Dover Area School District
Curriculum Cover Sheet

Grade: 7th

Subject/Course Title: Life Science

Course Description: This course is based on the Science, Technology, Engineering, and Environmental Literacy Standards (STEELS) published by the Pennsylvania Department of Education. It is designed to prepare students for the life science component of the 8th Grade Science PSSA. Topics covered include ecology, human impact, ecosystem services, cells, systems, genetics, natural selection, and classification.

Instructional Resources:

- Teacher Created and Curated Resources and Activities
- Schoology
- Amoeba Sisters
- HHMI Biointeractive
- CK -12
- Pearson Interactive

Dover Area School District Curriculum K-U-D

7th Grade Life Science

	Standards	Know	Understand	Do
Ecology Unit	3.1.6-8.F 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. 3.1.6-8.G 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. 3.1.6-8.I Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. 3.1.6-8.J Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. 3.1.6-8.K Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. 3.1.6-8.L Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. 3.1.6-8.U Evaluate competing design solutions for maintaining biodiversity and ecosystem services. 3.4.6-8.D Gather, read, and synthesize information from multiple sources to investigate how Pennsylvania environmental issues affect Pennsylvania's human and natural systems. 3.4.6-8.E Collect, analyze, and interpret environmental data to describe a local environment. 3.4.6-8.F Obtain and communicate information on how integrated pest management could improve indoor and outdoor environments.	organism population community ecosystem primary succession pioneer species climax community mature forest secondary succession soil creation limiting factor carrying capacity biodiversity climate energy pyramids food chains food webs herbivore carnivore omnivore primary consumer secondary consumer tertiary consumer decomposer producer energy trophic cascade apex predator keystone species indicator species scavenger fungi bacteria	Plants, algae, and some microorganisms make their own food through photosynthesis using sunlight, carbon dioxide, and water. Photosynthesis produces sugars for energy and releases oxygen into the air. Sunlight provides the energy needed for plants to carry out photosynthesis. Organisms depend on both living things and nonliving things (like water, air, and sunlight) to survive. Organisms that need the same resources may compete with each other, which limits how much they can grow or reproduce. Some organisms help each other survive, while others compete or act as predators. Ecosystems can only support a certain number of organisms because resources like food, water, and space are limited. Matter and energy move through ecosystems in food webs that include producers, consumers, and decomposers. Decomposers break down dead plants and animals and return nutrients to the soil or water. The same atoms and materials are used again and again as they cycle through living things and the environment. Ecosystems can usually recover from small changes, but big changes can affect how they function. Humans can affect ecosystems by changing habitats, which can help some species and harm others.	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. 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. 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. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. Gather, read, and synthesize information from multiple sources to investigate how Pennsylvania environmental issues affect Pennsylvania's human and natural systems. Collect, analyze, and interpret environmental data to describe a local environment
Cells Unit	3.1.6-8.A Conduct an investigation to provide evidence that living things are made of cells, either one cell or many different numbers and types of cells. 3.1.6-8.B Develop and use a model to describe the function of a cell as a whole and the ways that parts of cells contribute to the function. 3.1.6-8.C Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. 3.1.6-8.H Gather and synthesize information about how sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	neuron cell tissue organ organ system organelle nucleus cell membrane cytoplasm cell wall mitochondria golgi body ribosomes endoplasmic reticulum prokaryote eukaryote	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). Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. 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.	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. Develop and use a model to describe the function of a cell as a whole and the ways the parts of cells contribute to the function. Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

