7th Grade Science

Link Community Charter School

UNITS (6/6 SELECTED)	SUGGESTED DURATION
Unit 1: Living Things in the Biosphere	*31 lessons*
Unit 2: The Cell System	*40 lessons*
Unit 3: Genes and Heredity	*35 lessons*
Unit 4: Natural Selection and Change Over Time	*34 lessons*
Unit 5: Ecosystems	*7 lessons*
Unit 6: Populations, Communities, and Ecosystems	*7 lessons*

Unit 1: Living Things in the Biosphere

7th Grade Science - *Last Updated on July 7, 2021*

STANDARDS ADDRESSED

New Jersey (NJSLS) - Grades 6-8 - Science (2020)
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.
MS-LS1-3
Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
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.
Next Generation Science (NGSS) - Middle School - Life Sciences - Disciplinary Core Ideas
LS1.A.1
All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)
LS1.A.2
Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)
LS1.A.3
In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3)
Next Generation Science (NGSS) - Grade 6-8 - Crosscutting Concepts
3
Scale, Proportion, and Quantity: In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales

change.
4
Systems and System Models: A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.
6
Structure and Function: The way an object is shaped or structured determines many of its properties and functions.
Next Generation Science (NGSS) - Middle School - Science and Engineering Practices
3.
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.
2.
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.
7.
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).

Unit 1: Living Things in the Biosphere

7th Grade Science - *Last Updated on July 7, 2021*

DESIRED RESULTS

Established Goals
In this topic, students will explore living things, including how and why organisms are classified. Students will also learn about viruses, bacteria, protists, fungi, plants, and animals and how organisms from these various groups impact humans.

Transfer
Students will be able to independently use their learning to define and organize living things like scientists.

Meaning	
Big Ideas & Understandings	**Essential Questions**
Students will know... • living things are made of cells, and where living things come from. • what living things need to stay alive, grow, and reproduce. • living things are classified into groups. • the organization of levels of classification. • how the theory of evolution supports the classification of organisms. • the characteristics of viruses, bacteria, protists, and fungi. • how viruses, bacteria, protists, and fungi interact with nature and people. • the forms and functions of different plants and animals. • differences and similarities in plant and animal cells, and their traits	Students will consider... • What evidence is there that all living things are made of cells? • Where do living things come from? • What do living things need to stay alive, grow, and reproduce? • How are living things classified into groups? • How does the theory of evolution support the classification of organisms? • What are all living things made of? • What are the characteristics of viruses, bacteria, protists, and fungi? • How do viruses, bacteria, protists, and fungi interact with nature and people. • What makes animals and plants different in form and function? • Which special structures inside plant and animal cells determine an organism's characteristics? • How do similar cells work together to help plants and animals function? • Which traits are unique to animals?

Acquisition	
Knowledge	**Skills**
Students will know... • An organism is a living thing. • Cells are the basic unit of structure and function in living things. • In unicellular organisms, one cell carries out the functions necessary to stay alive. Organisms consisting of many cells are multicellular. • Any change or signal in the environment that can make an organism react in some way is called a stimulus. A response an that action or change in behavior. • The mistaken idea that living things arise from nonliving sources is called spontaneous generation. • The maintenance of stable internal conditions is called homeostasis. • A species is a group of similar organisms that can mate with each other and produce offspring that can also mate and reproduce. • Classification is the process of grouping things based on their similarities. • Binomial nomenclature is a system in which each organism is given a unique, two-part scientific name that indicates its genus and species. • The scientific study of how organisms are classified is called taxonomy • In classification, the broadest level of organization is domain. • The process of change over time is called evolution. • The process by which unrelated organisms evolve similar characteristics is called convergent evolution. • A virus is a tiny, nonliving particle that enters and	Students are working towards... • developing models to predict and/or describe phenomena. • conducting an investigation with multiple variables. • constructing an argument that supports or refutes claims for other explanations. • explaining that the fossil record documents the existence of many life forms throughout Earth's history. • interpreting data that shows phenomena observable at one scale may not be observable at another scale. • comparing and contrasting how systems interact with each other. • analyzing natural structures to determine how they function.

