SCIENCE

INVESTIGATING OUR NATURAL AND ENGINEERED WORLD.

Zoology Teaching & Learning Framework										
Unit 1 4 wks BL/8 wks YR	**Unit 2** 2 wks BL/4 wks YR	**Unit 3** 3 wks BL/6 wks YR	**Unit 4** 3 wks BL/6 wks YR	**Unit 5** 3 wks BL/6 wks YR	**Unit 6** 3 wks BL/6 wks YR	**Unit 7** 3 wks BL/6 wks YR	**Unit 8** 3 wks BL/6 wks YR	**Unit 9** 4 wks BL/8 wks YR	**SLO Exam**	**Unit 10** 3-4 wks BL/6-8 wks YR
Ecology	**Evolution**	**Classification & Organization**	**Porifera & Cnidarians**	**Worms**	**Mollusks & Echinoderms**	**Arthropods**	**Fish and Amphibians**	**Reptiles and Birds**		**Mammals**
ZS5. Students will evaluate the relationships between humans and other animals. a. Describe the effects of human activities such as habitat destruction, over hunting, introduced species, and pollution on animal biodiversity. b. Explain the importance of species diversity to the biological resources needed by human populations including food, medicine, and natural aesthetics c. Compare and contrast how humans can preserve animal diversity in captive and natural environments with regard to habitat creation and conservation, research, legislation, animal enrichment, diet, medical, breeding programs and management of genetic diversity at local and global levels. d. Investigate how moral, legal, societal, political, and economic decisions impact animal diversity with short-term and long-term effects.	**SZ2. Students will explain the evolutionary history of animals over the geological history of Earth.** a. Outline the geological history of Earth and discuss the major environmental changes that have occurred over time. b. Explain the concepts evolution, adaptation, natural selection, convergence, and speciation. c. Describe the fossil record of the animals including discussing the Cambrian Explosion and major extinction events.	**SZ1. Students will derive the phylogeny of animal taxa (monophyletic clades in a cladogram) using informative characteristics.** **SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.**	**SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.** a. Explain the similarities and differences among major body plans (e.g., asymmetry, radial and bilateral symmetry). b. Compare and contrast taxa based on morphological and genetic characters. c. Relate important structural changes to key functional transitions d. Dissect representative taxa and describe their internal anatomy and the function of major organ systems and organs and relate to cell specializations. SZ4.Students will assess how animals interact with their environment including key adaptations found within animal taxa. SZ5. Students will evaluate the relationships between humans and other animals.				**SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.** a. Explain the similarities and differences among major body plans (e.g., asymmetry, radial and bilateral symmetry). b. Compare and contrast taxa based on morphological and genetic characters. c. Relate important structural changes to key functional transitions d. Dissect representative taxa and describe their internal anatomy and the function of major organ systems and organs and relate to cell specializations. **SZ4.Students will assess how animals interact with their environment including key adaptations found within animal taxa.** **SZ5. Students will evaluate the relationships between humans and other animals.**			**SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.** **SZ4.Students will assess how animals interact with their environment including key adaptations found within animal taxa.** **SZ5. Students will evaluate the relationships between humans and other animals.**

Zoology Standards

The Georgia Performance Standards are designed to provide students with the knowledge and skills for proficiency in science. The Project 2061's *Benchmarks for Science Literacy* is used as the core of the curriculum to determine appropriate content and process skills for students. The GPS is also aligned to the National Research Council's *National Science Education Standards*. Technology is infused into the curriculum. The relationship between science, our environment, and our everyday world is crucial to each student's success and should be emphasized.

The performance standards should drive instruction. Hands-on, student-centered, and inquiry-based approaches should be the emphasis of instruction. This curriculum is intended as a required curriculum that would show proficiency in science, and instruction should extend beyond the curriculum to meet the student needs.

The hands-on nature of the science curriculum standards increases the need for teachers to use appropriate precautions in the laboratory and field. The guidelines for the safe use, storage, and disposal of chemicals must be observed. Safety of the student should always be foremost in science instruction.

Science consists of a way of thinking and investigating and includes a growing body of knowledge about the natural world. To become literate in science, therefore, students need to acquire understandings of both the Characteristics of Science and its Content. The Georgia Performance Standards for Science require that instruction be organized so that these are treated together. Therefore, A CONTENT STANDARD IS NOT MET UNLESS APPLICABLE CHARACTERISTICS OF SCIENCE ARE ALSO ADDRESSED AT THE SAME TIME. For this reason, they are presented as co-requisites.

Zoology

Co-Requisite – Content
SZ1. Students will derive the phylogeny of animal taxa (monophyletic clades in a cladogram) using informative characteristics.
   a. Construct a classification of representative animal taxa including: Porifera, Cnidaria, Platyhelminthes, Nematoda, Annelida, Rotifera, Mollusca, Arthropoda (Mandibulata, Chelicerata, and Crustacea), Bryozoa, Brachiopoda, Echinodermata, Hemichordata, Urochordata, Cephalochordata, and Vertebrata.
   b. Place taxa in a phylogenetic (evolutionary) context and provide data to support hypotheses of relationships
   c. Construct a graphical representation of animal evolution (cladogram) Recognize characters that are shared and derived, uniting taxa Interpret graphical representations of animal evolution (cladograms)
   d. Recognize types of data used to test hypotheses of relationships.

SZ2. Students will explain the evolutionary history of animals over the geological history of Earth.
   a. Outline the geological history of Earth and discuss the major environmental changes that have occurred over time.
   b. Explain the concepts evolution, adaptation, natural selection, convergence, and speciation.
   c. Describe the fossil record of the animals including discussing the Cambrian Explosion and major extinction events.