Dover Area School District Curriculum K-U-D

7th Grade Life Science

	Standards	Know	Understand	Do
		chlorophyll chloroplast diffusion osmosis cellular respiration photosynthesis active vs passive transport		
Genetics Unit	3.1.6-8.E Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. 3.1.6-8.M Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. 3.1.6-8.N 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. 3.1.6-8.R Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.	Cell theory mitosis meiosis asexual sexual binary fission budding fragmentation spores inherited acquired behavioral physical gene DNA genome dominant recessive selective breeding Punnett square homozygous heterozygous phenotype genotype biotechnology CRISPR Bioengineering Genetic Modification mutation sickle cell anemia genetic disorders gene therapy	Plants and animals grow because of both their genes and the conditions in their environment. Living things can reproduce in two ways—sexually (with two parents) or asexually (with one parent). Parents pass on genetic information to their offspring when they reproduce. Genes are found on chromosomes inside cells and control traits by telling the body how to make proteins. Each gene comes in different versions called alleles, and everyone gets one allele from each parent. Traits can vary between parents and offspring because of the random mix of genes inherited. Mutations are changes in genes that can affect the proteins made and may lead to new traits. Some mutations help organisms, some cause harm, and some don't make any difference. Sexual reproduction creates more variation in traits because offspring inherit a random mix of genes from two parents. Asexual reproduction produces offspring that are genetically very similar to the parent. Humans can use selective breeding to choose traits they want to pass on in plants or animals. The traits an organism has are the result of both the genes it inherits and how those genes interact with the environment. Genetic engineering is when humans change an organism's DNA to give it new traits or improve existing ones.	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. Develop and use a model to describe the function of a cell as a whole and the ways the parts of cells contribute to the function. Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

Dover Area School District Curriculum K-U-D

7th Grade Life Science

	Standards	Know	Understand	Do
Natural Selection and Classification Unit	3.1.6-8.D Use arguments 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. 3.1.6-8.M Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. 3.1.6-8.O Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. 3.1.6-8.P Apply scientific ideas to construct an explanation for anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. 3.1.6-8.Q Analyze displays of pictorial data to compare patterns of similarities in anatomical structures across multiple species to identify relationships not evident in the fully formed anatomy. 3.1.6-8.S 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. 3.1.6-8.T Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.	Adaptation Natural Selection Evolution Homology Comparative Anatomy Vestigial trait Fossil Theory Hypothesis Traits Mutation Gene Speciation Kingdom Phylum Class Order Family Genus Species	Genes are located on chromosomes inside cells, and each gene controls the production of specific proteins that determine traits. Each gene comes in different versions called alleles, and an individual inherits two alleles for each gene—one from each parent. Mutations are changes in genes that can affect the proteins produced, and may cause changes in traits. Some mutations help organisms, some are harmful, and some do not affect the organism at all. In sexual reproduction, offspring inherit a mix of genetic information from both parents, which creates variation in traits. Animals perform behaviors that help them survive and reproduce, such as finding food, protecting themselves, or attracting mates. Plants have different ways of reproducing, and some rely on animals or specific features to help them reproduce. Anatomical (body structure) similarities between organisms show how species are related and help scientists trace evolutionary history. The way embryos of different species develop can reveal common ancestry, even when adult animals look very different. Natural selection happens when traits that help an organism survive and reproduce become more common in a population over time. Adaptation is a process where species change over generations in response to changes in the environment, leading to new traits that help them survive. Over time, natural selection can change the distribution of traits in a population, making some traits more common and others less common.	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. Describe how natural selection is an underlying factor in a population's ability to adapt and change. Explain that adaptations within species are developed over long periods of time and passed from one generation to another. Use arguments 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. Identify evidence drawn from geology, fossils, and comparative anatomy and explain how that provides evidence for the theory of evolution. 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. Analyze displays of pictorial data to compare patterns of similarities in anatomical structures across multiple species to identify relationships not evident in the fully formed anatomy. 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. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Dover Area School District Curriculum Pacing Guide
7th Grade Life Science

