Rochelle Park School District

Curriculum Guide

Science
Grade 7

BOE Approved on August 30, 2022

Unit 1: Overview
Unit 1: Organization for Matter and Energy Flow in Organisms
Grade: 7
Content Area: Life Science
Pacing: 15 Instructional Days
Essential Question
How do some organisms turn electromagnetic radiation into matter and energy?
Student Learning Objectives (Performance Expectations)
MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
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.
Unit Summary
Students provide a mechanistic account for how cells provide a structure for the plant process of photosynthesis in the movement of matter and energy needed for the cell. Students 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 construct scientific explanations for the cycling of matter in organisms and the interactions of organisms to obtain matter and energy from an ecosystem to survive and grow. They understand that sustaining life requires substantial energy and matter inputs, and that the structure and functions of organisms contribute to the capture, transformation, transport, release, and elimination of matter and energy. The crosscutting concepts of matter and energy and structure and function provide a framework for understanding of the cycling of matter and energy flow into and out of organisms. Students are also expected to demonstrate proficiency in developing and using models. Students use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.
Technical Terms
Sepals, petals, stamen, filament, anther, pistil, stigma, style, ovary, ovule, angiosperm, gymnosperm, pollination, fertilization, egg cell, sperm cell, zygote, embryo, dormancy, germination, photosynthesis, heterotrophic, light reactions, chloroplast, thylakoid, granum, stroma, visible spectrum of light, ATP synthase, Calvin cycle, carbon fixation
Formative Assessment Measures
Part A: What is the role of photosynthesis in the cycling of matter and flow of energy into and out of an organism?
Students who understand the concepts are able to:

Construct a scientific explanation for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms based on valid and reliable evidence obtained from sources (including the students' own experiments). Construct a scientific explanation for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms based on 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.	
Part B: How is food rearranged through chemical reactions to form new molecules that support growth and/or release energy as this matter moves through an organism?	
Students who understand the concepts are able to: Develop and use a model to describe how food is rearranged through chemical reactions.	
Interdisciplinary Connections	
NJSLS- ELA	**NJSLS- Mathematics**
Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-6) RST.6-8.1 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.6-8.2 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.6-8.2 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-6) WHST.6-8.9	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) 6.EE.C.9
Core Instructional Materials	Lab-Aids, Lab Materials, Scholastic Magazine, Nearpod, Blooket, Crossword puzzles, science spot, Biology4 Kids, Google Images
Career Readiness, Life Literacies and Key Skills	9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries.

	9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2). 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome. 9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities). 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal. 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations. 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data. 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8). 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b) 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience. 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4). 9.4.8.TL.3: Select appropriate tools to organize and present information digitally. 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MSLS4-5, 6.1.8.CivicsPI.3). 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.
Computer Science and Design Thinking	8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.1.8.DA.6: Analyze climate change computational models and propose refinements.

	8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. 8.2.8.ED.5: Explain the need for optimization in a design process. 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). 8.2.8.ITH.2: Compare how technologies have influenced society over time. 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another. 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best

Modifications				
English Language Learners	**Special Education**	**At-Risk**	**Gifted and Talented**	**504**
Scaffolding	Word walls	Teacher tutoring	Curriculum compacting	Word walls
Word walls	Visual aides	Peer tutoring	Challenge assignments	Visual aides
Sentence/paragraph frames	Graphic organizers	Study guides	Enrichment activities	Graphic organizers
Bilingual	Multimedia	Graphic organizers	Tiered activities	Multimedia
dictionaries/translation	Leveled readers	Extended time	Independent research/inquiry	Leveled readers
Think alouds	Assistive technology	Parent communication	Collaborative teamwork	Assistive technology

Read alouds Highlight key vocabulary Annotation guides Think-pair- share Visual aides Modeling Cognates	Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast	Modified assignments Counseling	Higher level questioning Critical/Analytical thinking tasks Self-directed activities	Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast Parent communication Modified assignments Counseling

LIFE SCIENCE		
MS-LS1-6 From Molecules to Organisms: Structures and Processes		
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.		
Evidence Statements: MS-LS1-6		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
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	**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.	**Energy and Matter** Within a natural system, the transfer of energy drives the motion and/or cycling of matter.

describe the natural world operate today as they did in the past and will continue to do so in the future. **Connections to Nature of Science** **Scientific Knowledge is Based on Empirical Evidence** Science knowledge is based upon logical connections between evidence and explanations.	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)	
Connections to other DCIs in this grade-band: MS.PS1.B ; MS.ESS2.A		
Articulation of DCIs across grade-bands: 5.PS3.D ; 5.LS1.C ; 5.LS2.A ; 5.LS2.B ; HS.PS1.B ; HS.LS1.C ; HS.LS2.B ; HS.ESS2.D		
NJSLS- ELA: RST.6-8.1, RST.6-8.2, WHST.6-8.2, WHST.6-8.9		
NJSLS- Math: 6.EE.C.9		
5E Model		
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.		
Engage Anticipatory Set	http://studyjams.scholastic.com/studyjams/jams/science/plants/photosynthesis.htm	
Exploration Student Inquiry	Have students view the following video, read the related essay and respond to the related discussion questions. http://www.pbslearningmedia.org/resource/tdc02.sci.life.stru.photosynth/photosynthesis/ Do you think that the factory is a good analogy for the process of photosynthesis in plants? Why did Von Helmont think that plants got their nourishment from soil? Why did he eliminate soil as a source of nourishment and focus on water? What did he measure to find out if the willow plant got its nourishment from soil? Illuminating Photosynthesis Have students complete the interactive activity which will investigate the process of photosynthesis. http://www.pbslearningmedia.org/resource/tdc02.sci.life.stru.methusweb/illuminating-photosynthesis/ http://d43fweuh3sg51.cloudfront.net/media/assets/wgbh/tdc02/tdc02_doc_photosyn/tdc02_doc_photosyn.pdf	

	Photosynthesis: Watch It Happen http://www.hometrainingtools.com/a/photosynthesis-project/ How do organisms obtain and use matter and energy? How do matter and energy move through an ecosystem? Why are plants critical for the survival of animals? What do plants make that animals need?
Explanation Concepts and Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS1.C: Organization for Matter and Energy Flow in Organisms Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. 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)
Elaboration Extension Activity	Terrarium Students will build a terrarium and then observe it throughout the unit. To build a simple soda bottle terrarium using stations in the classroom. http://www.uscsd.k12.pa.us/cms/lib02/PA01000033/Centricity/Domain/342/Pennsylvania_Terrariums_Lesson_Plan.pdf
Evaluation Assessment Tasks	Assessment Task A: Written Scientific Explanation 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. Explanation should include evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. Information learned in above activities should be used to construct the explanation.

LIFE SCIENCE
MS-LS1-7 From Molecules to Organisms: Structures and Processes
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.		
Evidence Statements: MS-LS1-7		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
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 a model to describe unobservable mechanisms.	**LS1.C: Organization for Matter and Energy Flow in Organisms** 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. PS3.D: Energy in Chemical Processes and Everyday Life 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)	**Energy and Matter** Matter is conserved because atoms are conserved in physical and chemical processes.
Connections to other DCIs in this grade-band: MS.PS1.B		
Articulation of DCIs across grade-bands: 5.PS3.D ; 5.LS1.C ; 5.LS2.B ; HS.PS1.B ; HS.LS1.C ; HS.LS2.B		
NJSLS- ELA: SL.8.5		
NJSLS- Math: N/A		
5E Model		
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.		
Engage Anticipatory Set	http://ed.ted.com/lessons/the-simple-but-fascinating-story-of-photosynthesis-and-food-amanda-ooten http://www.pbslearningmedia.org/asset/tdc02_int_energyflow/	

	Continue the lesson by having students journal in their notebooks all the food that they ate from either dinner or lunch. Students should then categorize the food items into plant or animal. Students should then identify what the animals eat as their food source. Teacher facilitates student discussion leading students to the idea that all food traces back to plants. Students are encouraged to find food items they believe do not trace back to plants in order to enhance discussion. Pose the question: "Why are plants so essential to animals?"
Exploration Student Inquiry	Introduction: All parts of the body (muscles, brain, heart, and liver) need energy to work. This energy comes from the food we eat. Our bodies digest the food we eat by mixing it with fluids (acids and enzymes) in the stomach. When the stomach digests food, the carbohydrate (sugars and starches) in the food breaks down into another type of sugar, called glucose. The stomach and small intestines absorb the glucose and then release it into the bloodstream. Once in the bloodstream, glucose can be used immediately for energy or stored in our bodies, to be used later. In groups, have students develop a diagram which demonstrates the chemical changes that food undergoes and how these changes result in the release of energy. A sample model may begin with the food item, the eating of the item and then the digestion of the item. At each step students should be identifying how the food item was rearranged, where are the molecules going, what are the molecules/energy being used for by the organism. Have students walk around the room and look at each other's diagrams. Have them discuss what they noticed about each other's diagrams. If you have access to a document camera you can use this to share the diagrams. Guide the discussion to focus on different steps that groups may have illustrated. Have the class select the steps to make 1 class model. Exploration Questions: How do organisms obtain and use matter and energy? How do matter and energy move through an ecosystem? Why are plants critical for the survival of animals? What do plants make that animals need?
Explanation Concepts and Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS1.C: Organization for Matter and Energy Flow in Organisms 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.

