

# Middle School - 7th Grade Life Science

## North Boone CUSD 200

UNITS (4/4 SELECTED)

|  | SUGGESTED DURATION |
|--|--------------------|
|  Unit 1: Structure and Function of Life                | <i>43 lessons</i>  |
|  Unit 2: Genetics & the Changing Environment Over Time | <i>37 lessons</i>  |
|  Unit 3: Animals                                       | <i>37 lessons</i>  |
|  Unit 4: Interactions of life                          | <i>43 lessons</i>  |

# Unit 1: Structure and Function of Life

Middle School - 7th Grade Life Science - Last Updated on June 4, 2019

## STANDARDS

**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-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.

## PRIORITY STANDARDS

|                  |   |
|------------------|---|
| <b>MS-LS1-2.</b> | Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. |
| <b>MS-LS1-3.</b> | Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.    |

# Unit 1: Structure and Function of Life

Middle School - 7th Grade Life Science - Last Updated on June 4, 2019

## DESIRED RESULTS

| Enduring Understandings  | Essential Question(s)  |
|--|--|
| <p>All living things have certain characteristics in common, including structures and their functions.</p> <p>Scientific terminology is used to organize life.</p> | <p>How and why do we classify life?</p> <p>What are cells?</p> <p>How do cells fit into the sequence of life?</p> <p>What is the hierarchy of life?</p> <p>How does the hierarchy of life impact our footprint in the world?</p> |

| Students will know (Knowledge):   | Students will be able to (Skills):  |
|---|---|
| <ul style="list-style-type: none"><li>• Key concepts and scientific terms associated with the structure and function of life, including: organism, cell, unicellular, multicellular, homeostasis, binomial nomenclature, species, genus, dichotomous key, cladogram, light microscope, compound microscope, electron microscope, cell theory, macromolecule, nucleic acid, protein, lipid, carbohydrates, cell membrane, cell wall, cytoplasm, cytoskeleton, organelle, nucleus, chloroplast, passive transport, diffusion, osmosis, facilitated diffusion, active transport, endocytosis, exocytosis, cell differentiation, stem cell, tissue, organ, organ system</li><li>• The six characteristics shared by all living things</li><li>• The bases for classifying living things into groups</li><li>• Why every species has a scientific name</li><li>• How microscopes advanced ideas about living things</li><li>• The functions of cell structures: support, movement, controlling activities, processing energy, and transporting molecules</li><li>• How prokaryotic and eukaryotic cells are alike and different</li><li>• How materials enter and leave cells</li><li>• How cell size affects the transport of materials</li></ul> | <ul style="list-style-type: none"><li>• Use key concepts and scientific terms associated with the structure and function of life in discussions, inquiry activities, and performance tasks</li><li>• Construct a dichotomous key to a collection of objects and test it by making an identification</li><li>• Compare objects viewed through a microscope with objects viewed by the unaided eye</li><li>• Create a 2-D model of a plant cell</li><li>• Simulate diffusion in cells using balloons for cell membranes</li><li>• Determine how the intensity of light affects the rate of photosynthesis</li><li>• Describe the structure and function of the parts of uni- and multi-cellular organisms in order to recognize that an egg becomes a chicken through the process of cellular differentiation</li><li>• Undertake problem and/or project based learning to create a cell analogy</li><li>• extract DNA in a lab setting</li></ul> |

# Unit 1: Structure and Function of Life

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| Students will know (Knowledge):   | Students will be able to (Skills): |
|---|------------------------------------|
| <ul style="list-style-type: none"><li>• What distinguished uni-cellular organisms from multi-cellular organisms</li><li>• How cell differentiation leads to the organization within a multi-cellular organism</li></ul> |                                    |

## Unit 2: Genetics & the Changing Environment Over Time

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### STANDARDS

**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-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-LS1-4.:** Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

**MS-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-LS4-6.:** Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

**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-LS1-5.:** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

## Unit 2: Genetics & the Changing Environment Over Time

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### PRIORITY STANDARDS

|                  |  |
|------------------|--|
| <b>MS-LS3-1.</b> | 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.                        |
| <b>MS-LS1-4.</b> | Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. |
| <b>MS-LS4-4.</b> | 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.  |
| <b>MS-LS1-5.</b> | Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.  |
| <b>MS-LS4-1.</b> | 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.     |

