

Unit 1
7th Grade Life Science Blueprint

Ecology and Interactions

Essential Question: How are living things dependent upon each other and their surroundings?

Teaching time required: 5 weeks

Overview of Lesson Topics	Vocabulary	Standards Referenced	Objectives	Examples and Evidence Statements
Ecosystems Biomes on Earth Boreal Forest Ecology Food Webs Interactions Biological Succession Invasive Species	ecosystem biome biotic and abiotic factors tundra taiga/boreal forest temperate rainforest conifer broadleaf producer consumer decomposer competitive interaction consumptive interaction (predator/prey, herbivore, carnivore, omnivore) symbiotic interaction succession invasive species	MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. 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-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	Students will: <ul style="list-style-type: none"> Explain the basic types of interactions between organisms. Analyze the relationships of organisms within an ecosystem. Recognize how resource availability and genetic factors affect the growth, number, and diversity of organisms in an ecosystem. 	<ul style="list-style-type: none"> Emphasis is on predicting patterns of interactions that are consistent across ecosystems. Emphasis is on the cause and effect relationship between resource availability and growth.

Recommended Teaching Resources and Activities

Biomes of the World (online research)
Alaska's Forest and Wildlife (ADF&G)
Alaska's Ecology (ADF&G)

Teacher notes

- This unit is placed first in the sequence because the months of August and September allow students to investigate ecology outside the classroom walls.
- The study of local plants and animals allows students to understand interactions more easily and deeply.
- The seasonal changes of autumn in Alaska are an excellent platform for students to learn how abiotic and biotic factors of the environment affect living organisms.
- The concrete, hands-on nature of local ecology provides a high-interest backdrop for abstract concepts taught later in the year.

Unit 2 7th Grade Life Science Blueprint

Life Processes

Essential Question: What characteristics define living things?

Teaching time required: 5 weeks

Overview of Lesson Topics	Vocabulary	Standards Referenced	Objectives	Examples and Evidence Statements
Characteristics of Organisms Photosynthesis Cellular Respiration Cycling of Matter and Energy	organism matter energy molecule photosynthesis cellular respiration digestion excretion homeostasis	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-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. 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.	Students will: <ul style="list-style-type: none"> • Create food webs to model how matter and energy is transferred between producers, consumers, decomposers. • Illustrate the process of photosynthesis done by producers. • Illustrate the process of cellular respiration done by all living things. 	<ul style="list-style-type: none"> • Emphasis is on tracing the movement of matter and the flow of energy.

Recommended Teaching Resources and Activities

Alive or Not? Activity
 Cycling of Matter and Energy Poster
 Respiration and Photosynthesis investigation (Vernier equipment, lessons: _____)
 Cold Fish Lab (investigation of the effect of water temperature on fish respiration.)

Teacher notes

- This unit introduces what defines “life” in biology (characteristics such as the ability to move, take in food, respire, grow, excrete, reproduce, and maintain homeostasis).
- This unit builds upon Unit 1 (Ecology and Interactions) by providing evidence of dependence between plants and animals through the opposite yet complementary processes of photosynthesis and cellular respiration.
- It introduces specialized scientific equipment (probeware) that allows direct investigation of molecules too small to be detected without such tools.
- This is an excellent opportunity to use the Experimental Design Lab format (**need attachment**).
- A brief introduction (or review) of atoms, molecules, and the Periodic Table of Elements should be considered.

Unit 3
7th Grade Life Science Blueprint

Cell Structure and Function

Essential Question: What structures make up all living things?