Acquisition	
then reproduces inside a living cell. • A host is an organism that provides a source of energy or a suitable environment for a virus to live. • A vaccine stimulates a person's immune system to produce immunity to a specific disease, protecting the person from that disease. • Bacteria are single-celled organisms, also known as prokaryotes, that lack a nucleus. • Protists are eukaryotic organisms that cannot be classified as animals, plants, or fungi. • Parasites are organisms that benefit from living with, on, or in a host. • A group of similar cells that perform a specific function are called tissues. • Vascular plants contain true vascular tissues to transport water, food, and minerals through the plant. Nonvascular plants are low-growing plants that lacks vascular tissue for transporting materials. • Vertebrates are animals with a backbone. Animals without a backbone are classified as invertebrates. • Mammals are vertebrates whose body temperature is regulated by its internal heat, and has skin covered with hair or fur and glands that produce milk to feed its young.	

ASSESSMENT EVIDENCE (DIAGNOSTIC / FORMATIVE / SUMMATIVE)

Assessments

Evaluation Criteria	Assessment Evidence
Rubrics/Checklists: • Plan an Investigation Rubric • Construct Explanations Rubric • Evaluate Claims Rubric • Use Scientific Reasoning Rubric • Developing Models Rubric • Apply Scientific Reasoning Rubric • Analyze Systems Rubric	Performance Task(s): • uConnect Lab: Is It an Animal? • Hands-On Lab: All Wound Up • Hands-On Lab: Cheek Cells • Interactivity: What All Living Things Have in Common • Interactivity: Mom's Car Must Be Alive • Lesson 1 Check • Quest Check-in: Under the Microscope • Lesson Quiz • Case Study: The Touch and Tiny Tardigrade • Hands-On Lab: Clean Up that Junk Drawer! • Interactivity: Classify It • Hands-On Lab: A Mystery Organism No More! • Hands-On Lab: Living Mysteries • Lesson 2 Check • Quest Check-in: Classifying Seeds • Lesson Quiz • Hands-On Lab: Viruses by the Numbers • Interactivity: Bacteriophage Treatments • Interactivity: Vaccines and Populations • Interactivity: Life as a Single Cell • Hands-On Lab: Life in a Drop of Pond Water • Interactivity: There's Something Going Around • Lesson 3 Check • Quest Check-in: Discovering Rainforest Organisms • Lesson Quiz • Interactivity: So Many Cells • Hands-On Lab: Algae and Other Plants • Interactivity: Different Cells, Different Jobs • Interactivity: Identifying an Organism • Lesson 4 Check

	• Quest Check-in: Multicellular Rainforest Organisms • Lesson Quiz • Topic 1 Review and Assess • Topic 1 Test • Quest Findings: Create Your Field Guide • uDemonstrate Lab: It's Alive
	Other Evidence: • Reading Checks • Checking for Understanding Figures • Model It! • Math Toolbox • Connect It! • Plan it!

Unit 1: Living Things in the Biosphere

7th Grade Science - *Last Updated on July 7, 2021*

LEARNING PLAN

Summary of Key Learning Events and Instruction:

Lesson 1: Living Things

- Characteristics of Living Things
- Life Produces More Life
- Needs of Living Things

Lesson 2: Classification Systems

- Classifying Organisms
- Evolution and Classification

Lesson 3: Viruses, bacteria, Protists, and Fungi

- Microorganisms
- Viruses
- Bacteria
- Protists
- Fungi

Lesson 4: Plants and Animals

- Form and Function
- Characteristics of Plants
- Characteristics of Animals

SUPPORTING MATERIALS/RESOURCES/STRATEGIES FOR DIFFERENTIATION

Click here to view all possible modifications

Unit 2: The Cell System

7th Grade Science - *Last Updated on July 7, 2021*

STANDARDS ADDRESSED

New Jersey (NJSLS) - Grades 6-8 - Science (2020)
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.
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.
MS-LS2-3
Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
Next Generation Science (NGSS) - Grade 6-8 - Crosscutting Concepts
3
Scale, Proportion, and Quantity: In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.
6
Structure and Function: The way an object is shaped or structured determines many of its properties and functions.
5
Energy and Matter: Flows, Cycles, and Conservation: Tracking energy and matter flows, into, out of, and within systems helps one understand their system’s behavior.
Next Generation Science (NGSS) - Middle School - Life Sciences - Disciplinary Core Ideas

LS1.A.1
All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)
LS1.A.2
Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)
LS1.C.1
Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6)
Next Generation Science (NGSS) - Middle School - Science and Engineering Practices
2.
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.
3.
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.
6.
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.

Unit 2: The Cell System

7th Grade Science - *Last Updated on July 7, 2021*

DESIRED RESULTS

Established Goals
In this unit, students will use models to recognize cell structures and conduct investigations to understand cell structures and functions

Transfer
Students will be able to independently use their learning to determine how the structure of cells affects their function.

