection and Adaptations** help students formulate answers to the questions: "How does genetic variation among organisms in a species affect survival and reproduction? How does the environment influence genetic traits in populations over multiple generations?" Middle school students can analyze data from the fossil record to describe evidence of the history of life on Earth and can construct explanations for similarities in organisms. They have a beginning understanding of the role of variation, natural selection and how this leads to speciation. They have a grade-appropriate understanding and use of the practices of analyzing data, graphical displays; using mathematical models; and gathering, reading, and communicating information. The crosscutting concept of cause and effect is central to this topic.

SCIENTIFIC SKILLS UNIT (REVIEW)	
NJCCCS	
5.1.8 A 1. Habits of Mind – evaluate data 5.1.8 A 2. Habits of Mind – communicate with others 5.1.8 A 4. Habits of Mind – curiosity, skepticism, honesty, open-mindedness 5.1.8 B 1. Inquiry & Problem Solving – identify questions & make predictions 5.1.8 B 3. Inquiry & Problem Solving – collect, organize & interpret 5.1.8 C 1. Safety – when & how to use safety equipment 5.1.8 C 2. Safety – practice safety procedures during experiments 5.2.8 A 1. Cultural Contributions – constantly change over time; many people, reflect social & political 5.2.8 A 2. Cultural Contributions – many cultures work together – NOT specific scientists 5.2.8 B 1. Historical Perspectives – science/tech in conjunction with other history events 5.2.8 B 2. Historical Perspectives – development & exponential growth of innovation 5.3.8 A 1. Numerical Operations – appropriate use of decimals, percents, sci. notation 5.3.8 B 1. Geometry and Measurement – compute using labels & units 5.3.8 D 1. Data Analysis / Probability – represent & describe in graphs/tables 5.3.8 D 4. Data Analysis / Probability – use computers for analysis <p style="text-align: center;"><i>The above NJCCCS standards will be applied throughout each unit during the course of the school year:</i></p>	
Instructional Actions	
Activities/Strategies	Assessment
<ul style="list-style-type: none"> • Warm-ups • Group and classroom discussion • Hands-on activities • Inquiry-based Learning Activities • Group Demonstrations • Comparing and contrasting various cells under the microscope • Internet Technology (visual aids, videos, and interactive websites) • Class Surveys/Debates 	<ul style="list-style-type: none"> • Tests & quizzes • Current Science Assignments • Classwork on various topics • Homework Assignments • Differentiated Projects • Teacher observations • Discussion/Class participation • Lab Reports
Science Skills	
<ul style="list-style-type: none"> • Classroom expectations/rules • Lab safety equipment and procedures • Lab equipment identification and function • Definitions and samples of observation and inferences. • Microscope review of parts and usage • Lab expectations/ scientific method: to include: posing questions, developing hypothesis, designing an experiment or following procedures, interpreting data, drawing conclusions. (Throughout the year) • Current Science expectations & importance • Skills for thinking critically • How to use the metric system 	

CELL STRUCTURE AND FUNCTION UNIT

Next Generation Science Standards

MS. Structure, Function, and Information Processing:

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 cells, 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.

NJCCCS

5.5.8 A 2. Matter, Energy & Organization in Living Systems - levels of organization

5.5.8 B 1. Diversity & Biological Evolution – compare orgs. by internal & external characteristics

5.3.8 D 4. Data Analysis / Probability – use computers for analysis

5.5.8 A 2. Matter, Energy & Organization in Living Systems - levels of organization

5.5.8 B 1. Diversity & Biological Evolution – compare orgs. by internal & external characteristics

5.6.8 A 1. Structure & Properties of Matter – all matter composed of matter that may form molecules

Common Core State Standards

ELA/Literacy:

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-3)

RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-3)

WHST.6-8.1 Write arguments focused on discipline content. (MS-LS1-3)

WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-LS1-1)

WHST.6-8.8 Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. (MS-LS1-8)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2)

Mathematics:

