Unit 01: An Introduction to Animals

Content Area: **Science**
Course(s): **Zoology**
Time Period: **First Marking Period**
Length: **2 Week**
Status: **Published**

Unit Overview

This introductory unit will provide students with a background and review of biological evolution and classification. Students will then be introduced to the great diversity of the Animal Kingdom. They will study the main characteristics of animals and the major body plans of animals. Students will be introduced to the major phyla of animals. Students will also review safety procedures during lab activities, including dissections.

STAGE 1- DESIRED RESULTS

Standards- 2020 New Jersey Student Learning Standards- Science

High School Life Sciences

HS-LS1 From Molecules to Organisms: Structures and Processes

SCI.9-12.HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.
SCI.9-12.HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
SCI.9-12.HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
SCI.9-12.HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
SCI.9-12.HS-LS1-5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

SCI.9-12.HS-LS1-6	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
SCI.9-12.HS-LS1-7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed, resulting in a net transfer of energy.

HS-LS2 Ecosystems: Interactions, Energy, and Dynamics

SCI.9-12.HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
SCI.9-12.HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
SCI.9-12.HS-LS2-3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
SCI.9-12.HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
SCI.9-12.HS-LS2-5	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
SCI.9-12.HS-LS2-6	Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
SCI.9-12.HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
SCI.9-12.HS-LS2-8	Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.

HS-LS3 Heredity: Inheritance and Variation of Traits

SCI.9-12.HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
SCI.9-12.HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
SCI.9-12.HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

HS-LS4 Biological Evolution: Unity and Diversity

SCI.9-12.HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
SCI.9-12.HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3)

	competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
SCI.9-12.HS-LS4-3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
SCI.9-12.HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
SCI.9-12.HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
SCI.9-12.HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

Standards

Science and Engineering Practices

- Analyzing and Interpreting Data
- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions
- Developing and Using Models
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information
- Planning and Carrying Out Information
- Using Mathematics and Computational Thinking

Cross Cutting Concepts

- Cause and Effect
- Energy and Matter
- Influence of Engineering, Technology, and Science on Society and the Natural World
- Interdependence of Science, Engineering, and Technology
- Patterns
- Scale, Proportion, and Quantity
- Stability and Change
- Structure and Functions
- Systems and System Models

Dimension 3: Disciplinary Core Ideas

- LS1A: Structure and Functions
- LS1B: Growth and Development of Organisms
- LS1C: Organization for Matter and Energy Flow in Organisms
- LS1D: Information Processing
- LS2A: Interdependent Relationships in Ecosystems
- LS2B: Cycles of Matter and Energy Transfer in Ecosystems
- LS2C: Ecosystem Dynamics, Functioning, and Resilience
- LS2D: Social Interactions and Group Behavior
- LS3A: Inheritance of Traits
- LS3B: Variation of Traits
- LS4A: Evidence of Common Ancestry and Diversity
- LS4B: Natural Selection
- LS4C: Adaptation
- LS4D: Biodiversity and Humans

High School Engineering Design

SCI.9-12.HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
SCI.9-12.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
SCI.9-12.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
SCI.9-12.HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Essential Questions

- Why do scientists classify organisms?
- What are the major groups within which all organisms are currently classified?
- What is an animal?
- What characteristics and traits define animals?
- How have different animal body plans evolved?
- How did invertebrates evolve?
- How did chordates evolve?
- How do the structures of animals allow them to obtain essential materials and eliminate wastes?

- How do the body systems of animals allow them to collect information about their environments and respond appropriately?
- What are the common characteristics animals share within each of the major animal Phyla?

Enduring Understanding

- The diversity of life is the result of ongoing evolutionary change. Species alive today have evolved from ancient common ancestors.
- Animals have evolved diverse ways to carry out basic life processes and maintain homeostasis.
- Animals are grouped based on common characteristics.

Students will know…

Important Concepts

- How scientists classify living organisms.
- Compare modern classification and Linnaean classification.
- The importance of what the tree of life represents.
- Describe what an animal is and what the major characteristics of animals are.
- The difference between invertebrate and vertebrate animals.
- Interpret cladograms of invertebrates and vertebrates animals.
- Know the major characteristics of each of the major animal Phyla.
- Discuss what evolutionary evidence can tell us about animals and how they have evolved different body plans.
- Discuss some essential functions that animals have evolved in order to survive.