Meaning	
Big Ideas & Understandings	**Essential Questions**
Students will understand that... • cells determine the structure of living things. • plant and animal cells are different in their structure as well as their function. • the cell membrane is important in maintaining homeostasis. • cells go through reproduction. • plants and other organisms use photosynthesis to make food. • organisms use cellular respiration to break down food and produce energy and carbon dioxide.	Students keep considering... • What evidence is there that cells make up all living things? • How do cells determine the structure of living things? • What are some special structures within a cell? • How do the different parts of a cell help it function? • How are animal cells different from plant cells? • What is the primary role of the cell membrane in cell function? • What are the four functions of cell division? • Which structures in a cell help it to reproduce? • How do plants and other organisms use photosynthesis to make food? • What are the roles of light, carbon dioxide, water, and chlorophyll in photosynthesis? • What role does photosynthesis play in cycling materials and energy through ecosystems? • How does cellular respiration break down food to produce energy and carbon dioxide?

Meaning	
	• How can cells release energy without using oxygen? • How are matter and energy conserved during cellular respiration?

Acquisition	
Knowledge	**Skills**
Students will know... • Cells are the basic unit of structure and function in living things. • Microscopes make small objects look larger. • Cell Theory is a widely accepted explanation of the relationship between cells and living things. • Each organelle is a tiny cell structure that carries out a specific function within the cell. • The rigid supporting layer that surrounds the cells of plants and some other organisms is the cell wall. • The cell membrane is a thin, flexible barrier that surrounds a cell and controls which substances pass into and out of a cell. • Cytoplasm fills the region between the cell membrane and the nucleus. • In some cells, the nucleus is a large oval organelle that contains the cell's genetic material in the form of DNA • Mitochondria convert energy stored in food to energy the cell can use to live and function. • The chloroplast is an organelle in the cells of plants and some other organisms that captures energy from sunlight and changes it to an energy	Students will be skilled at... • developing models to describe phenomena. • conducting an investigation that will yield data needed to support goals. • constructing a scientific explanation based on valid and reliable evidence. • describing how living things are made up of one or more cells, which contain structures responsible for specific functions. • tracking energy as it moves through living systems

Acquisition	
form that cells can use in the form of sugar. • The vacuole is a sac-like organelle that stores water, food, or other materials needed by the cell. • The cell membrane is selectively permeable, which means some substances can cross the membrane while others cannot. • Diffusion is the process by which molecules move from an area of higher concentration to an area of lower concentration. Osmosis is the diffusion of water molecules across a selectively permeable membrane. • In a process called endocytosis, the cell membrane takes particle into the cell by changing shape and engulfing the particles. The reverse process of exocytosis allows large particles to leave a cell. • The regular sequence of events in which the cell grows, prepares for division, and divides to form two daughter cells is known as the cell cycle. • The first stage of the cell cycle is interphase, where the cell grows, makes a copy of its DNA, and prepares to divide into two cells. • In a process called replication, the cell makes a copy of the DNA in its nucleus before cell division. • During mitosis, the cell's nucleus divides into two new nuclei and one set of DNA is distributed into each daughter cell. • The final stage of the cell cycle is called cytokinesis where the cell's cytoplasm divides, distributing the organelles into each of the two new daughter cells. • Cells capture energy in sunlight and use it to make food in a process called photosynthesis. • Autotrophs, or producers, are able to create their own food in the form of glucose. An organism that	

Acquisition	
cannot make its own food is a consumer, or heterotroph. • The green photosynthetic pigment found in the chloroplasts of plants, algae, and some bacteria is chlorophyll. • Cellular respiration is the process in which oxygen and glucose undergo a complex series of chemical reactions inside cells, releasing energy. • The release of energy from food without using oxygen is called fermentation.	

ASSESSMENT EVIDENCE (DIAGNOSTIC / FORMATIVE / SUMMATIVE)

