Havre Public Schools Life Science Seventh Grade

Course Information
Grade Level: 7
Length: 1 Year
Period(s) Per Day: 1

Essential Understanding:
LS1: From Molecules to Organisms: Structures and Processes (Structure & Function, Growth & Development of Organisms, Organization for Matter and Energy Flow in Organisms, and Information Processing.) Help students formulate an answer to the question, "How can one explain the ways cells contribute to the function of living organisms?"

LS2: Interactions, Energy, and Dynamics Relationships in Ecosystems (Interdependent Relationships in Ecosystems; Cycles of Matter and Energy Transfer in Ecosystems; and Ecosystem Dynamics, Functioning, and Resilience.) Help students formulate an answer to the question, "How does a system of living and non-living things operate to meet the needs of the organisms in an ecosystem?"

LS3: Heredity: Inheritance and Variation of Traits (Inheritance of Traits, and Variation of Traits.) Help students formulate an answer to the question, "How do living organisms pass traits from one generation to the next?"

LS4: Biological Evolution: Unity and Diversity (Evidence of Common Ancestry and Diversity, Natural Selection, Adaptation, and Biodiversity and Humans) Help students formulate an answer to the question, "How do organisms change over time in response to changes in the environment?"

Theme Samples:

1. **Life Structure/Function**
    a. Classifying/Exploring life
    b. Cell Structure/Function
    c. Cells to Organisms
    d. Reproduction
    e. Genetics
    f. Environment & Change Over Time
2. **From Bacteria to Plants**
    a. Bacteria & Viruses
    b. Protists & Fungi
    c. Plant Diversity
    d. Plant Processes & Reproduction
3. **Animals**
    a. Animal Diversity
    b. Animal Structure & Function
    c. Animal Behavior and Reproduction
4. **Human Body Systems**
    a. Structure & Movement
    b. Digestion and Excretion
    c. Respiration & Circulation
    d. Immunity & Disease

e. Control & Coordination
f. Reproduction & Development

5. **Interactions of Life**
   a. Matter & Energy in the Environment
   b. Populations & Communities
   c. Biomes & Ecosystems
   d. Using Natural Resources

Course Objectives and Expectations:

Students in middle school develop understanding of key concepts to help them make sense of life science. The ideas build upon students' science understanding from earlier grades and from the disciplinary core ideas, science and engineering practices, and crosscutting concepts of other experiences with physical and earth sciences. There are four life science disciplinary core ideas in middle school: 1) From Molecules to Organisms: Structures and Processes, 2) Ecosystems: Interactions, Energy, and Dynamics, 3) Heredity: Inheritance and Variation of Traits, 4) Biological Evolution: Unity and Diversity. The performance expectations in middle school blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing usable knowledge across the science disciplines.

Student Skills:

- Planning & Conducting Investigations
- Developing and Using Models
- Engaging in Argument from Evidence
- Constructing Scientific Explanations and Designing Solutions
- Obtaining, Evaluating, and Communicating Information
- Analyzing and Interpreting Data
- Evaluating Competing Design Solutions
- Predicting
- Using Mathematics & Computational Thinking
- Asking Questions & Defining Problems
- Safety
- Research
- Technology
- Perseverance
- Observation
- Innovation

Student Objectives:

- I can distinguish between living and non-living things based upon the characteristics of life.
- I can identify, describe, and explain how biotic and abiotic factors in an ecosystem depend on, interact with, and compete for/with one another.
- I can describe how the cycling of matter in an ecosystem is different than the flow of energy in an ecosystem.
- I can build a model to show the cycling of matter and flow of energy in an ecosystem.
- I can identify, describe, and distinguish between different roles of organisms within ecosystems.
- I can describe how populations within ecosystems can change, including causes and effects of those changes.
- I can identify, describe, and give examples of relationships between organisms in communities.
- I can distinguish between populations and communities.
- I can compare and contrast and describe climate, biodiversity, and locations of different land and aquatic biomes on Earth.
- I can describe how ecosystems can change through time in terms of ecological succession; I can describe cause/effects of primary and secondary succession and model the key steps in each.
- I can explain what biodiversity is and describe how it is important in maintaining ecosystem services.