# Unit 2: Genetics & the Changing Environment Over Time

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## DESIRED RESULTS

| Enduring Understandings   | Essential Question(s)   |
|---|---|
| <p>Genetic traits within living organisms are influenced by physiological, structural, and behavioral factors</p> <p>Patterns are evident within DNA, fossils, models, and physical characteristics</p>   | <p>How do patterns and observations help us to explain the diversity of life?</p> <p>Are traits always evident in every generation?</p> <p>What are carriers and heterozygous traits?</p> <p>What are mutations? . . .</p> <p>Are all mutations bad?</p> <p>What selective pressures from the environment cause changes within a population?</p> <p>Using fossil evidence, what conclusions can be made about an organisms's development over time?</p> <p>What evidence supports changes over time?</p>  |
|   |   |
| Students will know (Knowledge):   | Students will be able to (Skills):  |
| <ul style="list-style-type: none"> <li>• Key concepts and scientific terms associated with genetics and the changing environment over time, including: heredity, genetics, dominant trait, recessive trait, gene, allele, phenotype, genotype, homozygous, heterozygous, Punnett square, incomplete dominance, codominance, polygenic inheritance, DNA, nucleotide, replication, RNA, transcription, translation, mutation, naturalist, variation, natural selection, adaptation, camouflage, mimicry, selective breeding, comparative anatomy, homologous structure, analogous structure, vestigial structure, embryology</li> <li>• Why Mendel performed cross-pollination experiments and the conclusions he drew about inherited traits</li> <li>• How dominant and recessive factors interact</li> <li>• What determines the expression of traits</li> </ul> | <ul style="list-style-type: none"> <li>• Use key concepts and scientific terms associated with genetics and the changing environment over time in discussions, inquiry activities, and performance tasks</li> <li>• Propose and test hypotheses to identify and explain (Mendelian and non-Mendelian) genetic patterns</li> <li>• Design adaptations that enable an organism to survive in a new environment and model the final version of the organism</li> <li>• Use Punnett squares to model the possible genotypes and phenotypes of offspring</li> <li>• Determine whether there are variations within their class and graph the results</li> <li>• Predict probability through natural selection simulations</li> <li>• Hypothesize how physical adaptations affect organisms</li> </ul> |

## Unit 2: Genetics & the Changing Environment Over Time

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| <ul style="list-style-type: none"><li>• Tools that can be used to model patterns of inheritance: Punnett squares and pedigrees</li><li>• Other patterns of inheritance and how they differ from Mendel's</li><li>• RNA's role in protein production</li><li>• How changes in the sequence of DNA affects the traits of an organism</li><li>• Who Charles Darwin was and how his theory of evolution by natural selection explains how species change over time</li><li>• How adaptations are evidence of the close relationships between species and their changing environments</li><li>• Evidence from living species that supports the theory that species descended from other species over time (fossils records)</li><li>• How Earth's organism are related</li></ul> | <ul style="list-style-type: none"><li>• Examine fossil evidence and evaluate the function of an organism's structures</li></ul> |
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## Unit 3: Animals

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### STANDARDS

**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-LS1-4.:** Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

**MS-LS1-8.:** Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

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

**MS-LS4-3.:** 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.

### PRIORITY STANDARDS

|                  |  |
|------------------|--|
| <b>MS-LS1-4.</b> | Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. |
| <b>MS-LS1-8.</b> | Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.  |
| <b>MS-LS1-3.</b> | Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.   |