WEEK	Introduction	Ecology	Cells	Genetics	Natural Selection
1 .	Intro to 7th Grade Science: Procedures, Routines, Base Skills for Success, Community Building				
2		Defining Life			
3		Ecosystem Organization			
4					
5		Balancing Populations			
6					
7					
8		Energy Transfers in Ecosystems			
9					
10					
11		Cycles			
12					
13		Biomes			
14					
15					
16		Sustainability			
17					
18					
19			Multicellular and Unicellular		
20			Microscopes Utilization and Data Analysis		
21					
22			Cell Structure and Function		
23					
24			Cell Processses		
25					
26			Organization of Multicellular Organisms		
27			DNA in the Cell	Chromosome Copying	
28				Predicting Traits	
29					
30				Genetic Engineering and Selective Breeding	
31					Process of Natural Selection
32					
33					Evidence for Evolution
34					Classification
35					
36					
37					Dichotmous Keys
38					
39					Galapagos Case Study
40					Year Review and Unit Wrap Up
45					
Year long concepts	Patterns, Mathematical Representations, Data Analysis, CER, Nature of Science				

7th Grade Science Ecology Unit Map

Subject:	Science	**Grade Level:**	7th Grade	**Duration:**	9 Multi-Day Sessions- 80 days total

Key Learning	Compare the biotic and abiotic factors of different ecosystems and explain relationships between these factors
Unit Essential Question:	How do natural systems function in balance, and what changes can shift that balance?

Identified Standards Addressed in the Unit:

3.1.6-8.F 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.

3.1.6-8.G 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.

3.1.6-8.I Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

3.1.6-8.J Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

3.1.6-8.K Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

3.1.6-8.L Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

3.1.6-8.U Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

3.4.6-8.D Gather, read, and synthesize information from multiple sources to investigate how Pennsylvania environmental issues affect Pennsylvania's human and natural systems.

3.4.6-8.E Collect, analyze, and interpret environmental data to describe a local environment.

3.4.6-8.F Obtain and communicate information on how integrated pest management could improve indoor and outdoor environments.

Do: Science and Engineering Practices (SEPs)	Know: Disciplinary Core Ideas (DCIs)	Understand: Crosscutting Concepts (CCCs)
Constructing Explanations and Designing Solutions: • Constructing explanations and designing solutions by using 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. **Developing and Using Models** • Developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop a model to describe unobservable mechanisms. **Analyzing and Interpreting Data** • Extending quantitative analysis to investigations, distinguishing between	**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. **LS2.A: Interdependent Relationships in Ecosystems** • Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. • In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for	**Energy and Matter** • Within a natural system, the transfer of energy drives the motion and/or cycling of matter. • Matter is conserved because atoms are conserved in physical and chemical processes. • The transfer of energy can be tracked as energy flows through a natural system. **Cause and Effect** • Cause and effect relationships may be used to predict phenomena in natural or designed systems. **Patterns** • Patterns can be used to identify cause and effect relationships. **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. **Scale Proportion and Quantity** • Using the concept of orders of magnitude allows one to understand how a model at one scale relates

correlation and causation, and basic statistical techniques of data and error analysis.
• Analyze and interpret data to provide evidence for phenomena.

Using Mathematics and Computational Thinking
• Using algebraic thinking and analysis, a range of linear and nonlinear functions for statistical analysis to analyze, represent, and model data.
• Use mathematical representations of phenomena or design solutions to support and
revise explanations.

Engaging in Argument from Evidence
• Constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).
• Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.

Obtaining, Evaluating, and Communicating Information
• 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.

limited resources, access to which consequently constrains their growth and reproduction.
• Growth of organisms and population increases are limited by access to resources. 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.
•Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.

LS2.B: Cycle of Matter and Energy Transfer in Ecosystems
• Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.

to a model at another scale.

Stability and Change
• Small changes in one part of a system might cause large changes in another part.

	LS2.C: Ecosystem Dynamics, Functioning, and Resilience • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. • 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. **ESS3.C: Human Impacts on Earth Systems** • Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.	