Teaching time required: 7 weeks

Overview of Lesson Topics	Vocabulary	Standards Referenced	Objectives	Examples and Emphasis Statements
Microbiology Types of Cells Cell Parts and Function Cellular Organization Microscope Investigation Osmosis Cell Division	virus prokaryotic cell/bacteria eukaryotic cell nucleus cytoplasm organelle plasma membrane cell wall chloroplast mitochondria unicellular multicellular tissue organ diffusion osmosis cell cycle	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 Describe how the body's interacting subsystems are composed of groups of cells.	Students will: <ul style="list-style-type: none"> • Understand that all living things are made of cells, whether unicellular or multicellular. • Understand that smaller structures within cells are responsible for particular functions. • Develop models of cells to describe their function. 	<ul style="list-style-type: none"> • Emphasis is the cell functioning as a system, and the contribution of specific parts to the whole cell.

Recommended Teaching Resources and Activities

Sample microbes from within school building and culture on Petri dishes (incubator needed.)
 Online resources: cellsalive.com, learn.genetics.utah.edu
 Cell models (paper-based, 3D, or virtual)
 Microscope Activities (using prepared and/or wet-mount slides)
 Osmosis Lab (investigates the effect of salt water concentrations on osmosis in potatoes, carrots, eggs, etc.) should follow Experimental Design Lab format.

Teacher notes

- This unit introduces students to the building blocks of life: cells.
- Comparisons between types of cells (prokaryotic vs. eukaryotic, plant vs. animal) focus on the structures present (or lacking) in each.
- Microscopes serve as the primary tool of investigation.
- Osmosis provides an example of processes that effects cell in an easily observable, measurable way.
- Unit 4 (Body Systems) will build upon student's knowledge of the levels of cellular organization

Unit 4
7th Grade Life Science Blueprint

Body Systems

Essential Question: How do the systems of the human body work together?

Teaching time required: 3 weeks*

Overview of Lesson Topics	Vocabulary	Standards Referenced	Objectives	Examples and Evidence Statements
Body (Organ) Systems	Circulatory (cardiovascular) respiratory digestive excretory nervous muscular	MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	Students will: <ul style="list-style-type: none"> • Identify the multiple interacting subsystems of the human body. • Describe how specialized organs are formed from tissues composed of specialized cells. 	

Teacher notes

***This unit may overlap or repeat the Health Curriculum taught in 6th grade and could potentially be omitted.**

- The focus of this unit is how the body systems depend upon each other, but this requires a basic understanding of the function of each system first.
- Though this unit builds upon Unit 3 (Cell Structure and Function), it could be taught out of sequence depending upon time constraints.

Unit 5 7th Grade Life Science Blueprint

Reproduction and Genetics

Essential Question: How do living things pass on their genetic information to offspring?

Teaching time required: 5 weeks

Overview of Lesson Topics	Vocabulary	Standards Referenced	Objectives	Examples and Evidence Statements
Modes of Reproduction Cell Division Genetics Mutations Selective breeding	asexual reproduction sexual reproduction mitosis meiosis egg sperm zygote ovule pollen seed DNA chromosome dominant trait recessive trait allele Punnett square mutation protein selective breeding (artificial selection)	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. MSLS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.	Students will: <ul style="list-style-type: none"> Understand that organisms reproduce either asexually or sexually. Identify how offspring produced by sexual reproduction inherit alleles for each gene, located on different chromosomes, from each parent. Recognize that genes are located on chromosomes in cells, and that genes control the production of proteins, which affect an organism's traits. Recognize how mutations can alter genetic information in a harmful, neutral or helpful way. Explain how humans have the capacity to influence the traits of organisms through selective breeding (artificial selection) and new technologies. 	<ul style="list-style-type: none"> Emphasis is on using Punnett squares and simulations to identify the cause and effect relationship of gene transmission from parents to offspring and the resulting genetic variation.

Recommended Teaching Resources and Activities:

Smiley Face Genetics (attach lesson plans)
Monster Genetics (attach lesson plans)

Teacher notes

- The processes of cell division (mitosis and meiosis) should be introduced at a basic level only, as necessary to explain growth and formation of reproductive cells.
- The topics of selective breeding (artificial selection) and mutations provide a logical link to natural selection in Unit 6 (Evolution).

Unit 6
7th Grade Life Science Blueprint

Evolution

Essential Question: How do living things change over time?