6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables, using graphs and tables, and relate these to the equation. (MS-LS1-1), (MS-LS1-2), (MS-LS1-3)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. ▫ Develop and use a model to describe phenomena.</p>	<p>LS1.A: Structure and Function ▫ All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)</p>	<p>Cause and Effect ▫ Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8) Scale, Proportion, and Quantity ▫ Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-</p>

<p>(MS-LS1-2) Planning and Carrying Out Investigations Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions. □ Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. (MS-LS1-1) Engaging in Argument from Evidence Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). □ Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. (MS-LS1-3) Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 6-8 builds on K-5 experiences and progresses to evaluating the merit and validity of ideas and methods. □ Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS1-8)</p>	<p>□ Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)</p>	<p>1) Systems and System Models □ Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3) Structure and Function □ Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2) ----- Connections to Engineering, Technology, and Applications of Science Interdependence of Science, Engineering, and Technology □ Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS1-1) ----- Connections to Nature of Science Science is a Human Endeavor □ Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3)</p>
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Instructional Actions	
Activities/Strategies	Assessment
<ul style="list-style-type: none"> • Warm-ups • Group and classroom discussion • Hands-on activities • Inquiry-based Learning Activities • Group Demonstrations • Comparing and contrasting various cells under the microscope • Internet Technology (visual aids, videos, and interactive websites) • Class Surveys/Debates 	<ul style="list-style-type: none"> • Tests & quizzes • Current Science Assignments • Classwork on various topics • Homework Assignments • Differentiated Projects • Teacher observations • Discussion/Class participation • Lab Reports

CELL PROCESSES UNIT

Next Generation Science Standards

MS. Matter and Energy in Organisms and Ecosystems:

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.]

NJCCCS

5.5.8 A 1. Matter, Energy & Organization in Living Systems – photosynthesis & respiration and recycle energy

5.5.8 A 2. Matter, Energy & Organization in Living Systems - levels of organization

5.5.8 B 1. Diversity & Biological Evolution – compare orgs. by internal & external characteristics.

5.6.8 A 1. Structure & Properties of Matter – all matter composed of matter that may form molecules

5.6.8 B 1. Chemical Reactions – show how substances react to form new substances w/ diff. properties

5.6.8 B 4. Chemical Reactions – illustrate how atoms rearrange but total mass is conserved

Common Core State Standards

ELA/Literacy:

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-6),(MS-LS2-1),(MS-LS2-4)

RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-6)

RST.6-8.7 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). (MS-LS2-1)

RI.8.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS2-4)

WHST.6-8.1 Write arguments to support claims with clear reasons and relevant evidence. (MS-LS2-4)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS1-6)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-6),(MS-LS2-4)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-7)(MS-LS2-3)

Mathematics:

6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-6),(MS-LS2-3)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.</p>	<p>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</p>	<p>Cause and Effect □ Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1)</p>

<p>▫ Develop a model to describe phenomena. (MS-LS2-3)</p> <p>▫ Develop a model to describe unobservable mechanisms. (MS-LS1-7)</p> <p>Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.</p> <p>▫ Analyze and interpret data to provide evidence for phenomena. (MS-LS2-1)</p> <p>Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.</p> <p>▫ 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)</p> <p>Engaging in Argument from Evidence Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).</p> <p>▫ 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)</p> <p>Connections to Nature of Science Scientific Knowledge is Based on Empirical Evidence</p> <p>▫ Science knowledge is based upon logical connections between evidence and explanations. (MS-LS1-6)</p>	<p>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)</p> <p>▫ 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)</p> <p>PS3.D: Energy in Chemical Processes and Everyday Life</p> <p>▫ 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)</p> <p>▫ 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)</p>	<p>Energy and Matter</p> <p>▫ Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7)</p> <p>▫ Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1-6)</p> <p>▫ The transfer of energy can be tracked as energy flows through a natural system. (MS-LS2-3)</p> <p>Stability and Change</p> <p>▫ Small changes in one part of a system might cause large changes in another part. (MS-LS2-4)</p> <p>-----</p> <p>Connections to Nature of Science Scientific Knowledge Assumes an Order and Consistency in Natural Systems</p> <p>▫ Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS2-3)</p>
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<p>Science disciplines share common rules of obtaining and evaluating empirical evidence. (MS-LS2-4)</p>		
Instructional Actions		
Activities/Strategies	Assessment	
<ul style="list-style-type: none"> • Warm-ups • Group and classroom discussion • Hands-on activities • Inquiry-based Learning Activities • Group Demonstrations • Comparing and contrasting various cells under the microscope • Internet Technology (visual aids, videos, and interactive websites) • Class Surveys/Debates 	<ul style="list-style-type: none"> • Tests & quizzes • Current Science Assignments • Classwork on various topics • Homework Assignments • Differentiated Projects • Teacher observations • Discussion/Class participation • Lab Reports 	