Know (Concepts):	**Do (Competencies):**
Diverse relationships (e.g. predator/prey competition, symbiosis) exist between organisms in different ecosystems. Variables can cause changes in a system over time. Diversity affects the integrity of natural ecological systems. Factors like- deforestation, disease, land use, natural disaster, invasive species- cause and/or influence changes in populations.	**Students will do experiments, collaborative activities, exploration, note-taking, analysis of text and data, and engage in reflection activities.** Students who demonstrate understanding can develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Changes in environmental conditions can affect the survival of a population and entire species	Students who demonstrate understanding can 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. Students who demonstrate understanding can 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. Students who demonstrate understanding can analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. Students who demonstrate understanding can construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. Students who demonstrate understanding can use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. Students who demonstrate understanding can gather, read, and synthesize information from multiple sources to investigate how Pennsylvania environmental issues affect Pennsylvania's human and natural systems. Students who demonstrate understanding can collect, analyze, and interpret environmental data to describe a local environment

Unit Key vocabulary	organism population community ecosystem primary succession pioneer species climax community mature forest secondary succession	soil creation limiting factor carrying capacity biodiversity climate energy pyramids food chains food webs herbivore	carnivore omnivore primary consumer secondary consumer tertiary consumer decomposer producer energy trophic cascade	apex predator keystone species indicator species scavenger fungi bacteria

Sample Unit Activating Strategy	Nature Encounter

	Session 1	**Session 2**	**Session 3**
Topic	Characteristics of Life	Factors of Ecology	Levels of Organization
Lesson Essential Question	What does it mean to be living?	How do different parts of the environment form an ecological system?	How are ecological systems organized?
Key Lesson Vocabulary	stimuli response homeostasis organism metabolism energy cell	abiotic biotic habitat niche	organism population community ecosystem biome biosphere
Assessment	Students answer the LEQ through completion of the lesson activities.	Students answer the LEQ through completion of the lesson activities.	Students answer the LEQ through completion of an ecosystem organizer.

	Session 4	**Session 5**	**Session 6**
Topic	Populations	Communities	Ecosystem
Essential Question	How do changes in environmental conditions affect the survival of populations?	How do living organisms relate to one another? What happens after an ecological disturbance?	How is energy transferred in an ecological system?
Key Lesson Vocabulary	limiting factor carrying capacity biodiversity climate	adaptation niche predation predator	energy pyramids food chains food webs herbivore

	hibernation migration ecotourism	prey symbiosis mutualism commensalism parasitism parasite host competition keystone species	carnivore omnivore primary consumer secondary consumer tertiary consumer decomposer producer photosynthesis energy apex predator scavenger fungus bacteria
Assessment	Students answer the LEQ through completion of the lesson activities.	Students answer the LEQ through completion of the lesson activities.	Students answer the LEQ through completion of the fractured food web analysis.

	Session 7	**Session 8**
Topic	Biomes	Human Impacts
Essential Question	How does matter cycle in natural systems? How do abiotic factors influence biodiversity?	How can we balance human needs and environmental responsibility? How do human decisions impact the environment?
Key Lesson Vocabulary	carbon cycle animal respiration plant respiration nitrogen fixing bacteria nitrogen cycle water cycle biome climate terrestrial aquatic grassland	pollution renewable resources nonrenewable resources sustainability climate change desertification habitat fragmentation deforestation

	savanna desert tropical rainforest emergent layer canopy understory tundra permafrost deciduous forest conifers boreal forest wetlands rivers and streams ponds and lakes estuaries oceans biodiversity		
Assessment	Students answer the LEQ through completion of the lesson activities.		Students answer the LEQ through completion of the lesson activities.

