



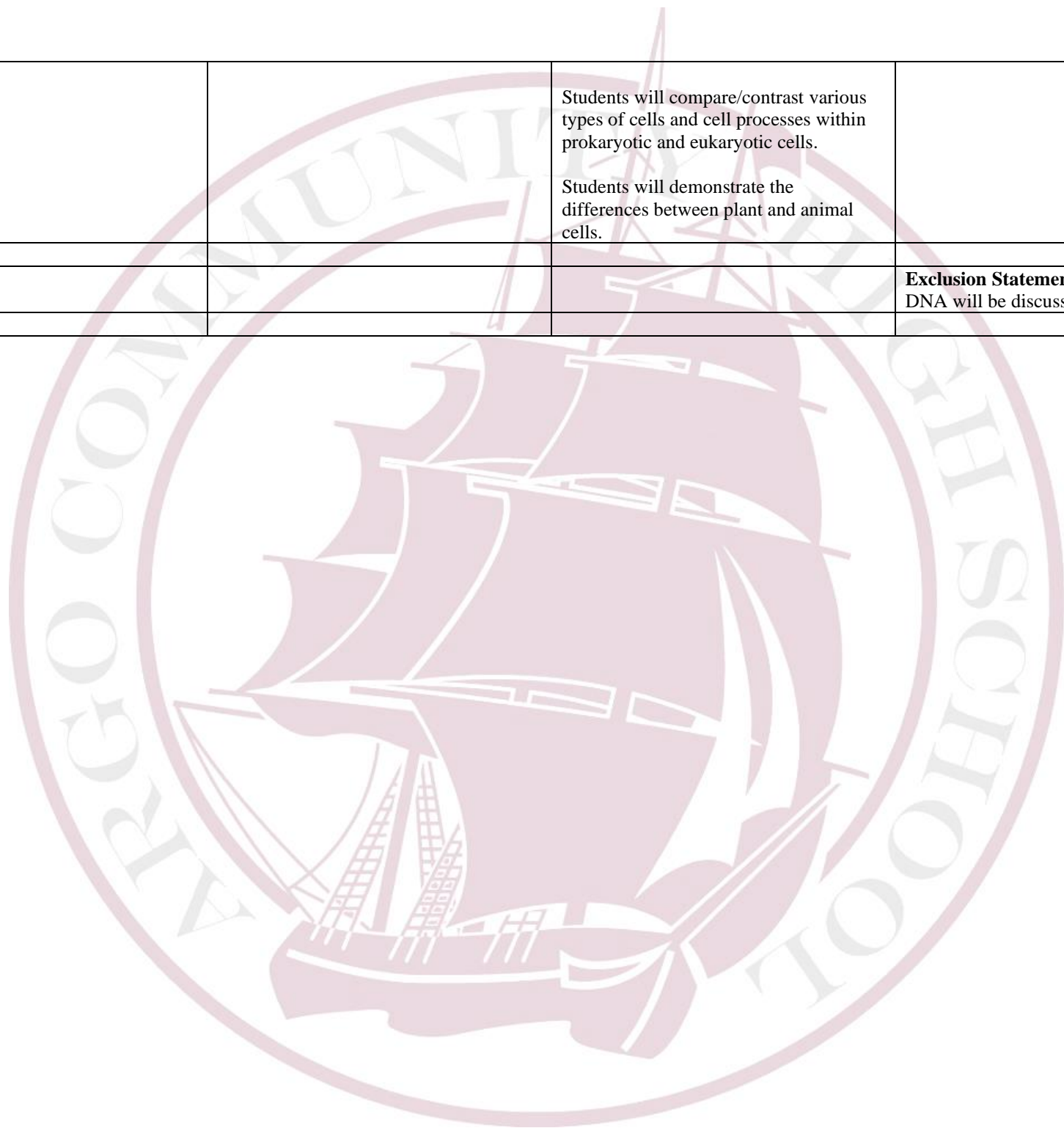
Comparative Biology at Argo Community High School