GENETICS

Next Generation Science Standards

MS. Growth, Development, and Reproduction of Organisms:

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. [Clarification Statement: 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.

[Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water.

Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] [Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.]

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-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.]

MS-LS4-5. Gather and synthesize information about the 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-LS4-4. 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

NJCCCS

5.5.8 A 2. Matter, Energy & Organization in Living Systems - levels of organization

5.5.8 B 1. Diversity & Biological Evolution – compare orgs. by internal & external characteristics

5.5.8 C Reproduction & Heredity – sorting & recombining of genetic material creates variation

Common Core State Standards

ELA/Literacy:

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-4),(MS-LS1-5),(MS-LS3-1),(MS-LS3-2),(MS-LS4-5)

RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-5)

RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. (MS-LS3-1),(MS-LS3-2)

RST.6-8.7 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). (MS-LS3-1),(MS-LS3-2)
 RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-4)
 WHST.6-8.1 Write arguments focused on discipline content. (MS-LS1-4)
 WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS1-5)
 WHST.6-8.8 Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. (MS-LS4-5)
 WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5)
 SL.8.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. (MS-LS3-1),(MS-LS3-2)

Mathematics:

MP.4 Model with mathematics. (MS-LS3-2)
 6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4),(MS-LS1-5)
 6.SP.B.4 Summarize numerical data sets in relation to their context. (MS-LS1-4),(MS-LS1-5)
 6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS3-2)
 6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1),(MS-LS1-2),(MS-LS1-3)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. □ Develop and use a model to describe phenomena. (MS-LS3-1),(MS-LS3-2)</p> <p>Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories. □ Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students’ own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-LS1-5)</p>	<p>LS1.B: Growth and Development of Organisms □ Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2) □ Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4) □ Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4) □ Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)</p> <p>LS3.A: Inheritance of Traits □ Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1) □ Variations of inherited traits between parent and</p>	<p>Cause and Effect □ Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2) □ Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4),(MS-LS1-5),(MS-LS4-5)</p> <p>Structure and Function □ Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1)</p> <p>-----</p> <p>Connections to Engineering, Technology, and Applications of Science Interdependence of Science, Engineering, and Technology □ Engineering advances have led to important discoveries in virtually every field of science, and</p>

<p>Engaging in Argument from Evidence Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). □ Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS1-4)</p> <p>Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods. □ Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS4-5)</p>	<p>offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)</p> <p>LS3.B: Variation of Traits □ In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2) □ In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)</p> <p>LS4.B: Natural Selection □ In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5)</p>	<p>scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5)</p> <p>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-LS4-5)</p>
Instructional Actions		
Activities/Strategies	Assessment	
<ul style="list-style-type: none"> • Warm-ups • Group and classroom discussion • Hands-on activities • Inquiry-based Learning Activities • Group Demonstrations • Comparing and contrasting various cells under the microscope • Internet Technology (visual aids, videos, and interactive websites) • Class Surveys/Debates 	<ul style="list-style-type: none"> • Tests & quizzes • Current Science Assignments • Classwork on various topics • Homework Assignments • Differentiated Projects • Teacher observations • Discussion/Class participation • Lab Reports 	

EVOLUTION

Next Generation Science Standards

MS. Natural Selection and Adaptations:

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.]

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-LS4-6. 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.]