- I can describe how living things are organized from the molecular level up to the biosphere level.
- I can identify and explain the three components of the cell theory.
- I can distinguish between prokaryotic and eukaryotic and plant and animal cells based on structure and function.
- I can distinguish between unicellular and multicellular organisms and give examples of each.
- I can identify and distinguish between cell organelles (structure and function) and compare and contrast plant cells and animal cells.
- I can describe processes cells use to transport materials into and out of the cell, including osmosis, diffusion, active and passive transport.
- I can describe and compare/contrast methods by which cells obtain energy: cellular respiration, fermentation, and photosynthesis.
- I can identify and distinguish between stages of the cell cycle and phases of mitosis and describe how these processes are important in the development of organisms.
- I can explain how cell differentiation leads to the organization of organisms from the smallest level (molecules) to the largest (ecosystems).
- I can compare and contrast sexual and asexual reproduction as well as the advantages and disadvantages of each.
- I can distinguish between dominant and recessive traits and understand how each are inherited.
- I can use a Punnett Square to predict the probability of offspring inheriting dominant and recessive traits.
- I can describe how genotype (genes) is related to phenotype (physical trait) and give examples of each.
- I can compare and contrast between different types of inheritance, including Mendelian Inheritance, incomplete dominance, codominance, and polygenic inheritance.
- I can describe the role of DNA and RNA in protein production and organism development/inheritance and describe how changes in DNA sequence can affect traits.
- I can describe how mutations can lead to variations of traits, some positive and some negative; as well as how variations can lead to adaptations.
- I can describe the conditions of fossil formation and describe how fossils can be used as evidence of change in species over time.
- I can describe Charles Darwin's theory of evolution by natural selection and give evidence supporting his theory.
- I can compare natural selection to artificial selection/selective breeding and give advantages and disadvantages of each.
- I can describe and give examples of structural, behavioral, and functional adaptations.
- I can use comparative anatomy and embryology to provide evidence of how species change over time.
- I can compare and contrast bacteria, viruses, protists, and fungi and give examples of each.
- I can describe common characteristics of plants and animals and distinguish between different types of each.
- I can describe adaptations that have allowed plants and animals to survive and reproduce.
- I can identify plant reproductive parts and describe methods plants use to reproduce.
- I can compare/contrast different types of animals and describe similarities and differences between them.
- I can describe how the human body is organized into systems and describe how the systems function together to allow the human body as a whole to function.

Pacing

LIFE SCIENCE

	Montana Content Standards	Units / Lessons	
Quarter 1	**MS-ETS1-1** Define criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions **MS-ETS1-2** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. **MS-ETS1-3** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. **MS-ETS1-4** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. **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 non-living parts of 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-LS1-7** 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-LS2-1** Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. **MS-LS2-4** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. **MS-LS 2-5** Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	INTERACTIONS OF LIFE: Characteristics of Life Food Chains, Food Webs, Energy Pyramids Ecosystems Ecological Succession Biodiversity & Ecosystem Services	Ch. 20 Matter & Energy Ch. 21 Populations & Communities Ch. 22 Biomes and Ecosystems

Quarter 2	**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 the parts of cells contribute to the function. **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-LS 1-6** 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.	LIFE STRUCTURE AND FUNCTION Dichotomous Keys Cladograms Microscopes	Ch. 1 Classifying and Exploring Life
Quarter 3	**MS-LS1-3** Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. **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-LS1-5** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. **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 an organism. **MS-LS4-5** Father and synthesize information about 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. **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	Cells & Organelles Plant vs. Animal Prokaryotic vs. Eukaryotic Photosynthesis & Cellular Respiration Cell Cycle & Mitosis Levels of Organization Meiosis and Reproduction Punnett Squares Pedigrees DNA vs. RNA Fossils Adaptations Natural Selection	Ch. 3 From a Cell to an Organism Chapter 4: Reproduction Ch. 5: Genetics Ch. 6 The Environment & Change Over Time

	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-LS4-6** Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. **MS-LS4-3** Analyze displays of pictorial data to compare patterns of similarities in embryological development across multiple species to identify relationships not evident in the fully formed anatomy.		
Quarter 4	**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-LS1-6** 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-LS 1-7** 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-LS1-3** Use argument supported by evidence for how the body is a system of interacting sub-systems composed of groups of cells.	ANIMALS: DIVERSITY, STRUCTURE & FUNCTION; BEHAVIOR HUMAN BODY	Ch. 10 Plant Reproduction Ch. 10-13 Animals Ch. 14-19 Human Body Systems

Kesler Science
Discovery Education
Boardworks
Bioman Interactive
https://betterlesson.com/
https://opi.mt.gov/Educators/Teaching-Learning/K-12-Content-Standards-Revision

Montana Content Standards (Disciplinary Core Ideas):

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 structure and function of a cell as a whole and ways parts of cells contribute to the function.

MS-LS 1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

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

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

MS-LS 1-6. 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-LS 1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth, release energy, or both, as this matter moves through an organism.

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, and analyze scientific concepts used by American Indians to maintain healthy relationships with environmental sources.

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.

MS-LS3-1. Develop and use a model to describe why structural changes to genes, such as mutations, 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-LS4-1. 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.

Resources
Kesler Science
Discovery Education
Boardworks
Bioman Interactive
https://betterlesson.com/
https://opi.mt.gov/Educators/Teaching-Learning/K-12-Content-Standards-Revision
Text Book:2012 McGraw-Hill Glencoe Life iScience
Science Standards- https://opi.mt.gov/LinkClick.aspx?fileticket=qHA5q8j-oGw%3d&portalid=182 Comparison MT Sci Content Standards and NGSS.pdf
Model Curriculum Guide https://opi.mt.gov/Educators/Teaching-Learning/K-12-Content-Standards/Science-Standards#88989482-resources

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