Updated 8/2022

Comparative Biology Curriculum Map

Unit	Topic	Enduring Understanding	Learning Objective	Essential Knowledge
1 Biology and the living world	1.1 Introduction to the living world	The study of Biology involves and understanding of biological principles and what life is. Life is connected through chemistry of life, homeostasis, and cellular processes.	Students will demonstrate the knowledge of and understanding of the characteristics of Life and what all living organisms have in common.	<p>How is the living world connected? How did the diversity of living change over time?</p> <ul style="list-style-type: none"> The world does not work in the naïve way we think it works. All life is connected through a combination of physical, and biological processes. Four unifying principles form the foundation of modern biology: cell theory, evolutionary theory, the gene theory and the principle of homeostasis.
	1.2 Essential Life Chemistry	Life is connected through chemistry. Basic chemical principles affect all living things and how they obtain and process energy and maintain homeostasis within their environment.	<p>Students will describe the arrangement of atoms and the nature of matter and why it is important to living things.</p> <p>Students will understand the properties of water and describe why it is essential to all living things to maintain homeostasis.</p> <p>Students will be able to explain the process of photosynthesis and cellular respiration and demonstrate how living things use these to process and cycle energy.</p>	<p>How are living organisms connected to the physical world?</p> <p>What physical science concepts are tied to understanding the living world and the connection between all living organisms?</p> <ul style="list-style-type: none"> Chemical energy Arises from the arrangement of atoms and can be released by a chemical reaction. Photosynthesis is an energy storing reaction: EQN: $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ Cellular Respiration is an energy Releasing reaction: EQN: $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{ATP (energy)}$
	1.3 Cellular Life	Cells are the basic unit of structure and function in all living things. Cells come in a variety of shapes and sizes to allow organisms to maintain homeostasis of cellular processes within their environment.	<p>Students will differentiate between prokaryotic cells, eukaryotic cells, Viruses, plant, and animal cells.</p> <p>Students will explain how the structures and functions of cells allow for homeostasis of cellular processes</p>	<p>How does the diversity of cellular life lead to homeostasis and the function of cellular processes?</p> <p>Compare and contrast different types of cells, and viruses. Which cell structures allow for cells to regulate homeostasis?</p>

			<p>Students will compare/contrast various types of cells and cell processes within prokaryotic and eukaryotic cells.</p> <p>Students will demonstrate the differences between plant and animal cells.</p>	
				<p>Exclusion Statement: Nucleic acids and DNA will be discussed but not tested.</p>