	PS3.D: Energy in Chemical Processes and Everyday Life 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)
Elaboration Extension Activity	Digital Presentation Have students synthesize the information they have gathered from the class diagrams to create a digital presentation which illustrates the chemical reactions of food and how this transfers into energy. Students should incorporate information presented in all group diagrams.
Evaluation Assessment Tasks	Assessment Task A: 3D Model Develop a model to describe unobservable mechanisms. Use attached rubric to assess models created by students. 3D Model Rubric

Unit 2: Overview
Unit: 2 Body Systems
Grade: 7
Content Area: Life Science
Pacing: 15 Instructional Days
Essential Question
What are humans made of?
Student Learning Objectives (Performance Expectations)
MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

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.

Unit Summary

Students develop a basic understanding of the role of cells in body systems and how those systems work to support the life functions of the organism. Students will construct explanations for the interactions of systems in cells and organisms. Students understand 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. Students construct explanations for the interactions of systems in cells and organisms and for how organisms gather and use information from the environment. The cross cutting concepts of systems and system models and cause and effect provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in engaging in argument from evidence and obtaining, evaluating, and communicating information. Students use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Technical Terms

Nervous system, stimuli, neurons, cell body, dendrites, axon, synapse, cerebrum, cerebellum, skeletal system, ligaments, marrow, muscular system, voluntary muscles, involuntary muscles, tendons, circulatory system, plasma, arteries, capillaries, atrium, ventricle, aorta, respiratory system, epiglottis, trachea, alveoli, digestive system, salivary glands, peristaltic, small intestines, pancreas, villi, large intestines

Formative Assessment Measures

Part A: What is the evidence that a body is actually a system of interacting subsystems composed of groups of interacting cells?

Students who understand the concepts are able to:

Use an oral and written argument supported by evidence to support or refute an explanation or a model of how the body is a system of interacting subsystems composed of groups of cells.

Part B: How do organisms receive and respond to information from their environment?

Students who understand the concepts are able to:

Gather, read, and synthesize information from multiple appropriate sources about sensory receptors' response to stimuli.
Assess the credibility, accuracy, and possible bias of each publication and methods used.
Describe how publications and methods used are supported or not supported by evidence.

Interdisciplinary Connections

NJSLS- ELA	NJSLS- Mathematics
Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-3) RST.6-8.1	N/A

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) RI.6.8 Write arguments focused on discipline content. (MS-LS1-3) WHST.6-8.1 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.(MS-LS1-8) WHST.6-8.8	
Core Instructional Materials	Lab-Aids,Lab Materials, Scholastic Magazine, Nearpod, Blooket, Crossword puzzles, science spot, Biology4 Kids, Google Images
Career Readiness, Life Literacies and Key Skills	9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries. 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2). 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome. 9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities). 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.

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Computer Science and Design Thinking	8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.1.8.DA.6: Analyze climate change computational models and propose refinements. 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. 8.2.8.ED.5: Explain the need for optimization in a design process. 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). 8.2.8.ITH.2: Compare how technologies have influenced society over time. 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another.

	8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.

Modifications				
English Language Learners	**Special Education**	**At-Risk**	**Gifted and Talented**	**504**
Scaffolding Word walls Sentence/paragraph frames Bilingual dictionaries/translation Think alouds Read alouds Highlight key vocabulary Annotation guides Think-pair- share Visual aides Modeling Cognates	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast	Teacher tutoring Peer tutoring Study guides Graphic organizers Extended time Parent communication Modified assignments Counseling	Curriculum compacting Challenge assignments Enrichment activities Tiered activities Independent research/inquiry Collaborative teamwork Higher level questioning Critical/Analytical thinking tasks Self-directed activities	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast Parent communication Modified assignments Counseling

LIFE SCIENCE
MS-LS1-3 From Molecules to Organisms: Structures and Processes
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.

Evidence Statements: MS-LS1-3

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
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.	**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.	**Systems and System Models** Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. **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.

Connections to other DCIs in this grade-band: N/A

Articulation of DCIs across grade-bands: HS.LS1.A

NJSLS- ELA: RST.6-8.1, RI.6.8, WHST.6-8.1

NJSLS- Math: 6.EE.C.9

5E Model

MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

Engage Anticipatory Set	Students will complete a “Pin the organ on the body” game. Hand students an organ of the body. Ask students to identify organ. Then, ask students to put organ in its place on the human body. This can be done via SmartBoard, a physical model, or paper cut-outs. Ask students: What are these organs? Where do they go in the body? http://sciencenetlinks.com/interactives/systems.html. Students will help Arnold find his organs. They will be able to identify the name of organs in different body systems and place them in the body.
Exploration	Levels of Organization

Student Inquiry	http://utahscience.oremjr.alpine.k12.ut.us/sciber00/7th/cells/sciber/levelorg.htm Start by putting levels of organization on the board (Levels 1-5). Pictures can accompany the words. Put students into groups. Research: Put students into groups and assign each group a body system to research. Systems can include: Digestive System, Respiratory System, Skeletal System, Nervous System, Cardiovascular System, Circulatory System, Reproductive System and Muscular system. Students will indicate the role the body system, which organs are within the body system, and how the system interacts with other body systems. Students can use the following website to gather information: http://www.getbodysmart.com/ap/systems/tutorial.html Presentation: Students will conduct a presentation on their body system. Students will create a PowerPoint that presents key information about their system including a list of organs in the system and the functions of these organs. Students should use an oral and written argument that is supported by evidence to explain their system. After all presentations, teacher should lead a class discussion focusing on how all body systems work in conjunction with one another.
Explanation Concepts & Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): 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.
Elaboration Extension Activity	Have students research a disease which affects the body system they presented on. Students can research various aspects of the disease including the causes and its impact on the system.
Evaluation Assessment Tasks	Assessment Task A: Research Presentation 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. Evaluation Criteria- Presentation should include: Key terms Information on major organs within the system Arguments that are supported by evidence

	Information on how body systems interact with one another

LIFE SCIENCE		
MS-LS1-8 From Molecules to Organisms: Structures and Processes		
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.		
Clarification Statement: N/A		
Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.		
Evidence Statements: MS-LS1-8		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
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.	**LS1.D: Information Processing** Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.	**Cause and Effect** Cause and effect relationships may be used to predict phenomena in natural systems.
Connections to other DCIs in this grade-band: N/A		
Articulation of DCIs across grade-bands: 4.LS1.D ; HS.LS1.A		
NJSLS- ELA: WHST.6-8.8		
NJSLS- Math: N/A		
5E Model		
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.		