Key Vocabulary/Terms

- Binomial Nomenclature
- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- Species
- Systematics
- Phylogeny
- Clade
- Monophyletic group
- Cladogram
- Derived characteristic
- Invertebrate
- Vertebrate

- Chordate
- Radial Symmetry
- Bilateral Symmetry
- Endoderm
- Mesoderm
- Ectoderm
- Coelom
- Pseudocoelom
- Zygote
- Blastula
- Protostome
- Deutorostome

Possible Misconceptions

- Students may not know how diverse the animal kingdom is.
- Students may not realize what groups are considered animals, when examples are shown.
- Students may think that evolution results in progress and that animals always improve through evolution.

Students will be able to...

- Describe the goals of binomial nomenclature and systematics.
- Identify the taxa in the classification system devised by Linnaeus.
- Describe how to make and interpret a cladogram.
- Explain the use of DNA sequences in classification.
- Name the six kingdoms of life as they are currently identified.
- Explain what the tree of life represents.
- List the characteristics that all animals share.
- Differentiate between invertebrates and chordates.
- List and discuss the essential functions that animals perform in order to survive.
- Explain the differences among the animal Phyla.
- Explain what fossil evidence indicates about the timing of the evolution of the first animals.
- Interpret the cladogram of chordates.
- Interpret the cladogram of invertebrates.

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment

- 3- Minute Pause
- A-B-C Summaries
- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Hand Signals
- Idea Spinner
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Misconception Check
- Observation
- One Minute Essay
- One Word Summary
- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

Authentic Assessments

- Create a checklist/protocol for proper use of a light microscope and dissection equipment.
- Cite multiple lines of evidence for evolution and the Theory of Natural Selection.
- Create a classification scheme for objects presented in class.
- Compare Linnaean classification and modern classification using real-world examples.
- Read and interpret a cladogram to show evolutionary relationships based on derived characteristics.
- Analyze and interpret a cladogram of animal invertebrates and a cladogram of animal vertebrates and describe relationships between different animal Phyla.
- Students will work in groups to identify and present a specific example of a challenge faced by animals in the world today.
- Unit quizzes

Benchmark Assessments

- Unit test

STAGE 3- LEARNING PLAN

Instructional Map

Instructional activities in this unit will include the following:

- Create a checklist/protocol for proper use of a light microscope and dissection equipment.
- Cite multiple lines of evidence for evolution and the Theory of Natural Selection.
- Create a classification scheme for objects presented in class.
- Compare Linnaean classification and modern classification using real-world examples.
- Read and interpret a cladogram to show evolutionary relationships based on derived characteristics.
- Analyze and interpret a cladogram of animal invertebrates and a cladogram of animal vertebrates and describe relationships between different animal Phyla.
- Students will work in groups to identify and present a specific example of a challenge faced by animals in the world today.

Throughout the unit, the following will be used:

- Project based learning activities
- Class notes and discussions
- Interactive websites relating to unit topics
- Cooperative learning
- Dissections and other lab activities

Modification/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials

- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content

- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials

- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

Modification Strategies

- Cooperative Grouping
- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook
- Modified Test
- Oral Directions

- Peer Tutoring
- Preferential Seating
- Re-direct
- Repeated Drill and Practice
- Shortened Assisgnment
- Teacher Notes
- Tutorials
- Use of Additional Reference Materials
- Use of Audio Resources

Differentiation Strategies

High Preparation

- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation

- Choice of Book / Activity

- Cubing Activities
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Mini Workshops to Re-teach or Extend Skills
- Open-ended Activities
- Think-Pair-Share by Readiness, Interest, or Learning Style
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Intergration- Interdisciplinary Connections

See Appendix

Vertical Integration- Discipline Mapping

Students will have been exposed to the Performance Expectations for Life Sciences and Engineering Design outlined in the Next Generation Science Standards (NGSS) starting in kindergarten through high school. In middle school, students complete a Diversity of Life unit in 6th grade, Populations and Ecosystems unit in 7th grade, and Human Systems Interactions and Heredity and Adaptations in 8th grade. Biology and Chemistry are offered during the Freshman and Sophomore year of High School.

Science classes are designed around the Performance Expectations, Science and Engineering Practices, Discplinary Core Ideas, and Croscutting Concepts in the NGSS. Zoology, being a half-year science elective course, will focus on having students gain a deeper understanding of the Performance Expectations outlined in the NGSS, particulary in Life Sciences and Engineering Design. A greater focus will be on HS-LS4 Biological Evolution: Unity and Diversity.

Additional Materials

http://www.pearsonsuccessnet.com

http://sciencecases.lib.buffalo.edu/cs/

http://www.newsela.com

http://www.pbs.org/nature

http://www.pbs.org/nova

Peer-reviewed scientific journal articles relevant to lesson themes