Teaching time required: 5 weeks

Overview of Lesson Topics	Vocabulary	Standards Referenced	Objectives	Examples and Evidence Statements
Natural selection Evolution Comparative Anatomy Fossil Record	species natural selection biological fitness physical adaptation behavioral adaptation evolution analogous and homologous structures embryo fossil extinction	<p>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. MSLS4-4 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-LS1-4 Use empirical evidence and scientific reasoning to explain how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction. MS-LS4-2, MS-LS4-3 Apply scientific ideas to construct an explanation for the anatomical similarities and differences between modern organisms, between modern and fossil organisms, and between the embryological development patterns of different species to infer evolutionary relationships. 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</p>	Students will: <ul style="list-style-type: none"> • Simulate how natural selection over generations is a process by which species adapt to changing environmental conditions. • Identify animal and plant adaptations (behaviors and structures) that increase their chances of successful reproduction. • Identify anatomical similarities and differences between organisms living today, organisms in the fossil record, and various organisms' embryological development to infer evolutionary relationships. • Investigate how the fossil record documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. 	

		Earth under the assumption that natural laws operate today as in the past.		
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Recommended Teaching Resources and Activities:

Natural Selection Simulation (Finch Beaks, Fish _____),
 Fossil Making Activity: _____

Teacher notes

- Hands-on simulations allow students to grasp the concept of genetic changes over time.
- This unit is a good opportunity for students to apply the process skill of assessing resources (books, articles, webpages, etc.) based upon scientific evidence.

Unit 7
7th Grade Life Science Blueprint

Biodiversity and Human Interactions

Essential Question: How do humans interact with the ecosystems in which we live?

Teaching time required: 5 weeks*

Overview of Lesson Topics	Vocabulary (will vary with projects)	Standards Referenced	Objectives	Examples and Evidence Statements
Biodiversity Ecosystem Services	biodiversity ecosystem services stewardship	MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	Students will: <ul style="list-style-type: none"> • Understand that ecosystems are dynamic in nature; disruptions can lead to shifts in populations. • Recognize that an ecosystem's biodiversity is used a measure of its health. • Explain how changes in biodiversity can influence humans' resources. 	

Recommended Teaching Resources and Activities:

Examples of Possible Research Project Titles (with Alaska Focus):

- Effects of Climate Change on Alaskan Organisms, The Susitna River Dam: Good or Bad for Alaska?, Pebble Mine: Minerals and Salmon, Genetic Engineering and Alaskan Salmon, Artificial Selection Through Legislation: Moose Antlers and Gillnet, Stream Ecology: How healthy is your local watershed?, Aliens Among Us: Invasive Species in Alaska, Current Research Projects at UAA, APU, UAF, UAS, Superbugs: Modern Medicine and Antibiotics, Why Mammoths in Alaska Became Extinct, Pleistocene Alaska, How Wood Frogs Survive Freezing, Red Squirrels: The Unexpected Carnivore, Seasonal Molting of Hares and Ptarmigan, Migratory Birds of Alaska-Why the Long Trip?

Examples of Possible Lab Experiment Titles:

- The Effects of Fertilizer on Plant Growth
- Water Temperature's Effect on Salmon Fry Emergence

Transpiration Rates of Different Vascular Plants

Ecosystem in a Bottle: Cycling of Matter and Energy

Fast Plants: Punnett Squares for Real

Possible Project Presentation Methods:

Posters, oral presentations with slides, live debate, video/podcast creation, field trips, service-learning projects, guest speaker interviews

***The scope of this unit may be shortened for end of year schedule and activity constraints by school.**

Teacher notes:

- This unit provides the Culminating Performance Task for the year: a project that integrates many learning objectives from Units 1-6.
- The time period and topics are flexible to allow for individual teacher and school site flexibility.
- This provides students with an excellent opportunity to apply science process skills and address the engineering and technology standards (ETS).