# Unit 3: Animals

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## DESIRED RESULTS

| Enduring Understandings:  | Essential Questions:  |
|---|---|
| <p>The major groups of animals include sponges, cnidarians, flatworms, roundworms, mollusks, segmented worms, arthropods, and chordates. They differ based on body structures and types of reproduction.</p> <p>Animals have different structures that perform similar functions which enable them to survive in different environments.</p> <p>The human skeletal system, muscular system, and the skin work together to move, support, and protect the body and maintain its homeostasis.</p> <p>The human nervous and endocrine systems work to sense the environment and coordinate body functions.</p> <p>The human respiratory and circulatory systems move materials through the body and remove wastes</p> <p>Animals communicate using sound, light, chemicals, and body language. Societies and social behaviors help them interact with each other. Courtship behaviors help animals find mates. Most animals use sexual reproduction.</p> | <p>How are animals alike and different?</p> <p>How are animals classified?</p> <p>What structures do animals have for moving from place to place?</p> <p>How are animal movement structures similar?</p> <p>How do bones, muscles, and skin work together and help the human body function?</p> <p>How are the ability to sense activity and react quickly essential for survival in daily life?</p> <p>How do the body's respiratory and circulatory systems work together?</p> <p>How do animals communicate and reproduce?</p>                         |
| Students will know (Knowledge):   | Students will be able to (Skills):  |
| <ul style="list-style-type: none"> <li>• Key concepts and scientific terms associated with animals</li> <li>• Defining characteristics of animals</li> <li>• The principles for classifying animals, including presence of a backbone; body symmetry; characteristics of proteins, DNA, and other molecules that make up their cells; and types of body structure</li> <li>• Defining characteristics of invertebrates</li> <li>• Distinguishing characteristics of the invertebrate phyla</li> <li>• Defining characteristics of chordates</li> <li>• Defining characteristics of vertebrates</li> </ul>   | <ul style="list-style-type: none"> <li>• Use key concepts and scientific terms associated with animals in discussions, inquiry activities, and performance tasks</li> <li>• Design a new animal phylum (by identifying characteristics common to all the members of the phylum) and develop a dichotomous key to identify individual animals within the phylum</li> <li>• Imagine a planet with a specific environment, consider the characteristics of animals that could survive in that environment, and present detailed creative examples</li> </ul> |

## Unit 3: Animals

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| <ul style="list-style-type: none"><li>• Distinguishing characteristics of vertebrate classes</li><li>• The purpose and distinguishing characteristics of animal support structures: endoskeletons and exoskeletons</li><li>• Distinguishing characteristics of animal control and movement structures: nerve nets and nerve cords</li><li>• What the human skeletal system does, how its parts work together, and how it interacts with other body systems</li><li>• What the human muscular system does, the distinguishing characteristics of its various muscle types, and how it interacts with other body systems</li><li>• What human skin does, the distinguishing characteristics of its three layers, and how it interacts with other body systems</li><li>• What the human nervous system does, how its parts work together, and how it interacts with other body systems</li><li>• What the human sensory system does and how it helps maintain homeostasis</li><li>• What the human endocrine system does and how it interacts with other body systems</li><li>• How the gas exchange systems differ between aquatic and terrestrial animals</li><li>• Distinguishing characteristics of open and closed circulatory systems</li><li>• What the human respiratory system does, how its parts work together, and how it interacts with other body systems</li><li>• What the human circulatory system does, how its parts work together, and how it interacts with other body systems</li><li>• What blood does and the distinguishing characteristics of its various parts</li><li>• Relationships between an animal's feeding and digestion structures and its diet</li><li>• Distinguishing characteristics of the excretory structures of aquatic and terrestrial animals</li></ul> | <p>of animal structures and functions that enable animals to survive</p> <ul style="list-style-type: none"><li>• Examine the properties of the skin, muscles, and bones of a chicken wing and observe the relationship between its structure and function</li><li>• Measure reaction times and explore factors that can influence reaction times</li><li>• Model the cells, hormones, and receptor sites that make up the pathway in a negative feedback cycle</li><li>• Discover the ratio of three types of blood cells in healthy blood and relate those ratios to homeostasis in the body</li><li>• Design an experiment to show homeostasis in earthworms</li><li>• Investigate the functions and interactions of the nervous and muscular systems</li><li>• Investigate the functions of the sensory system: sight, taste, smell, hearing</li><li>• Model light reception and pupil response in the eye</li><li>• Investigate the functions of the endocrine system: digestion</li><li>• Map a circulatory system</li></ul> |
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## Unit 3: Animals