Authentic, Varied, and Frequent Assessment Types
Common Summative Assessment:
Completion of aligned Study Island assignments with blue ribbon achievement.
Unit Success Criteria:
Food Web and Human Impact Project

Resources

- Google Drive
- Schoology
- Amoeba Sisters
- HHMI Biointeractive
- CK -12
- Pearson Interactive
- Direct instruction
- Water's Way: Thinking Like a Watershed
- Demonstration activities
- Diagrams
- Practice problems
- Lab activities

Scaffolds and Enrichment		
Struggling Learners	**Multi-Lingual Learners**	**Advanced Learners**
Guided Notes Modifications Quizlet for Vocabulary Practice Reteaching Opportunities Extended Time Text Variation	Guided Notes Modifications Quizlet for Vocabulary Practice Reteaching Opportunities Extended Time Text Variation	Challenge Questions Enrichment Opportunities Text Variation Peer Tutoring

7th Grade Science Cells Unit Map

Subject:	Science	**Grade Level:**	7th Grade	**Duration:**	7 Multi-Day Sessions - 30 Days

Key Learning	Identify the levels of organization from cell to organism and describe how specific structures (parts), which underlie larger systems, enable the system to function as a whole

Unit Essential Question:	How do the diverse structures of life allow for functioning at multiple levels?

Identified Standards Addressed in the Unit:

3.1.6-8.A Conduct an investigation to provide evidence that living things are made of cells, either one cell or many different numbers and types of cells.

3.1.6-8.B Develop and use a model to describe the function of a cell as a whole and the ways that parts of cells contribute to the function.

3.1.6-8.C Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

3.1.6-8.H Gather and synthesize information about how sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

Do: Science and Engineering Practices (SEPs)	Know: Disciplinary Core Ideas (DCIs)	Understand: Crosscutting Concepts (CCCs)
Planning and Carrying Out Investigations • Doing investigations that use multiple variables and provide	**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	**Structure and Function** • Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships

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. **Engaging in Argument from Evidence** •Constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). • Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.	(unicellular) or many different numbers and types of cells (multicellular). • Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. 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.	among their parts, therefore complex natural structures/systems can be analyzed to determine how they function **Scale, Proportion and Quantity** • Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale. **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.

Know (Concepts):	**Do (Competencies):**
There are levels of organization from cell to organism with specific structures that underlie larger systems to enable the system to function as a whole. Cells carry out the many functions needed to sustain life. Organisms can be unicellular and must carry out all life functions in one cell. Organisms can be multicellular and cells will work together. Cells arise from the division of a pre-existing cell.	**Students will do experiments, collaborative activities, exploration, note-taking, analysis of text and data, and engage in reflection activities.** Students who demonstrate understanding can conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. Students who demonstrate understanding can develop and use a model to describe the function of a cell as a whole and the ways the parts of cells contribute to the function. Students who demonstrate understanding can use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

Unit Key vocabulary	neuron	cytoplasm	chlorophyll
	cell	cell wall	chloroplast
	tissue	mitochondria	diffusion
	organ	golgi body	osmosis
	organ system	ribosomes	cellular respiration
	organelle	endoplasmic reticulum	photosynthesis
	nucleus	prokaryote	active vs passive transport
	cell membrane	eukaryote	

Sample Unit Activating Strategy	Cells Dramatic Intro Video

	Session 1	**Session 2**	**Session 3**
Topic	Cell Theory	Cell Classification	Organelles
Lesson Essential Question	What evidence underlies our understanding of the basic units of life?	How do the building blocks of life vary?	How do cells function as a system?
Key Lesson Vocabulary	theory cell theory	prokaryote eukaryote multicellular unicellular	cell membrane nucleus nucleolus cytoplasm cell wall mitochondria golgi body ribosomes endoplasmic reticulum chlorophyll chloroplast
Assessment	Students answer the LEQ through completion of the lesson activities.	Students answer the LEQ through a prepared slide lab.	Students answer the LEQ through completion of a cell model.

	Session 4	Session 5	Session 6
Topic	Cell Processes	Cell Division– Mitosis Focus	Microscopes
Essential Question	How do cells maintain themselves?	How do cells grow, repair and reproduce?	How do the parts of the Compound Light Microscope contribute to its functioning?
Key Lesson Vocabulary	homeostasis diffusion osmosis cellular respiration photosynthesis active vs passive transport	Interphase Prophase Metaphase Anaphase Telophase Cytokinesis cancer	microscope parts magnification light microscope electron microscope
Assessment	Students answer the LEQ through completion of the lesson activities.	Students answer the LEQ through completion of the lesson activities.	Students answer the LEQ through hands-on experiences.