Engage Anticipatory Set	Begin class with leading students through an online interactive Stroop Test: https://faculty.washington.edu/chudler/java/ready.html The test will show words written in various colors. Students will have to read words of colors and also try to read the color of the words. Any type of Stroop test can be conducted. http://brainu.org/do-stroop http://www.brainfacts.org/Sensing-Thinking-Behaving/Senses-and-Perception/Articles/2013/A-Mind-About-Touch
Exploration Student Inquiry	Reaction Time Lab In this experiment students will test each other's reaction times. Lab activities will assess visual, auditory and tactile stimuli. http://wiki.backyardbrains.com/Reaction_Time
Explanation Concepts and Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS1.D: Information Processing Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.
Elaboration Extension Activity	Sensory Flowchart Students will be able to connect how nerve receptors and senses can send messages to the brain. Students will be able to summarize the connection, create a flow chart that connects the concepts.
Evaluation Assessment Tasks	Assessment A: Lab Reflection 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. Students will synthesize the information learned in the lab to respond to the following questions and tasks. Why do you think touch and audio stimuli have a faster reaction time on average? Do your results match the averages mentioned above? Would you expect a difference in the average reaction times between a male and female? What about a more athletic person compared to a more sedentary person? Do you think it's OK to average two people like we did? What might be the problem? Why did we not test the "tactile" reaction time in the choice task? How could you redesign the experimental setup to test tactile reaction times in the choice task?

	As you know, you have a dominant vs. a non-dominant hand. With only four trials, it is too hard to see a difference. Perhaps you should repeat the experiment 10-20 times to see if there is any difference between dominant and nondominant hands. The average conduction velocity speed is approximately 20-80 m/s. It takes approximately 1 ms for a neurotransmitter to cross the synapses. Calculate the lower limit for your patella reflex vs. the patellar reflex of a giraffe.

Unit 3: Overview
Unit 3: Selection and Adaptation
Grade: 7
Content Area: Life Science
Pacing: 20 Instructional Days
Essential Question
Are Genetically Modified Organisms (GMO) safe to eat?
Student Learning Objectives (Performance Expectations)
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.

MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
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.
Unit Summary
Students construct explanations based on evidence to support fundamental understandings of natural selection and evolution. They will use ideas of genetic variation in a population to make sense of how organisms survive and reproduce, thus passing on the traits of the species. The crosscutting concepts of patterns and structure and function are called out as organizing concepts that students use to describe biological evolution. Students use the practices of constructing explanations, obtaining, evaluating, and communicating information, and using mathematical and computational thinking. Students are also expected to use these practices to demonstrate understanding of the core ideas.
Technical Terms
Natural selection, genetics, traits, probability, proportional reasoning, inheritance, artificial selection, genetic modifications, animal husbandry, gene therapy, mathematical models,adaptations, variables, Darwin Theory, genetic technology, selective breeding, extinct, transgenic, consumer, domestic, clone, synthesize, mutation, camouflage, industrial melanism, entomologist, simulation
Formative Assessment Measures
Part A: How can changes to the genetic code increase or decrease an individual's chances of survival?
Students who understand the concepts are able to: Construct an explanation that includes probability statements regarding variables and proportional reasoning of how genetic variations of traits in a population increase some individuals' probability surviving and reproducing in a specific environment. Use probability to describe some cause-and-effect relationships that can be used to explain why some individuals survive and reproduce in a specific environment.
Part B: How can the environment affect natural selection?
Students who understand the concepts are able to: Explain some causes of natural selection and the effect it has on the increase or decrease of specific traits in populations over time. Use mathematical representations to support conclusions about how natural selection may lead to increases and decreases of genetic traits in populations over time.
Part C: Are Genetically Modified Organisms (GMO) safe to eat?
Students who understand the concepts are able to: Gather, read, and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms (artificial selection) from multiple appropriate sources.

Describe how information from publications about technologies and methods that have changed the way humans influence the inheritance of desired traits in organisms (artificial selection) used are supported or not supported by evidence.
Assess the credibility, accuracy, and possible bias of publications and the methods they used when gathering information about technologies that have changed the way humans influence the inheritance of desired traits in organisms (artificial selection).

Interdisciplinary Connections	
NJSLS- ELA	**NJSLS- Mathematics**
Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-LS4-4),(MS-LS4-5) RST.6-8.1 Compare and contrast the information gained from experiments, simulations, videos, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-4) RST.6-8.9 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS4-4) WHST.6-8.2 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-LS4-5) WHST.6-8.8 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-4) WHST.6-8.9	Model with mathematics. (MS-LS4-6) MP.4 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.RP.A.1 Summarize numerical data sets in relation to their context. (MS-LS4-4),(MS-LS4-6) 6.SP.B.5 Recognize and represent proportional relationships between quantities. (MS-LS4-4),(MS-LS4-6) 7.RP.A.2

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-LS4-4) SL.8.1 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-LS4-4) SL.8.4	
Core Instructional Materials	Lab-Aids, Lab Materials, Scholastic Magazine, Nearpod, Blooket, Crossword puzzles, science spot, Biology4 Kids, Google Images
Career Readiness, Life Literacies and Key Skills	9.4.8.CI.2 Repurpose an existing resource in an innovative way. 9.4.8..CI.3 Examine challenges that may exist in the adoption of new ideas. 9.4.8.CT.1 Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s)are likely to be effective. 9.4,8.CT.2 Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option. 9.4.8.CT.3 Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome. 9.4.8.IML.1 Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.7 Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose. 9.4.8 TL.3 Select appropriate tools to organize and present information digitally. 9.4.8.TL.4 Synthesize and publish information about a local or global issue or event. 9.4.8.TL.6 Collaborate to develop and publish work that provides perspectives on a real-world problem.
Computer Science and Design Thinking	8.1.8.DA.1 Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.2.8.ITH.5 Compare the impacts of a given technology on different societies,noting factors that may make a technology appropriate and sustainable in one society but not in another. 8.2.8.ETW.2 Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time,tools,people, capital).
Modifications	

English Language Learners	Special Education	At-Risk	Gifted and Talented	504
Scaffolding Word walls Sentence/paragraph frames Bilingual dictionaries/translation Think alouds Read alouds Highlight key vocabulary Annotation guides Think-pair- share Visual aides Modeling Cognates	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast	Teacher tutoring Peer tutoring Study guides Graphic organizers Extended time Parent communication Modified assignments Counseling	Curriculum compacting Challenge assignments Enrichment activities Tiered activities Independent research/inquiry Collaborative teamwork Higher level questioning Critical/Analytical thinking tasks Self-directed activities	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast Parent communication Modified assignments Counseling

LIFE SCIENCE		
MS-LS4-4 Biological Evolution: Unity and Diversity		
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.		
Assessment Boundary: N/A		
Evidence Statements: MS-LS4-4		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Constructing Explanations and Designing Solutions	**LS4.B: Natural Selection**	**Cause and Effect**

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. Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena.	Natural selection leads to the predominance of certain traits in a population, and the suppression of others.	Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.
Connections to other DCIs in this grade-band: MS.LS2.A ; MS.LS3.A ; MS.LS3.B		
Articulation of DCIs across grade-bands: 3.LS3.B ; 3.LS4.B ; HS.LS2.A ; HS.LS3.B ; HS.LS4.B ; HS.LS4.C		
NJSLS- ELA: RST.6-8.1, RST.6-8.9, WHST.6-8.2, WHST.6-8.9, SL.8.1, SL.8.4		
NJSLS- Math: 6.RP.A.1, 6.SP.B.5, 7.RP.A.2		
5E Model		
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.		
Engage Anticipatory Set	Peppered Moth Simulation http://peppermoths.weebly.com/ Peppered Moth Activity http://betterlesson.com/lesson/637464/peppered-moths	
Exploration Student Inquiry	What is Evolution In this activity, students will construct an explanation based on evidence that describes how genetic variation of traits in a population increase some individual's probability of surviving and reproducing in a specific environment. http://betterlesson.com/lesson/636016/what-is-evolution	
Explanation Concepts and Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS4.B: Natural Selection	

	Natural selection leads to the predominance of certain traits in a population, and the suppression of others.
Elaboration Extension Activity	Related Lessons http://betterlesson.com/next_gen_science/browse/2239/ngss-ms-ls4-6-use-mathematical-representations-to-support-explanations-of-how-natural-selection-may-lead-to-increases-and-decrea
Evaluation Assessment Tasks	Assessment Task A: Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. To end the lesson, go through Recipe For Evolution: Variation, Selection & Time which is a resource from Learn. Genetics Genetic Science Learning Center which is a wonderful resource on a large variety of biology topics. This reinforces some of the things the students should have learned by doing the simulations. To assess student learning, have students write a response to the following prompt in their journal: explain how genetic variation of traits in a population increase some individual's probability of surviving and reproducing in a specific environment. Use evidence from your investigations to support your answer. As this is a formative assessment, use a 3 point scale to assess this journal entry: 3 - Demonstrates strong understanding of the concept. 2 - Demonstrates good understanding of the concept with only minor misunderstandings 1 - Demonstrates poor understanding of the concept with major misunderstandings Meet with students who scored a 1 to ensure that their misunderstandings are cleared up before moving on to the next lesson.