Assessments

Evaluation Criteria	Assessment Evidence
Rubrics/Checklists: Use Models Rubric Apply Scientific Reasoning Rubric Apply Concepts Rubric Determine Differences Rubric Compare and Contrast Rubric Construct Explanations Rubric Cause and Effect Rubric Energy and Matter Rubric Explain Phenomena Rubric Structure and Function Rubric	Performance Task(s): • uConnect Lab: What can you see? • Interactivity: In Common • Hands-On Lab: Observing Cells • Interactivity: Through a Microscope • Interactivity: A Strange Specimen • Lesson 1 Check • Lesson 1 Quiz • Hands-On Lab: How Large are Cells? • Hands-On Lab: Comparing Cells • Interactivity: Build a Cell • Interactivity: Structure Function Junction • Interactivity: Specialized Cells • Lesson 2 Check • Lesson Quiz • Quest Check-in: Make a Cell Model • Interactivity: Cell Transport • Hands-On Lab: Egg-speriment with a Cell • Interactivity: Entering and Leaving the Cell • Lesson 3 Check • Lesson 3 Quiz • Quest Check-in: Put Your Cells in Motion • Interactivity: Active Cell Division • Hands-On Lab: Modeling Mitosis • Interactivity: A Cell Divides • Interactivity: How Does a Broken Bone Heal? • Interactivity: The Cell Cycle • Lesson 4 Check • Lesson 4 Quiz • Interactivity: Food or Fiction • Interactivity: Making Food for Cells • Hands-On Lab: Energy from the Sun • Interactivity: Flower Food

	• Lesson 5 Check • Lesson 5 Quiz • Hands-On Lab: Cellular Respiration • Hands-On Lab: Exhaling Carbon Dioxide • Interactivity: Making Energy for Cells • Lesson 6 Check • Lesson 6 Quiz • Quest Check-in: The Importance of Cells and Accounting for Atoms • Case Study: The Mighty Mole-Rat • Topic 2 Review and Assess • Topic 2 Exam • Quest Findings: Reflect on Your Museum Exhibit
	Other Evidence: • Reading Checks • Checking for Understanding Figures • Model It! • Math Toolbox • Connect It! • Plan it!

Unit 2: The Cell System

7th Grade Science - *Last Updated on July 7, 2021*

LEARNING PLAN

Summary of Key Learning Events and Instruction:

Lesson 1: Structure and Function of Cells

- Cells
- Cell Theory

Lesson 2: Cell Structures

- Parts of a Cell
- Cells Working Together

Lesson 3: Obtaining and Removing Materials

- Moving Materials Into and Out of Cells

Lesson 4: Cell Division

- The Functions of Cell Division
- The Cell Cycle

Lesson 5: Photosynthesis

- Living Things and Energy
- Photosynthesis
- Expressing Photosynthesis

Lesson 6: Cellular Respiration

- Energy and Cellular Respiration
- Fermentation

SUPPORTING MATERIALS/RESOURCES/STRATEGIES FOR DIFFERENTIATION

Click here to view all possible modifications

STANDARDS ADDRESSED

New Jersey (NJSLS) - Grades 6-8 - Science (2020)
MS-LS3-1
Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
MS-LS3-2
Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
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-LS4-4
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.
Next Generation Science (NGSS) - Middle School - Life Sciences - Disciplinary Core Ideas
LS1.B.4
Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2)
LS3.A.2
Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)
LS3.B.1
In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals hav e two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2)
LS3.A.1
Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the indiv idual. Changes (mutations) to genes can result in changes to proteins, which can affect the

structures and functions of the organism and thereby change traits. (MS-LS3-1)
LS3.B.2
In addition to v ariations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)
Next Generation Science (NGSS) - Grade 6-8 - Crosscutting Concepts
2
Cause and Effect: Mechanism and Prediction: Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering
6
Structure and Function: The way an object is shaped or structured determines many of its properties and functions.
Next Generation Science (NGSS) - Middle School - Science and Engineering Practices
2.
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.
8.
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.

Unit 3: Genes and Heredity

7th Grade Science - *Last Updated on July 7, 2021*

DESIRED RESULTS

Established Goals
In this topic, students will explore patterns of reproduction and inheritance. They will also identify how offspring receive traits from their parents.

Transfer
Students will be able to independently use their learning to explain how offspring receive traits from their parents.

Meaning	
Big Ideas & Understandings	**Essential Questions**
Students will understand that... • Through Gregor Mendel's experiments, it was discovered how inherited alleles are related to an organism's traits and how probability is related to inheritance. • There is a relationship between genes, chromosomes, and inheritance, and we can use tools such as a pedigree to track inheritance. • Cells go through DNA replication and also make proteins and undergo protein synthesis. • Changes in DNA and RNA lead to trait variations in individuals and species. • Humans use genetic information for the benefit of society through the use of artificial selection, and how scientists engineer new genes.	Students will keep considering... • How did Gregor Mendel advance the fields of genetics and inheritance? • How are inherited alleles related to an organism's traits? • How is probability related to inheritance? • What is the relationship among genes, chromosomes, and inheritance? • How is a pedigree used to track inheritance? • How does the formation of sex cells during meiosis differ from the process of cell division? • Why do cells undergo DNA replication? • How do cells make proteins? • Why do cells undergo protein synthesis? • How do genes on sex chromosomes determine different traits? • How do mutations affect protein synthesis and increase variation? • How does the environment influence genetic traits? • How do humans use artificial selection to produce

Meaning	
	organisms with desired traits? • How do scientists engineer new genes? • How can genetic information be used?