	Session 7	Session 8
Topic	Building Blocks	Organization of Living Systems
Essential Question	What is life composed of?	How do cells work cohesively to form multicellular organisms?
Key Lesson Vocabulary	Macromolecules Lipids Carbohydrates Proteins Nucleic Acids Food Derivatives	Cell Tissue Organ Organ System
Assessment	Students answer the LEQ through completion of the lesson activities.	Students answer the LEQ through completion of the lesson activities.

Authentic, Varied, and Frequent Assessment Types
Common Summative Assessment:
Completion of aligned Study Island assignments with blue ribbon achievement.
Unit Success Criteria:
Cell Analysis Lab

Resources

- Google Drive
- Schoology
- Amoeba Sisters
- HHMI Biointeractive
- CK -12
- Pearson Interactive
- Direct instruction
- Demonstration activities
- Diagrams
- Practice problems
- Lab activities

Scaffolds and Enrichment		
Struggling Learners	**Multi-Lingual Learners**	**Advanced Learners**
Guided Notes Modifications Quizlet for Vocabulary Practice Reteaching Opportunities Extended Time Text Variation	Guided Notes Modifications Quizlet for Vocabulary Practice Reteaching Opportunities Extended Time Text Variation	Challenge Questions Enrichment Opportunities Text Variation Peer Tutoring

7th Grade Science Genetics Unit Map

Subject:	Science	Grade Level:	7th Grade	Duration:	6 Multi-Day Sessions - 30 Days

Key Learning	Explain how a set of genetic instructions determines inherited traits of organisms

Unit Essential Question:	How do genes allow for the continuity of life?

Identified Standards Addressed in the Unit:

3.1.6-8.E Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

3.1.6-8.M Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

3.1.6-8.N 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.

3.1.6-8.R Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

Do: Science and Engineering Practices (SEPs)	Know: Disciplinary Core Ideas (DCIs)	Understand: Crosscutting Concepts (CCCs)
Constructing Explanations and Designing Solutions: •Constructing explanations and designing solutions by using multiple sources of evidence consistent with scientific knowledge, principles, and theories.	**LS1.B: Growth and Development of Organisms** •Genetic factors as well as local conditions affect the growth of the adult plant. • Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.	**Cause and Effect** • Cause and effect relationships may be used to predict phenomena in natural or designed systems. **Connections to Engineering, Technology, and Applications of Science: Interdependence of Science, Engineering, and Technology**

• 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. **Developing and Using Models** •Developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop a model to describe unobservable mechanisms. **Obtaining, Evaluating, and Communicating Information** •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.	**LS3.A: Inheritance of Traits** • Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affect the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. • Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. **LS3.B: Variation of Traits** • In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. **LS4.B: Natural Selection** • In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring.	• 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.

Know (Concepts):	Do (Competencies):

Various basic sexual and asexual reproductive processes (e.g. budding, cuttings) differ between species. There is a difference between inherited and acquired traits. The gene is the basic unit of inheritance and explain the effect of dominant and recessive genes on inherited traits Selective breeding or biotechnologies can change the genetic makeup of an organism (e.g. domesticated dogs, horses, cows; crops, hybrid plants; integrated pest management) Selective breeding or biotechnology can change the genetic makeup of organisms. Scientific results or technological developments can have positive and negative effects (both intended and unintended).	**Students will do experiments, collaborative activities, exploration, note-taking, analysis of text and data, and engage in reflection activities.** Students who demonstrate understanding can construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. Students who demonstrate understanding can 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. Students who demonstrate understanding can 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. Students who demonstrate understanding can gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

Unit Key vocabulary	Cell theory mitosis meiosis asexual sexual binary fission budding fragmentation spores inherited acquired behavioral physical gene DNA genome	dominant recessive selective breeding Punnett square homozygous heterozygous phenotype genotype biotechnology CRISPR Bioengineering Genetic Modification mutation sickle cell anemia genetic disorders gene therapy