LIFE SCIENCE
MS-LS4-5 Biological Evolution: Unity and Diversity
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.
Assessment Boundary: N/A

Evidence Statements: MS-LS4-5

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
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.	**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 onto offspring.	**Cause and Effect** Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. **Connections to 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. **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.

Connections to other DCIs in this grade-band: N/A

Articulation of DCIs across grade-bands: HS.LS3.B ; HS.LS4.C

NJSLS- ELA: RST.6-8.1, WHST.6-8.8

NJSLS- Math: N/A

5E Model

MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

Engage Anticipatory Set	Video: Classical vs. Transgenic Breeding http://www.pbslearningmedia.org/resource/tdc02.sci.life.gen.breeding/classical-vs-transgenic-breeding/ For what kind of characteristics have food crops been selectively bred? What are some examples of harmful effects of selective breeding?

Exploration Student Inquiry	Artificially Selecting Dogs Students learn how artificial selection can be used to develop new dog breeds with characteristics that make the dogs capable of performing a desirable task. Students begin by examining canine features and their functions. They are then given a scenario that describes the type of task they need a new breed of dog to perform. They then select two existing breeds they feel will most likely produce a successful new breed and determine the resulting offspring's characteristics. This lesson emphasizes variation, inheritance, selection, and time (number of generations) to help students develop a clear understanding of artificial selection and, ultimately, natural selection. http://www.ucmp.berkeley.edu/education/lessons/breeding_dogs/ Genetic Technology Students will conduct research to determine the similarities, differences , applications and potential impacts of genetic technologies. http://betterlesson.com/lesson/636020/genetic-technology
Explanation Concepts and Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): 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 onto offspring.
Elaboration Extension Activity	Genetic Engineering Debate Objective: To research the genetic engineering of food and create a public service announcement from the perspective of either the farmer or consumer. Questions for students to address: What type of technology is used in your type of genetic engineering? What are the benefits and risks of this type of technology? Who should be in charge of regulating and monitoring this type of genetic engineering to make sure that no one is abusing this technology? Research- positions must be based on facts
Evaluation	Assessment Task A: Artificially Selecting Dogs- Written Response

Assessment Tasks	Following this activity, students will write a paragraph describing the process of artificial selection in their own words, using dogs or another organism as their example. Encourage students to use and underline the VIST terms (variation, inheritance, selection, time) in their explanation. Assessment Task B: Clone Video Reflection Following the activity part of the Genetic Technology lesson, students should synthesize information learned by completing the reflection activity. Assessment Task C: Students will create an illustration that sums up their feelings/viewpoint on the genetic technologies they just learned about. Students can hand draw this or create it on the computer but either way it must be neat, colorful and their position (for or against) must be obvious. Students can then compare their wordle created in the warm-up to their illustration to see if their perspective has changed. 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.

LIFE SCIENCE		
MS-LS4-6 Biological Evolution: Unity and Diversity		
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.		
Evidence Statements: MS-LS4-6		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
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.	**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.	**Cause and Effect** Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.
Connections to other DCIs in this grade-band: MS.LS2.A ; MS.LS2.C ; MS.LS3.B ; MS.ESS1.C		
Articulation of DCIs across grade-bands: 3.LS4.C ; HS.LS2.A ; HS.LS2.C ; HS.LS3.B ; HS.LS4.B ; HS.LS4.C		
NJSLS- ELA: N/A		
NJSLS- Math: MP.4, 6.RP.A.1, 6.SP.B.5, 7.RP.A.2		
5E Model		
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.		

Engage Anticipatory Set	Natural Selection Video http://www.hhmi.org/biointeractive/making-fittest-natural-selection-and-adaptation
Exploration Student Inquiry	Nature at Work Mice Lab https://d2ct263enury6r.cloudfront.net/dQOQjAOu34mWuVJ625rTV9mYLbqflasfeqyDrQZten4WDa0h.pdf If the events in the game occurred in nature, how would the group of mice change over time? How did the results for the white sand environment differ from those of the brown forest floor environment? Students should use their numerical data to explain how natural selection leads to increases or decreases of specific traits in populations over time.
Explanation Concepts and Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): 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.
Elaboration Extension Activity	Related Lessons http://betterlesson.com/next_gen_science/browse/2239/ngss-ms-ls4-6-use-mathematical-representations-to-support-explanations-of-how-natural-selection-may-lead-to-increases-and-decrea
Evaluation Assessment Tasks	Assessment Task A: Lab Analysis Questions Assessment Task B: Lab Graph Use mathematical representations to support scientific conclusions and design solutions. Student graphs should: - compare the population changes of mice in both environments across all three generations - include a title, labels and a key if necessary

Unit 4: Overview
Unit 4: Structure and Function
Grade: 7
Content Area: Life Science
Pacing: 15 Instructional Days
Essential Question
How do cells contribute to the functioning of an organism?
Student Learning Objectives (Performance Expectations)
MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
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.
Unit Summary
Students demonstrate age appropriate abilities to plan and carry out investigations to develop evidence that living organisms are made of cells. Students gather information to support explanations of the relationship between structure and function in cells. They are able to communicate an understanding of cell theory and understand that all organisms are made of cells. Students understand that special structures are responsible for particular functions in organisms. They then are able to use their understanding of cell theory to develop and use physical and conceptual models of cells. The crosscutting concepts of scale, proportion, and quantity and structure and function provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in planning and carrying out investigations, analyzing and interpreting data, and developing and using models, Students are also expected to use these to use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.
Technical Terms
Cell theory, cell membrane, cytoplasm, cytoskeleton, centriole, chloroplast, eukaryotic, endoplasmic reticulum, prokaryotic, organelle, vacuole, lysosome, lipid bilayer, ribosome, Golgi apparatus, mitochondria, selectively permeable
Formative Assessment Measures
Part A: How will astrobiologists know if they have found life elsewhere in the solar system?
Students who understand the concepts are able to: Conduct an investigation to produce data that provides evidence distinguishing between living and nonliving things. Conduct an investigation to produce data supporting the concept that living things may be made of one cell or many and varied cells. Distinguish between living and nonliving things. Observe different types of cells that can be found in the makeup of living things.

Part B: How do the functions of cells support an entire organism?		
Students who understand the concepts are able to: Develop and use a model to describe the function of a cell as a whole. Develop and use a model to describe how parts of cells contribute to the cell's function. Develop and use models to describe the relationship between the structure and function of the cell wall and cell membrane.		
Interdisciplinary Connections		
NJSLS- ELA		**NJSLS- Mathematics**
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.6-8.7 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2) SL.8.5		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) 6.EE.C.9
Core Instructional Materials	Lab-Aids, Lab Materials, Scholastic Magazine, Nearpod, Blooket, Crossword puzzles, science spot, Biology4 Kids, Google Images, etc.	
Career Readiness, Life Literacies and Key Skills	9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., crosscultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries. 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2). 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).	

	9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome. 9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities). 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal. 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations. 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data. 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8). 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b) 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience. 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4). 9.4.8.TL.3: Select appropriate tools to organize and present information digitally. 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MSLS4-5, 6.1.8.CivicsPI.3). 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

Computer Science and Design Thinking	8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.1.8.DA.6: Analyze climate change computational models and propose refinements. 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. 8.2.8.ED.5: Explain the need for optimization in a design process. 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). 8.2.8.ITH.2: Compare how technologies have influenced society over time. 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another. 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.