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5.5.8 B 1. Diversity & Biological Evolution – compare orgs. by internal & external characteristics

5.5.8 B 2. Diversity & Biological Evolution – environmental changes cause extinct or evolve

5.5.8 B 3. Diversity & Biological Evolution – individuals w/ certain traits likely survive

5.5.8 C Reproduction & Heredity – sorting & recombining of genetic material creates variation

Common Core State Standards

ELA/Literacy:

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-LS4-1),(MS-LS4-2),(MS-LS4-3),(MS-LS4-4)

RST.6-8.7 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). (MS-LS4-1),(MS-LS4-3)

RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-3),(MS-LS4-4)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS4-2),(MS-LS4-4)

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2),(MS-LS4-4)

SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS4-2),(MS-LS4-4)

SL.8.4 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. (MS-LS4-2),(MS-LS4-4)

Mathematics:
 MP.4 Model with mathematics. (MS-LS4-6)
 6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-LS4-4),(MS-LS4-6)
 6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS4-4),(MS-LS4-6)
 6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-LS4-1),(MS-LS4-2)
 7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-LS4-4),(MS-LS4-6)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. □ Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3) □ Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1)</p> <p>Using Mathematics and Computational Thinking Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments. □ Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6)</p> <p>Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. □ Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. (MS-LS4-2) □ Construct an explanation that includes qualitative or quantitative relationships between</p>	<p>LS4.A: Evidence of Common Ancestry and Diversity □ The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1) □ Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2) □ Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)</p> <p>LS4.B: Natural Selection □ Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)</p> <p>LS4.C: Adaptation □ Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)</p>	<p>Patterns □ Patterns can be used to identify cause and effect relationships. (MS-LS4-2) □ Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1), (MS-LS4-3)</p> <p>Cause and Effect □ Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4),(MS-LS4-6)</p> <p>-----</p> <p>Connections to Nature of Science Scientific Knowledge Assumes an Order and Consistency in Natural Systems □ Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS4-1),(MS-LS4-2)</p>

<p>variables that describe phenomena. (MS-LS4-4) ----- Connections to Nature of Science Scientific Knowledge is Based on Empirical Evidence □ Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-LS4-</p>		
Instructional Actions		
Activities/Strategies	Assessment	
<ul style="list-style-type: none"> • Warm-ups • Group and classroom discussion • Hands-on activities • Inquiry-based Learning Activities • Group Demonstrations • Comparing and contrasting various cells under the microscope • Internet Technology (visual aids, videos, and interactive websites) • Class Surveys/Debates 	<ul style="list-style-type: none"> • Tests & quizzes • Current Science Assignments • Classwork on various topics • Homework Assignments • Differentiated Projects • Teacher observations • Discussion/Class participation • Lab Reports 	

HUMAN BIOLOGY

Next Generation Science Standards

MS. Structure, Function, and Information Processing:

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.]The performance expectations above were developed using

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5.5.8 A 2. Matter, Energy & Organization in Living Systems - levels of organization

5.5.8 B 1. Diversity & Biological Evolution – compare orgs. by internal & external characteristics

Common Core State Standards

ELA/Literacy:

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-3)

RI.6.8 Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-3)

WHST.6-8.1 Write arguments focused on discipline content. (MS-LS1-3)

WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-LS1-1)

WHST.6-8.8 Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. (MS-LS1-8)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2)

Mathematics:

6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS1-1),(MS-LS1-2),(MS-LS1-3)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. □ Develop and use a model to describe phenomena. (MS-LS1-2)</p> <p>Planning and Carrying Out Investigations Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables</p>	<p>LS1.A: Structure and Function In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3)</p> <p>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</p>	<p>Cause and Effect □ Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8)</p> <p>Scale, Proportion, and Quantity □ Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1)</p> <p>Systems and System Models □ Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3)</p>