Sample Unit Activating Strategy	Unique Mutations

	Session 1	**Session 2**	**Session 3**
Topic	Organizing DNA	Genes	Predicting Outcomes
Lesson Essential Question	How does the structure of our genetic instructions affect the variability between generations?	Why do genes "reappear" over time in populations?	How can we predict genetic outcomes?
Key Lesson Vocabulary	DNA Nucleotide DNA replication Base Pairs semi-conservative double helix	dominant recessive traits (physical, behavioral, acquired, inherited) homozygous heterozygous allele gene phenotype genotype adaptation	Punnett squares Pedigree monohybrid cross dihybrid cross sex-linked traits multiple alleles codominance incomplete dominance
Assessment	Students answer the LEQ through completion of the lesson activities.	Students answer the LEQ through completion of trait inventory.	Students answer the LEQ through the solving of scenarios using Punnett Squares.

	Session 4	Session 5	Session 6
Topic	Gene Disorders	Selective Breeding and Genetic Engineering	Diverse Reproduction
Essential Question	What happens when gene copying goes wrong?	Historically and currently, how do humans control genetics?	What are the ways in which organisms may reproduce?
Key Lesson Vocabulary	mutation sickle cell anemia karyotype sex-linked disorders environmental factors	selective breeding genetic engineering clone gene modification ethics	mitosis meiosis asexual sexual binary fission budding fragmentation spores clone pollination
Assessment	Students answer the LEQ through completion of the lesson activities.	Students answer the LEQ through completion of the lesson activities.	Students answer the LEQ through completion of the lesson activities.

Authentic, Varied, and Frequent Assessment Types
Common Summative Assessment:
Completion of aligned Study Island assignments with blue ribbon achievement.
Unit Success Criteria:
Genetics Solving Task

Resources	
• Google Drive • Schoology • Amoeba Sisters • HHMI Biointeractive • CK -12 • Pearson Interactive	• PTC testing • Direct instruction • Demonstration activities • Diagrams • Practice problems • Lab activities

Scaffolds and Enrichment		
Struggling Learners	**Multi-Lingual Learners**	**Advanced Learners**
Guided Notes Modifications Quizlet for Vocabulary Practice Reteaching Opportunities Extended Time Text Variation	Guided Notes Modifications Quizlet for Vocabulary Practice Reteaching Opportunities Extended Time Text Variation	Challenge Questions Enrichment Opportunities Text Variation Peer Tutoring

7th Grade Science Natural Selection Unit Map

Subject:	Science	**Grade Level:**	7th Grade	**Duration:**	6 Multi-Day Sessions- 40 days

Key Learning	Explain natural selection and its role in evolution.

Unit Essential Question:	How do you know species will be different millions of years from now?

Identified Standards Addressed in the Unit:

3.1.6-8.D Use arguments 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.

3.1.6-8.M Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

3.1.6-8.O Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

3.1.6-8.P Apply scientific ideas to construct an explanation for anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.

3.1.6-8.Q Analyze displays of pictorial data to compare patterns of similarities in anatomical structures across multiple species to identify relationships not evident in the fully formed anatomy.

3.1.6-8.S 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.

3.1.6-8.T Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Do: Science and Engineering Practices (SEPs)	Know: Disciplinary Core Ideas (DCIs)	Understand: Crosscutting Concepts (CCCs)
Constructing Explanations and Designing Solutions •Constructing explanations and designing solutions by using 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. **Analyzing and Interpreting Data** •Extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. • Analyze and interpret data to provide evidence for phenomena. **Using Mathematics and Computational Thinking** •Using algebraic thinking and analysis, a range of linear and nonlinear functions for statistical analysis to analyze, represent, and model data. • Use mathematical representations of phenomena or design solutions to support and revise explanations.	**LS3.A: Inheritance of Traits** • Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. **LS3.B: Variation of Traits** • In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. **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. **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. • Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully formed anatomy	**Cause and Effect** • Cause and effect relationships may be used to predict phenomena in natural or designed systems. **Patterns** • Patterns can be used to identify cause and effect relationships. **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.