Modifications				
English Language Learners	**Special Education**	**At-Risk**	**Gifted and Talented**	**504**
Scaffolding	Word walls	Teacher tutoring	Curriculum compacting	Word walls
Word walls	Visual aides	Peer tutoring	Challenge assignments	Visual aides/Graphic organizers
Sentence/paragraph frames	Graphic organizers	Study guides	Enrichment activities	Multimedia
Bilingual	Multimedia	Graphic organizers	Tiered activities	Leveled readers

dictionaries/translation Think alouds Read alouds Highlight key vocabulary Annotation guides Think-pair- share Visual aides Modeling Cognates	Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast	Extended time Parent communication Modified assignments Counseling	Independent research/inquiry Collaborative teamwork Higher level questioning Critical/Analytical thinking tasks Self-directed activities	Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter/Color contrast Parent communication Modified assignments Counseling

LIFE SCIENCE		
MS-LS1-1 From Molecules to Organisms: Structures and Processes		
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 nonliving things, and understanding that living things may be made of one cell or many and varied cells.		
Assessment Boundary: N/A		
Evidence Statements: MS-LS1-1		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
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	**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).	**Scale, Proportion, and Quantity** Phenomena that can be observed at one scale may not be observable at another scale. **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.

evidence that meet the goals of an investigation.		
Connections to other DCIs in this grade-band: N/A		
Articulation of DCIs across grade-bands: HS.LS1.A		
NJSLS- ELA: WHST.6-8.7		
NJSLS- Math: 6.EE.C.9		
5E Model		
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.		
Engage Anticipatory Set	Is It Alive PowerPoint http://www.curriki.org/xwiki/bin/view/Coll_kfasimpaur/Isitalive Introduction to Cells Video https://vimeo.com/37107992 Interactive Cell Model http://www.cellsalive.com/	
Exploration Student Inquiry	Cheek Cell Lab https://docs.google.com/document/d/16ZM9fNEwHrl2wjFBAZj74zC9av0fZTvWr2nDT4mjKzg/edit In this activity, students will: Collect, observe, and describe your own cheek cells Use science equipment and supplies according to instructions Compare stained and unstained cheek cells Summarize findings based on observations	
Explanation Concepts and Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS1.A: Structure and Function All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).	

Elaboration Extension Activity	Related Activities Better Lessons: LS1-1
Evaluation Assessment Tasks	Assessment Task A: Cheek Cell Lab- Post Reflection Questions Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. 1. How are the three specimens (2 stained and one unstained) alike? 2. How are the three specimens different? 3. What benefit would there be for looking at cells without stain? 4. Was it easier to see the cell structures when they were clumped together or isolated by themselves? Why would that be? 5: What cell structures were you able to view under the microscope? Why were they visible? 6. What cell structures were you NOT able to view? 7. What shape are cheek cells? Is this easy to figure out? Why or why not? 8. List two real-life situations in which looking at cells under a microscope benefits mankind.

LIFE SCIENCE		
MS-LS1-2 From Molecules to Organisms: Structures and Processes		
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.		
Evidence Statements: MS-LS1-2		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
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.	**LS1.A: Structure and Function** Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.	**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.

Develop and use a model to describe phenomena.		
Connections to other DCIs in this grade-band: MS.LS3.A		
Articulation of DCIs across grade-bands: 4.LS1.A ; HS.LS1.A		
NJSLS- ELA: SL.8.5		
NJSLS- Math: 6.EE.C.9		
5E Model		
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.		
Engage Anticipatory Set	Parts and Functions of a Cell: http://www.pbslearningmedia.org/asset/tdc02_vid_nucleus/ Parts of a Cell: http://freevideolectures.com/Course/2548/Biology/34	
Exploration Student Inquiry	Lesson 1: Make a Cell Model http://sciencenetlinks.com/lessons/cells-1-make-a-model-cell/ Lesson 2: The Cell as a System http://sciencenetlinks.com/lessons/cells-2-the-cell-as-a-system/	
Explanation Concepts & Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS1.A: Structure and Function Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.	
Elaboration Extension Activity	Students will compare a cell to a particular system of their choice. Students can choose to compare a cell to a school, sports team, a bicycle or home. They can create a blueprint poster or a 3D model. The model or blueprint will have to showcase their analogy and each of the parts and their functions. The title of your poster will be “A Cell Is Like a….” The poster will actually show your system – NOT the cell. All the parts you include in your poster will be described as part of the system. Student will then explain their cell comparison.	
Evaluation	Assessment Task A: Make a Cell Model Develop and use a model to describe phenomena.	

Assessment Tasks	Description: Students should understand the basic functions of the cell structures highlighted in this lesson, as well as have a better understanding of the usefulness and limitations of models. Assess students on their answers to the student sheet as well on their participation in class discussions. <u>Assessment Task B: The Cell as a System- Reflection Questions</u> Students should be able to clearly state why the factory, and more importantly the cell, can be thought of as systems. They should also be able to explain how the individual parts of the cell system operate within the larger context of the cell, and that the processes necessary for life take place within each cell. Ask the following questions to assess this understanding, telling students to think about the cell as a system: 1. When this system is working, what does it do? (It produces proteins.) 2. For this system to work, must it receive any input? (Yes; for example, energy ultimately from the sun.) 3. What, if any, output does this system produce? (It produces proteins.) 4. Identify at least four parts of this system. Describe what each part does, and tell how each part contributes to the system as a whole. Can any one part of the system do what the whole system does? Justify your response. (Answers will vary. Students should realize that the organelles need to work together to produce proteins.) 5. Identify at least two parts of this system that must interact if the system is to function. Describe how these parts interact. 6. Can you identify any subsystems within the whole system? (Answers will vary, but students should be able to describe at least one subsystem.) 7. Describe how the functioning of this system would change if one of the parts wears out. 8. In what ways is it useful to think of the cell as a system? (In general, thinking about a cell as a system helps in understanding individual cell organelle functions, and how they operate within the larger context of the cell.)

Unit 5: Overview
Unit 5: Growth, Development and Reproduction of Organisms
Grade: 7
Content Area: Life Science
Pacing: 25 Instructional Days
Essential Question
What influences the growth and development of an organism?
Student Learning Objectives (Performance Expectations)
MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
Unit Summary
Students use data and conceptual models to understand how the environment and genetic factors determine the growth of an individual organism. They connect this idea to the role of animal behaviors in animal reproduction and to the dependence of some plants on animal behaviors for their reproduction. Students provide evidence to support their understanding of the structures and behaviors that increase the likelihood of successful reproduction by organisms. The crosscutting concepts of cause and effect and structure and function provide a framework for understanding the disciplinary core ideas. Students demonstrate grade-appropriate proficiency in analyzing and interpreting data, using models, conducting investigations, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas.
Technical Terms
Reproduction, nest building, herding, breeding, predators, germination, phenomena, organisms
Formative Assessment Measures
Part A: How do characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively?
Students who understand the concepts are able to: Collect empirical evidence about animal behaviors that affect the animal's probability of successful reproduction and also affect the probability of plant reproduction. Collect empirical evidence about plant structures that are specialized for reproductive success. Use empirical evidence from experiments and other scientific reasoning to support oral and written arguments that explain the relationship among plant structure, animal behavior, and the reproductive success of plants. Identify and describe possible cause-and effect relationships affecting the reproductive success of plants and animals using probability. Support or refute an explanation of how characteristic animal behaviors and specialized plant structures affect the probability of successful plant reproduction using oral and written arguments.

Part B: How do environmental and genetic factors influence the growth of organisms?	
Students who understand the concepts are able to: Conduct experiments, collect evidence, and analyze empirical data. Use evidence from experiments and other scientific reasoning to support oral and written explanations of how environmental and genetic factors influence the growth of organisms. Use evidence from experiments and other scientific reasoning to support oral and written explanations of how environmental and genetic factors influence the growth of organisms. Identify and describe possible causes and effects of local environmental conditions on the growth of organisms. Identify and describe possible causes and effects of genetic conditions on the growth of organisms.	
Interdisciplinary Connections	
NJSLS- ELA	**NJSLS- Mathematics**
Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-4),(MS-LS1-5) RST.6-8.1 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.6-8.2 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) RI.6.8 Write arguments focused on discipline content. (MS-LS1-4) WHST.6-8.1 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.6-8.2 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5) WHST.6-8.9	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.A.2 Summarize numerical data sets in relation to their context. (MS-LS1-4),(MS-LS1-5) 6.SP.B.4
Core Instructional Materials	Lab-Aids, Lab Materials, Scholastic Magazine, Nearpod, Blooket, Crossword puzzles, science spot, Biology4 Kids, Google Images, etc.
Career Readiness, Life Literacies and Key Skills	9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).

	9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.
Computer Science and Design Thinking	8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact.