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| <ul style="list-style-type: none"><li>• How animal behaviors help them maintain homeostasis</li><li>• How animal behaviors are classified: innate or learned</li><li>• How animals communicate and interact in societies</li><li>• Terminology and function of male and female reproductive organs</li><li>• Distinguishing characteristics of internal and external fertilization and development</li></ul> |  |
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## Unit 4: Interactions of life

Middle School - 7th Grade Life Science - Last Updated on June 4, 2019

### STANDARDS

**MS-LS1-5.:** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

**MS-LS2-4.:** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

**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-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-LS1-4.:** Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

**MS-LS1-7.:** 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-LS2-2.:** 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-LS2-5.:** Evaluate competing design solutions for maintaining biodiversity and ecosystem services.\*

### PRIORITY STANDARDS

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| <b>MS-LS2-1.</b> | Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. |
| <b>MS-LS2-2.</b> | Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.  |
| <b>MS-LS2-3.</b> | Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.                             |

# Unit 4: Interactions of life

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## DESIRED RESULTS

| Enduring Understandings:  | Essential Questions:  |
|---|---|
| <p>Living things interact with and depend on each other and on the nonliving things in an ecosystem.</p> <p>A community contains many populations that interact in their energy roles and in their competition for resources. Populations can increase, decrease, and move, affecting the community.</p> <p>Each of Earth's land biomes and aquatic ecosystems is characterized by distinct environments and organisms. Biomes and ecosystems change by natural processes of ecological succession and by human activities.</p> <p>Earth has many resources; factors such as pollution and climate change affect the survival of many species and future generations.</p> | <p>How do organisms interact with the living and nonliving environments to obtain matter and energy?</p> <p>How do matter and energy move through an ecosystem?</p> <p>What happens to ecosystems when the environment changes?</p> <p>How do organisms interact in groups to benefit individuals?</p> <p>What can be done to protect the earth and the survival of future generations?</p> |

| Students will know (Knowledge):   | Students will be able to (Skills):  |
|---|---|
| <ul style="list-style-type: none"> <li>Key concepts and scientific terms associated with interactions of life, including: ecosystem, biotic factor, abiotic factor, climate, atmosphere, evaporation, condensation, precipitation, nitrogen fixation, photosynthesis, chemosynthesis, food chain, food web, energy pyramid, biosphere, community, population, competition, limiting factor, population density, biotic potential, carrying capacity, birthrate, death rate, extinct species, endangered species, threatened species, migration, habitat, niche, producer, consumer, symbiosis, mutualism, commensalism, parasitism, biome, desert, grassland, temperate, taiga, tundra, salinity, wetland, estuary, intertidal zone, coral reef, ecological succession, climax community, pioneer species, eutrophication,</li> </ul> | <ul style="list-style-type: none"> <li>Use key concepts and scientific terms associated with interactions of life in discussions, inquiry activities, and performance tasks</li> <li>Construct a model food web in order to visualize how populations interact through feeding relationships</li> <li>Observe how energy in food can be released and transformed into other forms of energy</li> <li>Observe the effect of various events on a population</li> <li>Model migration and analyze changes in population size when migration patterns are disrupted or blocked</li> <li>Analyze data from a graph to see how birthrates and death rates change a population size</li> <li>Speculate how increases or decreases in species populations would affect humans in a community</li> </ul> |

## Unit 4: Interactions of life

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| <p>renewable resources, nonrenewable resources, inexhaustible resources, sustainability.</p> <ul style="list-style-type: none"><li>• Examples of abiotic factors in an environment</li><li>• How matter moves in cycles in the ecosystem</li><li>• How energy flows through ecosystems</li><li>• Models of the flow of energy in ecosystems</li><li>• Factors that affect the size of a population</li><li>• Why human populations change</li><li>• Three types of relationships within a community are predator-prey, cooperative, and symbiotic</li><li>• Distinguishing characteristics of Earth's land biomes</li><li>• How humans impact land biomes and aquatic ecosystems</li><li>• Earth's aquatic ecosystems include freshwater and saltwater ecosystems</li><li>• How land and aquatic ecosystems change over time in predictable processes of ecological succession</li><li>• How are natural resources used and misused?</li></ul> | <ul style="list-style-type: none"><li>• Undertake problem and project based learning with respect to biodiversity and ecosystem synthesis</li></ul> |
|--|---|