Engaging in Argument from Evidence •Constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). • Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. **Scientific Knowledge is Based on Empirical Evidence** • Science knowledge is based upon logical and conceptual connections between evidence and explanations.	**LS4.B: Natural Selection** • Natural selection leads to the predominance of certain traits in a population, and the suppression of others. **LS4.C: Adaptation** • Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. 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.	

Know (Concepts):	Do (Competencies):
Natural selection is an underlying factor in a population's ability to adapt and change Adaptations within species (physical, behavioral, physiological) are developed over long periods of time Adaptations are developed over long periods of time and are passed from one generation to another. Evidence drawn from geology, fossils, and comparative anatomy that provides the basis for the theory of evolution.	**Students will do experiments, collaborative activities, exploration, note-taking, analysis of text and data, and engage in reflection activities.** Students who demonstrate understanding can 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. Students will describe how natural selection is an underlying factor in a population's ability to adapt and change. Students will explain that adaptations within species are developed over long periods of time and passed from one generation to another. Students who demonstrate understanding can use arguments 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. Students will identify evidence drawn from geology, fossils, and comparative anatomy and explain how that provides evidence for the theory of evolution. Students who demonstrate understanding can 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. Students who demonstrate understanding can 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. Students who demonstrate understanding can analyze displays of pictorial data to compare patterns of similarities in anatomical structures across multiple species to identify relationships not evident in the fully formed anatomy. Students who demonstrate understanding can 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. Students who demonstrate understanding can use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Unit Key vocabulary	Adaptation	Theory	Phylum
	Natural Selection	Hypothesis	Class
	Evolution	Traits	Order
	Homology	Mutation	Family
	Comparative Anatomy	Gene	Genus
	Vestigial trait	Speciation	Species
	Fossil	Kingdom	

Sample Unit Activating Strategy	The Vastness of Time (Geological time)

Topic	Mutations and Variations	Natural Selection and Evolution	Evidence for Evolution
Lesson Essential Question	How can mutations change populations over time?	How do external factors and internal factors influence the survival of populations?	What scientific evidence supports the theory of evolution?
Key Lesson Vocabulary	traits mutation adaptations	Natural Selection Evolution	comparative anatomy homologous structures vestigial trait fossil embryology
Assessment	Students answer the LEQ through completion of the lesson activities.	Students answer the LEQ through completion of the lesson activities.	Students answer the LEQ through completion of the evidence for evolution stations.

	Session 4	
Topic	Speciation and Phylogenetic Trees	Classification
Essential Question	How do we map the divergence of species?	How do scientists organize life?
Key Lesson Vocabulary	Speciation cladogram phylogeny	Kingdom Phylum Class Order Family Genus Species
Assessment	Students will analyze phylogenetic trees.	Students will create and use dichotomous keys.

Authentic, Varied, and Frequent Assessment Types
Common Summative Assessment:
Completion of aligned Study Island assignments with blue ribbon achievement.
Unit Success Criteria:
Natural Selection Portfolio

Resources
• Google Drive • Schoology • Amoeba Sisters • HHMI Biointeractive • CK -12 • Pearson Interactive • Direct instruction • Your Inner Fish • Demonstration activities • Diagrams • Practice problems • Lab activities • Manipulatives • Imax Galapagos

Scaffolds and Enrichment		
Struggling Learners	**Multi-Lingual Learners**	**Advanced Learners**
Guided Notes Modifications Quizlet for Vocabulary Practice Reteaching Opportunities Extended Time Text Variation	Guided Notes Modifications Quizlet for Vocabulary Practice Reteaching Opportunities Extended Time Text Variation	Challenge Questions Enrichment Opportunities Text Variation Peer Tutoring