SZ3. Students will compare form and function relationships within animal groups (clades) and across key taxa.
    a. Explain the similarities and differences among major body plans (e.g., asymmetry, radial and bilateral symmetry).
    b. Compare and contrast taxa based on morphological and genetic characters.
    c. Relate important structural changes to key functional transitions.
    d. Dissect representative taxa and describe their internal anatomy and the function of major organ systems and organs and relate to cell specializations.

SZ4. Students will assess how animals interact with their environment including key adaptations found within animal taxa.
    a. Discuss morphological and physiological adaptations relative to ecological roles.
    b. Relate animal adaptations, including behaviors, to the ecological roles of animals.
    c. Explain various life cycles found among animals (e.g., polyp and medusa in cnidarians; multiple hosts and stages in the platyhelminthe life cycle; arthropod metamorphosis; egg, tadpole, adult stages in the amphibian life cycle).

SZ5. Students will evaluate the relationships between humans and other animals.
    a. Describe the effects of human activities such as habitat destruction, over hunting, introduced species, and pollution on animal biodiversity.
    b. Explain the importance of species diversity to the biological resources needed by human populations including food, medicine, and natural aesthetics
    c. Compare and contrast how humans can preserve animal diversity in captive and natural environments with regard to habitat creation and conservation, research, legislation, animal enrichment, diet, medical, breeding programs and management of genetic diversity at local and global levels.
    d. Investigate how moral, legal, societal, political, and economic decisions impact animal diversity with short-term and long-term effects.

Co-Requisite – Characteristics of Science Habits of Mind
SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.
    a. Exhibit the above traits in their own scientific activities.
    b. Recognize that different explanations often can be given for the same evidence.
    c. Explain that further understanding of scientific problems relies on the design and execution of new experiments which may reinforce or weaken opposing explanations.

SCSh2. Students will use standard safety practices for all classroom laboratory and field investigations.
    a. Follow correct procedures for use of scientific apparatus.
    b. Demonstrate appropriate technique in all laboratory situations.
    c. Follow correct protocol for identifying and reporting safety problems and violations.

SCSh3. Students will identify and investigate problems scientifically.
    a. Suggest reasonable hypotheses for identified problems.
    b. Develop procedures for solving scientific problems.
    c. Collect, organize and record appropriate data.

d. Graphically compare and analyze data points and/or summary statistics.

e. Develop reasonable conclusions based on data collected.

f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

SCSh4. Students use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

a. Develop and use systematic procedures for recording and organizing information.

b. Use technology to produce tables and graphs.

c. Use technology to develop, test, and revise experimental or mathematical models.

SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

a. Trace the source on any large disparity between estimated and calculated answers to problems.

b. Consider possible effects of measurement errors on calculations.

c. Recognize the relationship between accuracy and precision.

d. Express appropriate numbers of significant figures for calculated data, using scientific notation where appropriate.

e. Solve scientific problems by substituting quantitative values, using dimensional analysis and/or simple algebraic formulas as appropriate.

SCSh6. Students will communicate scientific investigations and information clearly.

a. Write clear, coherent laboratory reports related to scientific investigations.

b. Write clear, coherent accounts of current scientific issues, including possible alternative interpretations of the data.

c. Use data as evidence to support scientific arguments and claims in written or oral presentations.

d. Participate in group discussions of scientific investigation and current scientific issues.

<u>The Nature of Science</u>

SCSh7. Students analyze how scientific knowledge is developed. Students recognize that:

a. The universe is a vast single system in which the basic principles are the same everywhere.

b. Universal principles are discovered through observation and experimental verification.

c. From time to time, major shifts occur in the scientific view of how the world works. More often, however, the changes that take place in the body of scientific knowledge are small modifications of prior knowledge. Major shifts in scientific views typically occur after the observation of a new phenomenon or an insightful interpretation of existing data by an individual or research group.

d. Hypotheses often cause scientists to develop new experiments that produce additional data.

e. Testing, revising, and occasionally rejecting new and old theories never ends.

SCSh8. Students will understand important features of the process of scientific inquiry. Students will apply the following to inquiry learning practices:

 a. Scientific investigators control the conditions of their experiments in order to produce valuable data.

b. Scientific researchers are expected to critically assess the quality of data including possible sources of bias in their investigations' hypotheses, observations, data analyses, and interpretations.

c. Scientists use practices such as peer review and publication to reinforce the integrity of scientific activity and reporting.

d. The merit of a new theory is judged by how well scientific data are explained by the new theory.

e. The ultimate goal of science is to develop an understanding of the natural universe which is free of biases.

f. Science disciplines and traditions differ from one another in what is studied, techniques used, and outcomes sought.

SCSh9. Students will enhance reading in all curriculum areas by:

a. Reading in all curriculum areas
- Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
- Read both informational and fictional texts in a variety of genres and modes of discourse.
- Read technical texts related to various subject areas.

b. Discussing books Discuss messages and themes from books in all subject areas.
- Respond to a variety of texts in multiple modes of discourse.
- Relate messages and themes from one subject area to messages and themes in another area.
- Evaluate the merit of texts in every subject discipline.
- Examine author's purpose in writing. Recognize the features of disciplinary texts.

c. Building vocabulary knowledge
- Demonstrate an understanding of contextual vocabulary in various subjects.
- Use content vocabulary in writing and speaking.
- Explore understanding of new words found in subject area texts.