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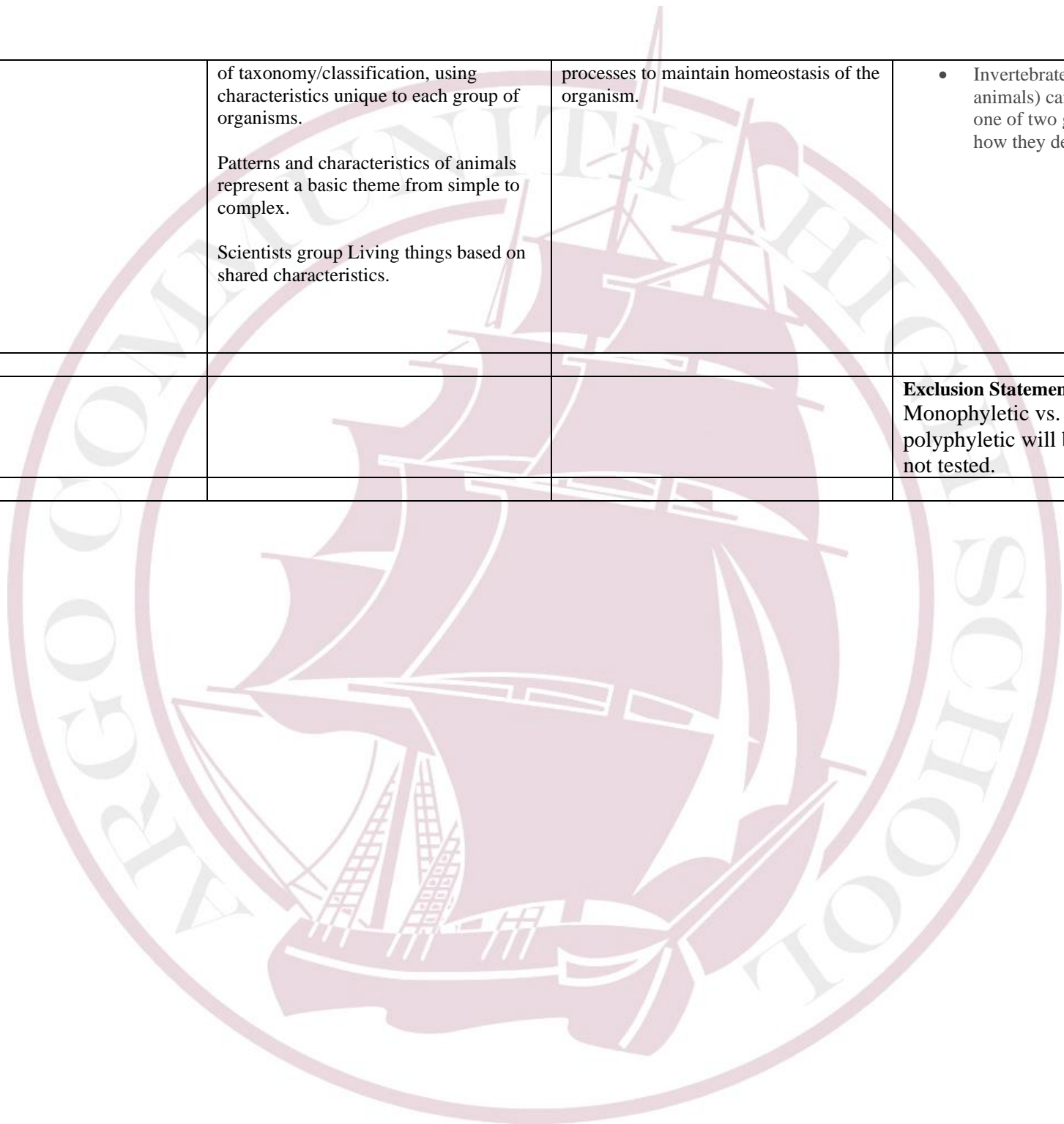
Unit	Topic	Enduring Understanding	Learning Objective	Essential Knowledge
2: Evolution and origins of the Animal Kingdom	2.1 Introduction to Evolution	Evolution is a foundation of biological studies. Animals have evolved over time which has led to animal diversity.	Students will apply the characteristics of living things to understand how organisms are best adapted to their environment.	<p>How did the huge diversity of animal kingdom get here over time? What are the biological mechanisms that explain how animal life changes over time?</p> <ul style="list-style-type: none"> • Darwin’s theory of evolution by natural selection states that living things with beneficial traits produce more offspring than others do. This produces changes in the traits of living things over time
	2.2 Evolution and Natural Selection	<p>A common misconception is that an organism can choose to “adapt” to a changing environment. Natural selection naturally results from genetic variation in a population and the fact that some of those variants may be able to leave more offspring in the next generation than other variants. That genetic variation is generated by random mutation — a process that is unaffected by what organisms in the population want or what they are “trying” to do. Either an individual has genes that are good enough to survive and reproduce, or it does not; it can’t get the right genes by “trying. The Primary force for adaptive evolution is natural selection.</p>	<p>Students will explain the role genetics plays in evolution and the reproduction of animals.</p> <p>Students will apply the theory of evolution to the reproduction and adaptations of animals.</p> <p>Students will be able to explain the process natural selection and how animal life has changed over time.</p>	<p>What are the biological mechanisms that explain how animal life changes over time?</p> <ul style="list-style-type: none"> • Evolutionary mechanisms include: natural selection, genetic drift, genetic recombination, mutation, and sexual selection • A Niche is an organism’s collective identity. The sum total of everything that a living thing is, the habitats it lives in, how it is adapted to that habitat and interactions within that habitat. When a niche is vacant, natural selection will favor those who exploit it.
	2.3 Classification/Taxonomy	Scientists group Living things based on shared characteristics.	<ul style="list-style-type: none"> • Students will learn the basis for the Linnaean system of classification of living organisms • Students will understand how binomial nomenclature is used to name organisms • Students will be able to explain that a Phylogeny is 	<ul style="list-style-type: none"> • Classification is an important step in understanding life on Earth. • All modern classification systems have their roots in the Linnaean classification system. • The Linnaean system is based on similarities in obvious physical traits. It consists of a

			<p>the evolutionary history of group of related organisms</p> <ul style="list-style-type: none"> Students will use a clade to exhibit a group of organisms and common ancestors. 	<p>hierarchy of taxa, from the kingdom to the species</p> <ul style="list-style-type: none"> Phylogeny is the evolutionary history of group of related organisms. It is represented by a phylogenetic tree that shows how species are related to each other through common ancestors. A clade is a group of organisms that includes an ancestor and all of its descendants. It is a phylogenetic classification, based on evolutionary relationships.
	2.4 Origins of the animal Kingdom	Patterns and characteristics of animals represent a basic theme from simple to complex.	Students will demonstrate knowledge of genetics, evolution of life, animal reproduction, and development and apply the characteristics of life for all animals.	<p>How were the fundamental characteristics for animals established with the evolution of simple organisms?</p> <p>What characteristics place sponges at the root of the animal family tree and maintain sponges as successful organisms?</p> <ul style="list-style-type: none"> Animals have evolved over time which has led to animal diversity.
				<p>Exclusion Statement: The formation of the earth and geochemical processes will be discussed as it pertains to the age and development of the earth. DNA and Genetics will be covered and reviewed but not tested.</p>