Acquisition	
Knowledge	**Skills**
Students will know the meanings for the following terms: • Heredity, Dominant Allele, Recessive Allele, Probability, Genotype, Phenotype • Chromosome, Cell Cycle, Pedigree, Meiosis, Chromatids, Mitosis • DNA, Protein Synthesis, Messenger RNA, Transfer RNA • Variation, Sex Chromosomes, Autosomal Chromosomes, Mutation, Sex-Linked Genes • Artificial Selection, Genetic Engineering, Gene Therapy, Clone, Genome	Students will be skilled at... • developing models to describe unobservable processes. • critically comparing and evaluating information to explain how a natural phenomenon occurs. • explaining how genetics and the environment affect an organism's growth • explaining how genes control specific proteins which affect an individual's traits. • explaining how an organism receives one-half of its genes from each parent • describing how certain cellular structures have specific functions, such as carrying genetic information. • critically comparing the cause and effect relationships that may predict the occurrence of natural phenomena.

ASSESSMENT EVIDENCE (DIAGNOSTIC / FORMATIVE / SUMMATIVE)

Assessments

Evaluation Criteria	Assessment Evidence
Rubrics/Checklists: • Relate Structure and Function Rubric • Design Solutions Rubric • Use a Model Rubric • Construct Explanation Rubric • Draw Conclusions Rubric • Engage in Argument Rubric • Support Your Explanation Rubric • Patterns Rubric • Connect to the Environment Rubric • Construct Arguments Rubric	Performance Task(s): • uConnect Labs • uDemonstrate Labs • Interactivities • Hands-On Labs • uInvestigate Labs • Lesson Check • Lesson Quiz • Quest Check-In • Case Study • Topic Review and Assess • Topic Test • Quest Findings
	Other Evidence: • Reading Checks • Checking for Understanding Figures • Model It! • Math Toolbox • Connect It! • Plan it!

Unit 3: Genes and Heredity

7th Grade Science - *Last Updated on July 7, 2021*

LEARNING PLAN

Summary of Key Learning Events and Instruction:

Lesson 1 - Patterns of Inheritance

- Mendel's Observations
- Alleles Affect Inheritance
- Probability and Heredity
- Genotype

Lesson 2 - Chromosomes and Inheritance

- Chromosomes and Genes
- Forming Sex Cells

Lesson 3 - Genetic Coding and Protein Synthesis

- The Genetic Code
- Making Proteins

Lesson 4 - Trait Variations

- Diversity of Life
- Chromosomes and Variation
- Types of Mutations
- Environmental Factors
- Mutations in Reproduction

Lesson 5 - Genetic Technologies

- Artificial Selection
- Genetic Engineering
- Practical Uses for DNA

SUPPORTING MATERIALS/RESOURCES/STRATEGIES FOR DIFFERENTIATION

Click here to view all possible modifications

Unit 4: Natural Selection and Change Over Time

7th Grade Science - *Last Updated on July 7, 2021*

STANDARDS ADDRESSED

New Jersey (NJSLS) - Grades 6-8 - Science (2020)
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.
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.
Next Generation Science (NGSS) - Middle School - Life Sciences - Disciplinary Core Ideas
LS4.B.1
Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)
LS4.B.2
In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5)

LS4.C.1
Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)
LS4.A.2
Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2)
LS4.A.3
Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)
Next Generation Science (NGSS) - Grade 6-8 - Crosscutting Concepts
2
Cause and Effect: Mechanism and Prediction: Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering
1
Patterns: Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.
Next Generation Science (NGSS) - Middle School - Science and Engineering Practices
6.
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.
5.
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.
8.
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.
4.
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.

Unit 4: Natural Selection and Change Over Time

7th Grade Science - *Last Updated on July 7, 2021*

DESIRED RESULTS

Established Goals
In this topic, students will explore the processes that explain how organisms change over time. Students will investigate factors that drive natural selection and learn about evidence that supports the scientific theory of evolution.