Modifications				
English Language Learners	**Special Education**	**At-Risk**	**Gifted and Talented**	**504**
Scaffolding Word walls Sentence/paragraph frames Bilingual dictionaries/translation Think alouds Read alouds Highlight key vocabulary Annotation guides Think-pair- share Visual aides Modeling Cognates	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast	Teacher tutoring Peer tutoring Study guides Graphic organizers Extended time Parent communication Modified assignments Counseling	Curriculum compacting Challenge assignments Enrichment activities Tiered activities Independent research/inquiry Collaborative teamwork Higher level questioning Critical/Analytical thinking tasks Self-directed activities	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast Parent communication Modified assignments Counseling

LIFE SCIENCE
MS-LS1-4 From Molecules to Organisms: Structures and Processes
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.

Assessment Boundary: N/A

Evidence Statements: MS-LS1-4

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
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.	**LS1.B: Growth and Development of Organisms** Animals engage in characteristic behaviors that increase the odds of reproduction. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.	**Cause and Effect** Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

Connections to other DCIs in this grade-band: MS.LS2.A

Articulation of DCIs across grade-bands: 3.LS1.B ; HS.LS2.A ; HS.LS2.D

NJSLS- ELA: RST.6-8., WHST.6-8.1

NJSLS- Math: 6.SP.A.2, 6.SP.B.4

5E Model

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.

Engage Anticipatory Set	Bald Eagle- Reproduction Pairs Maine http://participatoryscience.org/standard/ms-ls1-4
Exploration	Video & Lesson Series

Student Inquiry	http://www.pbslearningmedia.org/resource/tdc02.sci.life.repro.lp_reproduce/reproduction/ Lead students through series of videos and related discussion questions. Construct an Argument Have students select one plant or animal. Students will research the characteristics and structures to answer the following questions: How do organisms (plants and animals) reproduce? What environmental factors/characteristics would help to make plants and animals reproduce successfully? What factors/characteristics would inhibit reproduction? What are some of the causes/effects of reproduction that plants and animals might experience within their habitat/ecosystem?
Explanation Concepts and Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS1.B: Growth and Development of Organisms Animals engage in characteristic behaviors that increase the odds of reproduction. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.
Elaboration Extension Activity	Related Activities Better Lessons: MS-LS1-4
Evaluation Assessment Tasks	Assessment Task A: Construct an Argument 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. Evaluation Criteria- Argument should include: Key terms Information regarding the reproduction characteristics of plant/animal Factors that contribute to or inhibit reproduction Research-based evidence

LIFE SCIENCE		
MS-LS1-5 From Molecules to Organisms: Structures and Processes		
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.		
Evidence Statements: MS-LS1-5		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
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.	**LS1.B: Growth and Development of Organisms** Genetic factors as well as local conditions affect the growth of the adult plant.	**Cause and Effect** Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.
Connections to other DCIs in this grade-band: MS.LS2.A		
Articulation of DCIs across grade-bands: 3.LS1.B ; 3.LS3.A ; HS.LS2.A		
NJSLS- ELA: RST.6-8.1, RST.6-8.2, WHST.6-8.2, WHST.6-8.9		
NJSLS- Math: 6.SP.A.2, 6.SP.B.4		
5E Model		

MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	
Engage Anticipatory Set	Population Growth Patterns: http://www.ck12.org/life-science/Population-Growth-Patterns-in-Life-Science/lesson/Population-Growth-Patterns-Basic/?referrer=concept_details Limiting Factors: https://www.tracy.k12.ca.us/sites/mitrajuarez/Shared%20Documents/chapter05_section02.htm
Exploration Student Inquiry	Limiting Factors to Population Growth: http://www.ck12.org/life-science/Limiting-Factors-to-Population-Growth-in-Life-Science/ Lead students in exploration of articles, videos and related discussion questions. Carousel Activity Develop a set of questions that will provide students with situations and data about how specific factors will affect an organism, its habitat and its growth potential. These questions will be hung on the walls around the room. Students will pair up and like a Carousel move from station to station sharing their ideas of how to answer the question. Students will also provide feedback to other answers (students) and whether they agree (Check Mark) or disagree (X) with what was presented before them. Questions should include an organism, a genetic or environmental factor being discussed and how that factor may/may not affect the growth potential of that organism. Example Questions: What basic environmental factors do organisms need to survive (water, air, habitat and food)? What environmental factors would affect how an organism grows within its environment? How would an abundance of or lack of water, food, air and habitat affect an organism's growth potential? Are there any environmental hazards that would contribute to the growth of an organism within its habitat (drought, size of habitat vs. size of organism, human influence - fertilizer, etc.)?
Explanation Concepts and Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS1.B: Growth and Development of Organisms Genetic factors as well as local conditions affect the growth of the adult plant.
Elaboration	Related Activities

Extension Activity	Better Lessons: MS-LS1-5
Evaluation Assessment Tasks	Assessment Task A: Carousel Evaluation 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. Evaluation Criteria- Explanation should include: Key terms Explanation of how environmental and genetic factors influence growth of organisms

Unit 6: Overview

Unit 6: Structure and Function
Grade: 7
Content Area: Life Science
Pacing: 15 Instructional Days
Essential Question
How do cells contribute to the functioning of an organism?
Student Learning Objectives (Performance Expectations)
MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
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.
Unit Summary
Students demonstrate age appropriate abilities to plan and carry out investigations to develop evidence that living organisms are made of cells. Students gather information to support explanations of the relationship between structure and function in cells. They are able to communicate an understanding of cell theory and understand that all organisms are made of cells. Students understand that special structures are responsible for particular functions in organisms. They then are able to use their understanding of cell theory to develop and use physical and conceptual models of cells. The crosscutting concepts of scale, proportion, and quantity and structure and function provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in planning and carrying out investigations, analyzing and interpreting data, and developing and using models, Students are also expected to use these to use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.
Technical Terms
Cell theory, cell membrane, cytoplasm, cytoskeleton, centriole, chloroplast, eukaryotic, endoplasmic reticulum, prokaryotic, organelle, vacuole, lysosome, lipid bilayer, ribosome, Golgi apparatus, mitochondria, selectively permeable
Formative Assessment Measures
Part A: How will astrobiologists know if they have found life elsewhere in the solar system?
Students who understand the concepts are able to: Conduct an investigation to produce data that provides evidence distinguishing between living and nonliving things. Conduct an investigation to produce data supporting the concept that living things may be made of one cell or many and varied cells. Distinguish between living and nonliving things. Observe different types of cells that can be found in the makeup of living things.
Part B: How do the functions of cells support an entire organism?

Students who understand the concepts are able to:

Develop and use a model to describe the function of a cell as a whole.

Develop and use a model to describe how parts of cells contribute to the cell's function.

Develop and use models to describe the relationship between the structure and function of the cell wall and cell membrane.

Interdisciplinary Connections	
NJSLS- ELA	**NJSLS- Mathematics**
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.6-8.7 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS1-2) SL.8.5	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) 6.EE.C.9

Core Instructional Materials	Lab-Aids, Lab Materials, Scholastic Magazine, Nearpod, Blooket, Crossword puzzles, science spot, Biology4 Kids, Google Images, etc.
Career Readiness, Life Literacies and Key Skills	9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries. 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2). 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.

	9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities). 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal. 9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations. 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data. 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8). 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b) 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience. 9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4). 9.4.8.TL.3: Select appropriate tools to organize and present information digitally. 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MSLS4-5, 6.1.8.CivicsPI.3). 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.
Computer Science and Design Thinking	8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.1.8.DA.6: Analyze climate change computational models and propose refinements. 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. 8.2.8.ED.5: Explain the need for optimization in a design process. 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product.

	8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). 8.2.8.ITH.2: Compare how technologies have influenced society over time. 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another. 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product. 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.