<p>and provide evidence to support explanations or solutions.</p> <p>▫ Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. (MS-LS1-1)</p> <p>Engaging in Argument from Evidence Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).</p> <p>▫ Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. (MS-LS1-3)</p> <p>Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 6-8 builds on K-5 experiences and progresses to evaluating the merit and validity of ideas and methods.</p> <p>▫ Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS1-8)</p>	<p>the brain, resulting in immediate behaviors or memories. (MS-LS1-8)</p>	<p>Structure and Function ▫ Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2)</p> <p>-----</p> <p>Connections to Engineering, Technology, and Applications of Science Interdependence of Science, Engineering, and Technology ▫ Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS1-1)</p> <p>-----</p> <p>Connections to Nature of Science Science is a Human Endeavor ▫ Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3)</p>
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Instructional Actions	
Activities/Strategies	Assessment
<ul style="list-style-type: none"> • Warm-ups • Group and classroom discussion • Hands-on activities • Inquiry-based Learning Activities • Group Demonstrations • Comparing and contrasting various cells under the microscope • Internet Technology (visual aids, videos, and interactive websites) • Class Surveys/Debates 	<ul style="list-style-type: none"> • Tests & quizzes • Current Science Assignments • Classwork on various topics • Homework Assignments • Differentiated Projects • Teacher observations • Discussion/Class participation • Lab Reports

ECOLOGY

Next Generation Science Standards

MS. Matter and Energy in Organisms and Ecosystems:

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-LS2-3. 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. Interdependent Relationships in Ecosystems:

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-LS2-5. 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.]

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5.7.8 B 1. Energy Transformations - understanding of natural laws as they apply to energy transformations.

5.10.8 A 1. Natural Systems & Interactions – impact of catastrophic events on ecosystems in NJ

5.10.8 B 1. Human Interactions & Impact – compare practices that affect use & management of natural resources

Common Core State Standards

ELA/Literacy:

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-2)

RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5)

RI.8.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS2-5)

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS2-2)

WHST.6-8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (MS-LS2-2)

SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS2-2)

SL.8.4 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. (MS-LS2-2)

Mathematics:

MP.4 Model with mathematics. (MS-LS2-5)

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-LS2-5)

6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS2-2)

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.</p> <ul style="list-style-type: none"> ▫ Develop a model to describe phenomena. (MS-LS2-3) ▫ Develop a model to describe unobservable mechanisms. (MS-LS1-7) <p>Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.</p> <ul style="list-style-type: none"> ▫ Analyze and interpret data to provide evidence for phenomena. (MS-LS2-1) <p>Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.</p> <ul style="list-style-type: none"> ▫ 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) <p>Engaging in Argument from Evidence Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).</p> <ul style="list-style-type: none"> ▫ 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) 	<p>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. (MS-LS2-2)</p> <p>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. (MS-LS2-3)</p> <p>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. (MS-LS2-5)</p> <p>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)</p> <p>ETS1.B: Developing Possible Solutions ▫ There are systematic processes for evaluating</p>	<p>Cause and Effect ▫ Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1)</p> <p>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)</p> <p>Patterns ▫ Patterns can be used to identify cause and effect relationships. (MS-LS2-2)</p> <p>Stability and Change ▫ Small changes in one part of a system might cause large changes in another part. (MS-LS2-5)</p> <p>-----</p> <p>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 use varies from region to region and over time. (MS-LS2-5)</p> <p>-----</p> <p>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)</p> <p>Scientific Knowledge Assumes an Order and</p>

<p>----- 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 evaluating empirical evidence. (MS-LS2-4)</p>	<p>solutions with respect to how well they meet the criteria and constraints of a problem. (secondary to MS-LS2-5)</p>	<p>Consistency in Natural Systems □ Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS2-3)</p>
Instructional Actions		
Activities/Strategies	Assessment	
<ul style="list-style-type: none"> • Warm-ups • Group and classroom discussion • Hands-on activities • Inquiry-based Learning Activities • Group Demonstrations • Comparing and contrasting various cells under the microscope • Internet Technology (visual aids, videos, and interactive websites) • Class Surveys/Debates • Field Trip 	<ul style="list-style-type: none"> • Tests & quizzes • Current Science Assignments • Classwork on various topics • Homework Assignments • Differentiated Projects • Teacher observations • Discussion/Class participation • Lab Reports 	
<p>The following technology will be utilized to enhance instruction throughout each unit during the course of the school year:</p> <ul style="list-style-type: none"> • LCD Projector • United Streaming videos & other websites for models • Excel for data collection • Videos on DVD • Document Projector • Microsoft Office 		