Transfer
Students will be able to independently use their learning to explain how characteristics change over time.

Meaning

Big Ideas & Understandings	Essential Questions
Students will understand that... • the evidence that led to the development of the scientific theory of evolution and how species change over time. • Natural selection leads to evolution and how genes, mutations, and the environment affect natural selection. • Genetics and variation in traits influence a population and interactions between species affect evolution. • Evidence for evolution includes: fossils and similarities in structures among different organisms. The factors that lead to extinction. • Modern technology and DNA provide new evidence about evolution.	Students will keep considering... • What processes explain how organisms can change over time? • What observations and evidence support the theory of evolution? • How does natural selection lead to change over time in organisms? • What are the roles of genes, mutations, and the environment in natural selection? • How do natural selection and inherited variations influence a population? • How does sexual selection influence a population's genetic variation? • How is species interaction a factor in evolution? • What supports evidence for the scientific theory of evolution? • How do fossils show change over time? • What does the early development of different organisms tell use about evolution? • How does failure to adapt to a changing environment lead to a species' extinction?

Meaning	
	• How does modern technology provide evidence that all organisms have a common ancestor? • What new discoveries about evolution has modern technology made possible?

Acquisition	
Knowledge	**Skills**
Students will know the meanings of the following terms: • Species, Evolution, Fossil, Adaptation, Scientific Theory • Mechanism, Natural Selection, Competition • Fitness, Sexual Selection, Coevolution • Fossil Record, Embryo, Homologous Structures, Extinct • Protein, Endosymbiosis,	Students will be skilled at... • using graphical displays to identify evolutionary relationships among organisms. • using computers to analyze large data sets for trends. • presenting arguments supported by evidence and scientific reasoning to confirm or refute an explanation. • describing similarities among organisms that lived at different times in Earth's history as evidence of evolution. • explaining how humans can use artificial selection to produce farm or pet animals with a desired trait. • explaining how species can change over time through adaptation by natural selection. • interpreting diagrams showing patterns of evolutionary change in related organisms over time. • explaining how genetic variations in a trait may have enabled a species to change over time.

ASSESSMENT EVIDENCE (DIAGNOSTIC / FORMATIVE / SUMMATIVE)

Assessments

Evaluation Criteria	Assessment Evidence
Rubrics/Checklists: • Use Mathematics Rubric • Support Your Explanation Rubric • Construct Explanations Rubric • Explain Phenomenon Rubric • Distinguish Relationships Rubric • Support Your Explanations Rubric • Apply Scientific Reasoning Rubric • Construct Arguments Rubric	Performance Task(s): • uConnect Labs • uDemonstrate Labs • Interactivities • Hands-On Labs • uInvestigate Labs • Lesson Check • Lesson Quiz • Quest Check-In • Case Study • Topic Review and Assess • Topic Test • Quest Findings
	Other Evidence: • Reading Checks • Checking for Understanding Figures • Model It! • Math Toolbox • Connect It! • Plan it!

Unit 4: Natural Selection and Change Over Time

7th Grade Science - *Last Updated on July 7, 2021*

LEARNING PLAN

Summary of Key Learning Events and Instruction:

Lesson 1 - Early Study of Evolution

- Observing Changes
- Darwin's Journey
- Galapagos Organisms
- Darwin's Hypothesis

Lesson 2 - Natural Selection

- Evolution by Natural Selection

Lesson 3 - The Process of Evolution

- Processes of Evolution
- Sexual Selection
- Coevolution

Lesson 4 - Evidence in the Fossil Record

- The Fossil Record
- Fossil Evidence of Evolution
- Comparisons of Anatomy
- Beginning and End of a Species

Lesson 5 - Other Evidence of Evolution

- Using Technology to Study Evolution
- Gene Transfer Between Species

SUPPORTING MATERIALS/RESOURCES/STRATEGIES FOR DIFFERENTIATION

Click here to view all possible modifications

Unit 5: Ecosystems

7th Grade Science - *Last Updated on August 6, 2021*

STANDARDS ADDRESSED

New Jersey (NJSLS) - Grades 6-8 - Science (2020)
MS-LS2-1
Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
MS-LS2-3
Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
Next Generation Science (NGSS) - Middle School - Life Sciences - Disciplinary Core Ideas
LS2.A.1
Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)
LS2.A.2
In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS2-1)
LS2.A.3
Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)
LS2.B.1
Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3)
Next Generation Science (NGSS) - Grade 6-8 - Crosscutting Concepts
2
Cause and Effect: Mechanism and Prediction: Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering

5
Energy and Matter: Flows, Cycles, and Conservation: Tracking energy and matter flows, into, out of, and within systems helps one understand their system’s behavior.
Next Generation Science (NGSS) - Middle School - Science and Engineering Practices
4.
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.