Modifications				
English Language Learners	**Special Education**	**At-Risk**	**Gifted and Talented**	**504**
Scaffolding Word walls Sentence/paragraph frames Bilingual dictionaries/translation Think alouds Read alouds Highlight key vocabulary Annotation guides Think-pair- share Visual aides Modeling Cognates	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast	Teacher tutoring Peer tutoring Study guides Graphic organizers Extended time Parent communication Modified assignments Counseling	Curriculum compacting Challenge assignments Enrichment activities Tiered activities Independent research/inquiry Collaborative teamwork Higher level questioning Critical/Analytical thinking tasks Self-directed activities	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast Parent communication Modified assignments

				Counseling

LIFE SCIENCE		
MS-LS1-1 From Molecules to Organisms: Structures and Processes		
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 nonliving things, and understanding that living things may be made of one cell or many and varied cells.		
Assessment Boundary: N/A		
Evidence Statements: MS-LS1-1		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
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.	**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).	**Scale, Proportion, and Quantity** Phenomena that can be observed at one scale may not be observable at another scale. **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.
Connections to other DCIs in this grade-band: N/A		
Articulation of DCIs across grade-bands: HS.LS1.A		
NJSLS- ELA: WHST.6-8.7		
NJSLS- Math: 6.EE.C.9		
5E Model		

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.	
Engage Anticipatory Set	Is It Alive PowerPoint http://www.curriki.org/xwiki/bin/view/Coll_kfasimpaur/Isitalive Introduction to Cells Video https://vimeo.com/37107992 Interactive Cell Model http://www.cellsalive.com/
Exploration Student Inquiry	Cheek Cell Lab https://docs.google.com/document/d/16ZM9fNEwHrl2wjFBAZj74zC9av0fZTvWr2nDT4mjKzg/edit In this activity, students will: Collect, observe, and describe your own cheek cells Use science equipment and supplies according to instructions Compare stained and unstained cheek cells Summarize findings based on observations
Explanation Concepts and Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS1.A: Structure and Function All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).
Elaboration Extension Activity	Related Activities Better Lessons: LS1-1
Evaluation Assessment Tasks	Assessment Task A: Cheek Cell Lab- Post Reflection Questions Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. 1. How are the three specimens (2 stained and one unstained) alike? 2. How are the three specimens different? 3. What benefit would there be for looking at cells without stain?

	4. Was it easier to see the cell structures when they were clumped together or isolated by themselves? Why would that be? 5: What cell structures were you able to view under the microscope? Why were they visible? 6. What cell structures were you NOT able to view? 7. What shape are cheek cells? Is this easy to figure out? Why or why not? 8. List two real-life situations in which looking at cells under a microscope benefits mankind.

LIFE SCIENCE		
MS-LS1-2 From Molecules to Organisms: Structures and Processes		
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.		
Evidence Statements: MS-LS1-2		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
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.	**LS1.A: Structure and Function** Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.	**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.
Connections to other DCIs in this grade-band: MS.LS3.A		
Articulation of DCIs across grade-bands: 4.LS1.A ; HS.LS1.A		
NJSLS- ELA: SL.8.5		
NJSLS- Math: 6.EE.C.9		
5E Model		

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.	
Engage Anticipatory Set	Parts and Functions of a Cell: http://www.pbslearningmedia.org/asset/tdc02_vid_nucleus/ Parts of a Cell: http://freevideolectures.com/Course/2548/Biology/34
Exploration Student Inquiry	Lesson 1: Make a Cell Model http://sciencenetlinks.com/lessons/cells-1-make-a-model-cell/ Lesson 2: The Cell as a System http://sciencenetlinks.com/lessons/cells-2-the-cell-as-a-system/
Explanation Concepts & Practices	In these lessons Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS1.A: Structure and Function Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.
Elaboration Extension Activity	Students will compare a cell to a particular system of their choice. Students can choose to compare a cell to a school, sports team, a bicycle or home. They can create a blueprint poster or a 3D model. The model or blueprint will have to showcase their analogy and each of the parts and their functions. The title of your poster will be "A Cell Is Like a…." The poster will actually show your system – NOT the cell. All the parts you include in your poster will be described as part of the system. Student will then explain their cell comparison.
Evaluation Assessment Tasks	Assessment Task A: Make a Cell Model Develop and use a model to describe phenomena. Description: Students should understand the basic functions of the cell structures highlighted in this lesson, as well as have a better understanding of the usefulness and limitations of models. Assess students on their answers to the student sheet as well on their participation in class discussions. Assessment Task B: The Cell as a System- Reflection Questions Students should be able to clearly state why the factory, and more importantly the cell, can be thought of as systems. They should also be able to explain how the individual parts of the cell system operate within the larger context of the cell, and that the processes necessary for life take place within each cell. Ask the following questions to assess this understanding, telling students to think about the cell as a system:

	1. When this system is working, what does it do? (It produces proteins.) 2. For this system to work, must it receive any input? (Yes; for example, energy ultimately from the sun.) 3. What, if any, output does this system produce? (It produces proteins.) 4. Identify at least four parts of this system. Describe what each part does, and tell how each part contributes to the system as a whole. Can any one part of the system do what the whole system does? Justify your response. (Answers will vary. Students should realize that the organelles need to work together to produce proteins.) 5. Identify at least two parts of this system that must interact if the system is to function. Describe how these parts interact. 6. Can you identify any subsystems within the whole system? (Answers will vary, but students should be able to describe at least one subsystem.) 7. Describe how the functioning of this system would change if one of the parts wears out. 8. In what ways is it useful to think of the cell as a system? (In general, thinking about a cell as a system helps in understanding individual cell organelle functions, and how they operate within the larger context of the cell.)

Unit 7: Overview

Unit 7: Evidence of a Common Ancestry
Grade: 7
Content Area: Life Science
Pacing: 20 Instructional Days
Essential Questions
How do we know when an organism (fossil) was alive?
How do we know that birds and dinosaurs are related?
Student Learning Objectives (Performance Expectations)
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.
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.
MS-LS4-3. Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.
Unit Summary
In this unit of study, students analyze graphical displays and gather evidence from multiple sources in order to develop an understanding of how fossil records and anatomical similarities of the relationships among organisms and species describe biological evolution. Students search for patterns in the evidence to support their understanding of the fossil record and how those patterns show relationships between modern organisms and their common ancestors. The crosscutting concepts of cause and effect, patterns, and structure and function are called out as organizing concepts for these disciplinary core ideas.Students use the practices of analyzing graphical displays and gathering, reading, and communicating information.Students are also expected to use these practices to demonstrate understanding of the core ideas.
Technical Terms
Biological Evolution, Fossil records, Existence, Diversity, Unity, Anatomical Structures, Chronological order, Rock layers, Anatomical,evolutionary, gross appearance, anatomy, embryological development, macroscopic, sediment, amber, radiometric dating, relative dating,chronometric, cladograms, homologous structure, morphology, DNA, trait, cladistics,embryos, nonlinear relationships
Formative Assessment Measures
Part A: How do we know when an organism (fossil) was alive?
Students who understand the concepts are able to: Use graphs, charts, and images to identify patterns within the fossil record. Analyze and interpret data within the fossil record to determine similarities and differences in findings. Make logical and conceptual connections between evidence in the fossil record and explanations about the existence, diversity, extinction, and change in many life forms throughout the history of life on Earth.
Part B: How do we know that birds and dinosaurs are related?

Students who understand the concepts are able to:
Apply scientific ideas to construct explanations for evolutionary relationships.
Apply the patterns in gross anatomical structures among modern organisms and between modern organisms and fossil organisms to construct explanations of evolutionary relationships.
Apply scientific ideas about evolutionary history to construct an explanation for evolutionary relationships evidenced by similarities or differences in the gross appearance of anatomical structures.

Part C: Other than bones and structures being similar, what other evidence is there that birds and dinosaurs are related?

Students who understand the concepts are able to:
Use diagrams or pictures to identify patterns in embryological development across multiple species.
Analyze displays of pictorial data to identify where the embryological development is related linearly and where that linear nature ends.
Infer general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.

Interdisciplinary Connections

NJSLS- ELA	NJSLS- Mathematics
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) RST.6-8.1 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.6-8.7 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) RST.6-8.9 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) WHST.6-8.2 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2) WHST.6-8.9 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'	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) 6.EE.B.6

ideas and expressing their own clearly. (MS-LS4-2) SL.8.1 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) SL.8.4	
Core Instructional Materials	Lab-Aids, Lab Materials, Scholastic Magazine, Nearpod, Blooket, Crossword puzzles, science spot, Biology4 Kids, Google Images, etc.
Career Readiness, Life Literacies and Key Skills	9.4.8.DC.1 Analyze the resource citations in online materials for proper use. 9.4.8.DC.2 Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.IML.1 Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.4 Ask insightful questions to organize types of data and create meaningful visualizations. 9.4.8.IML.5 Analyzeand interpret local or public data sets to summarize and effectively communicate the data. 9.4.8.IML.7 Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose. 9.4.8.IML.12 Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience. 9.4.8.TL.1 Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making. 9.4.8.TL.3 Select appropriate tools to organize and present information digitally. 9.4.8.TL.4 Synthesize and publish information about a local or global issue or event.
Computer Science and Design Thinking	8.1.8.DA.1 Organize and transform data collected using computational tools to make it usable for a specific purpose. 8.2.8.ED.3 Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, sketch).

