Unit 4 The Diversity of Life

Content Area: **Science**
Course(s): **Science 7**
Time Period: **Marking Period 4**
Length: **MP4**
Status: **Published**

Essential Questions

- How are living things alike yet different?
- How do you know an animal when you see it?
- How do animals get and use energy?
- How does an animal's behavior help it survive and reproduce?

Big Ideas

- Living things are alike yet different.
- Structures in living things are related to their functions.
- Living things get and use energy.
- Living things grow, change, and reproduce during their lifetime.

Cross-Curricular Integration

Integration Area: Language Arts

W.AW.7.1. Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.

A. Introduce claim(s) about a topic or issue, acknowledge alternate or opposing claims, and organize the reasons and evidence logically.

B. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

C. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), reasons, and evidence.

D. Establish and maintain a formal style/academic style, approach, and form.

E. Provide a concluding statement or section that follows from and supports the argument presented.

RL.TS.7.4. Analyze the structure an author uses to organize a text and how it contributes to the text as a whole, including how a drama's or poem's form or structure (e.g., soliloquy, sonnet) contributes to its meaning.

Activity:

Populations & Ecosystems: Using the text as your primary source, read and analyze factors that affect animal populations. Based on your research, form an opinion on how ecosystems affect the populations that exist within the ecosystem. Construct an argument in the form of an essay that is supported by valid and credible evidence that defends the claim that a change to this physical or biological component of an ecosystem will affect its populations. Make sure to use relevant vocabulary and create a clear and coherent position on which factor is the most important.

Integration Area: Pre-Algebra

Chapter 8: Geometric Figures

7.G.B.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

Chapter 9/5: Measurement and Geometry

7.G.A.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

7.G.A.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

7.G.A.3 Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

7.G.B.4 Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle

7.G.B.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Chapter 7: Collecting, Displaying and Analyzing Data

7.SP.A.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

7.SP.A.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.*

7.SP.B.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on*

a dot plot, the separation between the two distributions of heights is noticeable.

7.SP.B.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book*.

Chapter 10: Probability

7.SP.C.5 Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

7.SP.C.6 Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times*.

7.SP.C.7 Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

7.SP.C.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

Algebra Prerequisites

8.NS.A.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.

8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 times 10^8 and the population of the world as 7 times 10^9, and determine that the world population is more than 20 times larger*.

8.F.A.3 Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line*.

8.F.B.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

8.G.B.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

CRLLKS- Career Education

9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

9.2.8.B.4 Evaluate how traditional and nontraditional careers have evolved regionally, nationally, and globally.

9.2.8.B.5 Analyze labor market trends using state and federal labor market information and other resources available online.

Connection:

Explore the variety of scientific careers that revolve around animals and their survival. Discuss how different types of scientists communicate and collaborate to gain even more information pertinent to their careers.

Science and Society

Carolus Linnaeus

He devised the formal two-part naming system we use to classify all lifeforms.

Anton von Leeuwenhoek

Van Leeuwenhoek is best known for his pioneering work in microscopy and for his contributions toward the establishment of microbiology as a scientific discipline.

Charles Darwin

Charles Darwin is often cited as the greatest biologist in history. His most famous work, On the Origin of Species, explains the theory of evolution by natural selection, providing numerous supporting examples.

Louis Pasteur

Pasteur revolutionized chemistry and biology with his discovery of mirror-image organic molecules, then founded microbiology with his work on fermentation, his discovery of anaerobic bacteria, and his establishment of the germ theory of disease. The process he invented to stop foodstuffs going bad, pasteurization, is still in use worldwide today.

Ivan Pavlov

Ivan Petrovich Pavlov was an eminent Russian physiologist and psychologist who devised the concept of the conditioned reflex. He conducted a legendary experiment in which he trained a hungry dog to drool at the sound of a bell, which had previously been related to the presentation of food to the animal.

CSDT Technology Integration

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results

8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

Activity:

Students will graph data that they collected on an assignment based on resource availability in an ecosystem. The students will use a simulation to find test results. They will make a spreadsheet with the data and present a graph based on the results. They will report the findings.

Enduring Understandings

MS. From Molecules to Organisms: Structures and Processes

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 of organisms.

MS. Ecosystems: Interactions, Energy, and Dynamics

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.

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

- Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4)
- Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)
- Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)

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.(MS-LS2-1)
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS2-1)
- Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)

Crosscutting Concepts

Energy and Matter

The transfer of energy can be tracked as energy flows through a natural system. (MS-LS2-3)

Cause and Effect

Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1)

Stability and Change

Small changes in one part of a system might cause large changes in another part. (MS-LS2-4)

Focus Areas

Classifying Life

- Biologists use classification to organize living things into groups so that the organisms are easier to study.
- The levels of classification are domain, kingdom, phylum, class, order, family, genus and species.
- Taxonomic keys are useful tools that help determine the identity of organisms.

Introduction to Animals

- The main functions of an animal are to obtain food and oxygen, keep internal conditions stable, move in some way and reproduce.
- Animals are classified according to how they are related to other animals. These relationships are determined by an animal's body structure, the way the animal develops and its DNA.
- The organization of an animal's cells into higher levels of structure helps to describe an animal's body

plan.
- Animals without symmetry have no tissues. Animals with radial symmetry have tissue and usually have organ systems. Animals with bilateral symmetry have organ systems.
- Animals that do not have backbones are invertebrates.
- At some point in their lives, all chordates have three characteristics: a notochord, a nerve cord, and pouches in the throat area.
- The body temperatures of some vertebrates change with the environment. Other vertebrates maintain a constant body temperature.
- There are five major groups of vertebrates. They are fishes, amphibians, reptiles, birds, and mammals.

Obtaining Energy

- The different ways that an animal obtains food depends on what it eats and its adaptations for getting food.
- Some types of animals digest food mainly inside their cells, but most animals digest food outside their cells.
- Respiratory systems include structures such as skin, gills, and lungs. The type of respiratory system an animal has depends on how complex the animal is and where it lives.
- Complex animals have one of two types of circulatory systems: open or closed.
- Some closed systems have a single-loop circulation pattern. Others have a double-loop circulation pattern.
- Many animals have specialized structures to get rid of wastes.

Animal Reproduction and Fertilization

- Animals undergo either asexual or sexual reproduction to make more of their own kind or species. External fertilization occurs outside of the female's body, and internal fertilization occurs inside the female's body.

*See Appendix E for Cross Content

Climate Change

MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

- Activity: Students will be able to develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. Students will be assessed through a project/activity where they will create a visual model showcasing the cycling of matter and flow of energy in a chosen ecosystem. They will also provide a written explanation of their model.

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

- Activity: Students will be able to develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. Students will be assessed through a project/activity where they will create a visual model showcasing the cycling of matter and flow of energy in a chosen

ecosystem. They will also provide a written explanation of their model.

Resources

Savvas Interactive Science - The Diversity of Life 2016

Scientific Inquiry

MS-LS2-3 (5.3.8.B.1) *Nitrogen Cycle activity*
MS-LS2-4 *Changes to Ecosystem Lab*