Unit 5: Ecosystems

7th Grade Science - *Last Updated on August 6, 2021*

DESIRED RESULTS

Established Goals
Patterns of interactions between living and nonliving things in an ecosystem, and how these interaction affect resource availability are the main ideas that frame this topic. While studying organisms' interactions in ecosystems and limiting factors that affect their populations, students begin to recognize the connections among features of an ecosystem, human and natural events, and overall health of an ecosystem, including the availability of resources.

Transfer
Students will be able to independently use their learning to explain how matter and energy are cycled in an ecosystem.

Meaning	
Big Ideas & Understandings	**Essential Questions**
Students will understand that... • Organization of ecosystems and analyze evidence of the effects of limiting factors on resource availability, organisms, and populations of organisms within an ecosystem. • Food chains and food webs model how energy flows between the living and nonliving things within an ecosystem. • Organisms and their environment participate in the cycling of carbon, oxygen, nitrogen, and water.	Students will keep considering... • How are populations affected by changes to the amount and availability of resources? • How are population size and resource availability related? • What are the energy roles in an ecosystem? • How is energy transferred between living and nonliving parts of an ecosystem? • How is energy conserved in an ecosystem? • How is matter transferred between the living and nonliving parts of an ecosystem? • How is matter conserved in an ecosystem?

Acquisition	
Knowledge	**Skills**
Students will know the meanings for the following terms...	Students will be skilled at...

Acquisition	
• Organism, Habitat, Biotic Factor, Abiotic Factor, Population, Community, Ecosystem, Limiting Factor • Producer, Consumer, Decomposer, Food Chain, Food Web, Energy Pyramid • Law of Conservation of Mass, Law of Conservation of Energy, Evaporation, Condensation, Precipitation •	• developing models to describe phenomena • analyzing and interpreting data to provide evidence for phenomena. • explaining how organisms are dependent on environmental interactions with living and non living things • explaining how materials from decaying organisms are cycled repeatedly between the living and nonliving world. • using cause-and-effect relationships to predict phenomena in natural systems, yet acknowledging that correlation may not imply causation. • explaining how the transfer of energy can be tracked as it flows through a natural system.

ASSESSMENT EVIDENCE (DIAGNOSTIC / FORMATIVE / SUMMATIVE)

Assessments

Evaluation Criteria	Assessment Evidence
Rubrics/Checklists: • Construct Explanations Rubric • Develop Models Rubric • Consider Limitations Rubric • Energy and Matter Rubric • System Models Rubric • Stability and Change Rubric • Construct Arguments Rubric	Performance Task(s): • uConnect Labs • uDemonstrate Labs • Interactivities • Hands-On Labs • uInvestigate Labs • Lesson Check • Lesson Quiz • Quest Check-In • Case Study • Topic Review and Assess • Topic Test • Quest Findings
	Other Evidence: • Reading Checks • Checking for Understanding Figures • Model It! • Math Toolbox • Connect It! • Plan it!

Unit 5: Ecosystems

7th Grade Science - *Last Updated on August 6, 2021*

LEARNING PLAN

Summary of Key Learning Events and Instruction:

Lesson 1 - Living Things and the Environment

- Organisms and Habitats
- Ecosystem Organization
- Populations
- Factors That Limit Population Growth

Lesson 2 - Energy Flow in Ecosystems

- Energy Roles in an Ecosystem
- Energy and Matter Transfer

Lesson 3 - Cycles of Matter

- Conservation of Matter and Energy
- Water Cycle
- Carbon and Oxygen Cycles
- Nitrogen Cycle in Ecosystems

SUPPORTING MATERIALS/RESOURCES/STRATEGIES FOR DIFFERENTIATION

Click here to view all possible modifications

Unit 6: Populations, Communities, and Ecosystems

7th Grade Science - *Last Updated on August 23, 2022*

STANDARDS ADDRESSED

New Jersey (NJSLS) - Grades 6-8 - Science (2020)
MS-LS2-1
Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
MS-LS2-2
Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
MS-LS2-3
Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
MS-LS2-4
Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS-LS2-5
Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
MS-ETS1-2
Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
Next Generation Science (NGSS) - Middle School - Life Sciences - Disciplinary Core Ideas
LS2.A.1
Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)
LS2.A.4
Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2)
LS2.C.1

Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)
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.
LS2.C.2
Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (MS-LS2-5)
LS4.D.1
Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to MS-LS2-5)
Next Generation Science (NGSS) - Grade 6-8 - Crosscutting Concepts
1
Patterns: Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.
2
Cause and Effect: Mechanism and Prediction: Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering
7
Stability and Change: For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.
Next Generation Science (NGSS) - Middle School - Science and Engineering Practices
4.
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.
6.