Modifications				
English Language Learners	**Special Education**	**At-Risk**	**Gifted and Talented**	**504**
Scaffolding	Word walls	Teacher tutoring	Curriculum compacting	Word walls
Word walls	Visual aides	Peer tutoring	Challenge assignments	Visual aides
Sentence/paragraph frames	Graphic organizers	Study guides	Enrichment activities	Graphic organizers
Bilingual	Multimedia	Graphic organizers	Tiered activities	Multimedia
dictionaries/translation	Leveled readers	Extended time	Independent	Leveled readers
Think alouds	Assistive technology	Parent communication	research/inquiry	Assistive technology
Read alouds	Notes/summaries	Modified assignments	Collaborative teamwork	Notes/summaries
Highlight key vocabulary	Extended time	Counseling	Higher level questioning	Extended time

Annotation guides Think-pair- share Visual aides Modeling Cognates	Answer masking Answer eliminator Highlighter Color contrast		Critical/Analytical thinking tasks Self-directed activities	Answer masking Answer eliminator Highlighter Color contrast Parent communication Modified assignments Counseling

LIFE SCIENCE		
MS-LS4-1 Biological Evolution: Unity and Diversity		
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.		
Evidence Statements: MS-LS4-1		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
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 and interpret data to determine similarities and differences in findings. **Connections to Nature of Science** **Scientific Knowledge is Based on Empirical Evidence**	**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.	**Patterns** Graphs, charts, and images can be used to identify patterns in data. **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.

Science knowledge is based upon logical and conceptual connections between evidence and explanations.		
Connections to other DCIs in this grade-band: MS.ESS1.C ; MS.ESS2.B		
Articulation of DCIs across grade-bands: 3.LS4.A ; HS.LS4.A ; HS.ESS1.C		
NJSLS- ELA: RST.6-8.1, RST.6-8.7		
NJSLS- Math: 6.EE.B.6		
5E Model		
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.		
Engage Anticipatory Set	What Are Fossils http://www.ck12.org/biology/Fossils/lecture/user:13IntC/What-are-fossils/?referrer=concept_details&conceptLevel=&conceptSource=all Show several different fossils or pictures of fossils (diverse types of fossils and fossils from different time periods) and ask students what characteristics the fossils have and how they compare to organisms that still exist today – identify names of present day organisms similar to the fossilized organisms How is the present day organism SIMILAR to the extinct species? WHY are the two species similar? How is the present day organism DIFFERENT than the extinct species? WHY are the two species different? http://www.fossilmuseum.com/ http://www.bbc.co.uk/nature/fossils	
Exploration Student Inquiry	Fossil Evidence for Evolution http://www.pbslearningmedia.org/resource/tdc02.sci.life.evo.lp_fossilevid/the-fossil-evidence-for-evolution/ In this lesson, students will learn how scientists find evidence of evolution and piece together the history of life. Students will learn about the fossil record, the primary form of evidence, as well as the fossil formation process and the evolution of animals.	
Explanation Concepts and Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): 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.
Elaboration Extension Activity	Related Activities Better Lessons: MS-LS4-1
Evaluation Assessment Tasks	Assessment Task A: Whale Evolution Timeline (Part 3 Step 10 of lesson plan from PBS learning website) Ask each team of two to prepare an Eocene epoch timeline on paper, using the same scale as the classroom model (one inch equals one million years). Their timelines should be twenty-one inches long, with each million years labeled. Whales in the Making Using the images provided on the Whales in the Making worksheet, students will create timeline which represents the evolution of whales. Assessment Task B: Discussion Questions Analyze and interpret data to determine similarities and differences in findings. After creating the timeline, students should use the following discussion questions to interpret and analyze the data collected. What typical whale like traits were apparently the earliest to appear? What apparently evolved much later? As each "missing link" was found, how many new gaps were formed? What is the relationship between gaps and fossils? To find fossil evidence to fill the largest remaining gap in whale evolution, what age sediments would you search? What distinguishing traits would you expect to find in whale fossils of that age? Explain why the absence of transitional fossils does not mean that evolution didn't take place.

LIFE SCIENCE		
MS-LS4-2 Biological Evolution: Unity and Diversity		
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.		
Assessment Boundary: N/A		
Evidence Statements: MS-LS4-2		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**

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.	**LS4.A: Evidence of Common Ancestry and Diversity** 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.	**Patterns** Patterns can be used to identify cause and effect relationships. **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.
Connections to other DCIs in this grade-band: MS.LS3.A ; MS.LS3.B ; MS.ESS1.C		
Articulation of DCIs across grade-bands: 3.LS4.A ; HS.LS4.A ; HS.ESS1.C		
NJSLS- ELA: RST.6-8.1, WHST.6-8.2, WHST.6-8, SL.8.1, SL.8.4		
NJSLS- Math: 6.EE.B.6		
5E Model		
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.		
Engage Anticipatory Set	Students will compare images of an elephant shrew, an elephant, and a shrew to predict which two are most closely related based on observable anatomical characteristics https://www.sciencenews.org/article/elephant-shrews-are-oddly-related-actual-elephants	
Exploration Student Inquiry	Cladistics Students will infer evolutionary relationships using a cladogram. http://betterlesson.com/lesson/638611/cladistics Evolution - Homologous Structures & Embryology Students will be able to identify similarities in morphology and early embryo development as evidence for evolution http://betterlesson.com/lesson/638268/evolution-homologous-structures-embryology	

Explanation Concepts and Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS4.A: Evidence of Common Ancestry and Diversity 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.
Elaboration Extension Activity	Additional Cladogram Activities http://www.isd622.org/cms/lib07/MN01001375/Centricity/Domain/718/Learning_Target_4.6_Cladograms.pdf http://www.biologycorner.com/worksheets/cladogram.html#.VXBu00a8qSo http://chapin.episd.org/common/pages/DisplayFile.aspx?itemId=3070611
Evaluation Assessment Tasks	Assessment Task A: Evaluate the accuracy of the completed Cladogram that student built in the Cladistics activity. Assessment Task B: Closing Explanation Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. At the end of the lesson, pose the following question to students In your opinion, what is the most compelling evidence for evolution. Why? Encourage students to use the ACE strategy to answer. See link below. ACE Strategy

LIFE SCIENCE		
MS-LS4-3 Biological Evolution: Unity and Diversity		
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.		
Evidence Statements: MS-LS4-3		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**

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.	**LS4.A: Evidence of Common Ancestry and Diversity** Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy.	**Patterns** Graphs, charts, and images can be used to identify patterns in data.
Connections to other DCIs in this grade-band: N/A		
Articulation of DCIs across grade-bands: HS.LS4.A		
NJSLS- ELA: RST.6-8.1, RST.6-8.7, RST.6-8.9		
NJSLS- Math: N/A		
5E Model		
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.		
Engage Anticipatory Set	Guess the Embryo Interactive http://www-tc.pbs.org/wgbh/nova/assets/swf/1/embryo/embryo.swf	
Exploration Student Inquiry	Embryo Comparison Activity Given pictorial data, students will compare patterns of similarities in embryos to identify relationships across multiple species Which of the identified characteristics are still present in the fully formed anatomy of each species? Exploration Questions What does the presence or absence of embryological characteristics in the fully formed anatomy suggest about relationships among these species? Embryonic Development- Evidence for Evolution In this activity, students will 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. http://betterlesson.com/lesson/637398/embryonic-development-evidence-for-evolution	
Explanation	In these lessons:	

Concepts and Practices	Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS4.A: Evidence of Common Ancestry and Diversity Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy.
Elaboration Extension Activity	Related Activities http://www.ck12.org/search/?q=MS-LS4-3&referrer=top_nav&autoComplete=false
Evaluation Assessment Tasks	Assessment Task A: Embryonic Development Exit Slip Analyze displays of data to identify linear and nonlinear relationships. Students complete an Exit Slip, where they are required to write a scientific explanation on how embryo development across species is evidence for evolution.