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.
7.
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).
7.3
Construct, use, and/or present 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.
7.5
Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.
New Jersey (NJSLS) - Grades 6-8 - Computer Science and Design Thinking (2020)
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.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.

Unit 6: Populations, Communities, and Ecosystems

7th Grade Science - *Last Updated on August 23, 2022*

DESIRED RESULTS

Established Goals
The impact of ecosystem changes on a region's biodiversity is the context that frames this topic. While studying organisms' interactions in ecosystems and factors that affect their populations, students recognize the importance of biodiversity for sustaining life on Earth.

Transfer
Students will be able to independently use their learning to explain how living and nonliving this affect one another.

Meaning	
Big Ideas & Understandings	**Essential Questions**
Students will understand that... • The different types of relationships between organisms and how changes to one population may impact another. • Changes to abiotic and biotic factors in ecosystems impact populations. • Biodiversity is important and we have to consider the scientific, economic, and social implications of human intervention in ecosystems. • Ecosystems are important to humans.	Students will keep considering... • How can resource availability affect interactions between organisms? • How is population size affected by predation and symbiotic relationships? • How are patterns of interactions between organisms similar in different ecosystems? • How can changes to physical or biological components of an ecosystem affect organisms and populations? • How do natural events impact the environment? • How do human activities impact ecosystems? • What is the value of biodiversity? • What factors affect biodiversity? • How do human activities impact biodiversity? • Why is it important to maintain healthy ecosystems? • Which supporting services are necessary to all other ecosystem services? • How does biodiversity impact ecosystem services?

Meaning	

Acquisition	
Knowledge	**Skills**
Students will know... • Niche, Competition, Predation, Symbiosis, Commensalism, Mutualism, Parasitism • Succession, Pioneer Species • Biodiversity, Keystone Species, Extinction, Invasive Species • Ecosystem Services, Ecology, Natural Resource, Conservation, Sustainability, Ecological Restoration	Students will be skilled at... • performing basic statistical analysis techniques. • constructing an explanation that predicts phenomena based on relationships between variables. • explaining how populations of organisms are dependent on living and nonliving things. • defining biodiversity as a measure of an ecosystem's health. • explaining the impacts of biodiversity changes on humans' access to resources. • using patterns to identify cause-and-effect relationships. • using cause-and-effect relationships to make predictions. • explaining the impacts of changes on different scales.

ASSESSMENT EVIDENCE (DIAGNOSTIC / FORMATIVE / SUMMATIVE)

Assessments

Evaluation Criteria	Assessment Evidence
Rubrics/Checklists: • Construct Explanations Rubric • Design Solutions Rubric • Apply Scientific Reasoning Rubric • Cause and Effect Rubric • Apply Concepts Rubric • Synthesize Information Rubric • Explain Phenomena Rubric	Performance Task(s): • uConnect Labs • uDemonstrate Labs • Interactivities • Hands-On Labs • uInvestigate Labs • Lesson Check • Lesson Quiz • Quest Check-In • Case Study • Topic Review and Assess • Topic Test • Quest Findings
	Other Evidence: • Reading Checks • Checking for Understanding Figures • Model It! • Math Toolbox • Connect It! • Plan it!

Unit 6: Populations, Communities, and Ecosystems

7th Grade Science - *Last Updated on August 23, 2022*

LEARNING PLAN

Summary of Key Learning Events and Instruction:

Lesson 1 - Interactions in Ecosystems

- Adaptations and Survival
- Competition and Predation
- Symbiotic Relationships

Lesson 2 - Dynamic and Resilient Ecosystems

- Succession
- Ecosystem Disruptions and Population Survival

Lesson 3 - Biodiversity

- The Value of Biodiversity
- Factors Affecting Biodiversity
- Human Impact

Lesson 4 - Ecosystem Services

- Ecosystem Services
- Factors Impacting Ecosystem Services
- Conservation

SUPPORTING MATERIALS/RESOURCES/STRATEGIES FOR DIFFERENTIATION

Click here to view all possible modifications