Comparative Biology Curriculum Map

Unit	Topic	Enduring Understanding	Learning Objective	Essential Knowledge
3 Invertebrates	3.1 Invertebrate Diversity	<p>The study of the diversity of animals involves understanding and knowledge of taxonomy/classification, using characteristics unique to each group of organisms.</p> <p>Patterns and characteristics of animals represent a basic theme from simple to complex.</p> <p>Scientists group Living things based on shared characteristics.</p>	<p>Students will understand unique structures of invertebrates and how differentiation has led to survival of species</p> <p>Students will understand animal behavior and how evolutionary process has led to these different animals</p>	<ul style="list-style-type: none"> • What characteristics of invertebrates makes them a successful group of organisms? • The majority of living animals are invertebrates. Invertebrates lack a backbone. • Invertebrates may have an incomplete or a complete digestive system. • Invertebrates vary in how they move and in the complexity of their nervous system. • Most invertebrates reproduce sexually. After hatching, many invertebrates pass through one or more larval stages that are different from the adult stage
	3.2 Invertebrate Evolution	<p>The study of the diversity of animals involves understanding and knowledge of taxonomy/classification, using characteristics unique to each group of organisms.</p> <p>Patterns and characteristics of animals represent a basic theme from simple to complex.</p> <p>Scientists group Living things based on shared characteristics.</p>	<p>Students will demonstrate knowledge of how invertebrate structures and behaviors evolved and relate to the environment they are found in.</p> <p>Students will demonstrate knowledge of understanding the major invertebrate body stems (structures and functions) and how these organisms can maintain homeostasis within their environment.</p>	<ul style="list-style-type: none"> • Many important traits evolved in invertebrates. They include: multicellularity, tissues and organs, radial and bilateral symmetry, cephalization, mesoderm, complete digestive system, coelom, segmented body, and notochord
	3.3 Invertebrate Classification	<p>The study of the diversity of animals involves understanding and knowledge</p>	<p>Students will classify various groups of invertebrates using psychological characteristics, adaptations, and</p>	<ul style="list-style-type: none"> • Eight invertebrate phyla contain most invertebrate species.

		<p>of taxonomy/classification, using characteristics unique to each group of organisms.</p> <p>Patterns and characteristics of animals represent a basic theme from simple to complex.</p> <p>Scientists group Living things based on shared characteristics.</p>	<p>processes to maintain homeostasis of the organism.</p>	<ul style="list-style-type: none"> Invertebrates (and higher animals) can also be placed in one of two groups based on how they develop as embryos.
				<p>Exclusion Statement: Monophyletic vs. paraphyletic vs. polyphyletic will be discussed but not tested.</p>



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Unit	Topic	Enduring Understanding	Learning Objective	Essential Knowledge
4: Vertebrates	4.1 Vertebrate Diversity	<p>The study of the diversity of animals involves understanding and knowledge of taxonomy/classification, using characteristics unique to each group of organisms.</p> <p>Patterns and characteristics of animals represent a basic theme from simple to complex.</p> <p>Scientists group Living things based on shared characteristics.</p>	<p>Students will understand unique structures of vertebrates and how differentiation has led to survival of species</p> <p>Students will understand animal behavior and how evolutionary process has led to these different animals</p>	<ul style="list-style-type: none"> • Vertebrates are a subphylum of chordates that have a vertebral column and an endoskeleton made of cartilage or bone. • Vertebrates also have complex organ systems, including a closed circulatory system with a heart, an excretory system with a pair of kidneys, and an adaptive immune system
	4.2 Vertebrate Evolution	<p>The study of the diversity of animals involves understanding and knowledge of taxonomy/classification, using characteristics unique to each group of organisms.</p> <p>Patterns and characteristics of animals represent a basic theme from simple to complex.</p> <p>Scientists group Living things based on shared characteristics.</p>	<p>Students will demonstrate knowledge of how vertebrates evolved and relate to the environment they are found in.</p> <p>Students will demonstrate knowledge of understanding the major body stems (structures and functions) and how these help vertebrates maintain homeostasis within their environment.</p>	<ul style="list-style-type: none"> • The earliest vertebrates resembled hagfish and lived more than 500 million years ago. • As other classes of fish appeared, they evolved traits such as a complete vertebral column, jaws, and a bony endoskeleton. • Amphibians were the first tetrapod vertebrates as well as the first vertebrates to live on land. • Reptiles were the first amniotic vertebrates. • Mammals and birds, which both descended from reptile-like ancestors, evolved endothermy, or the ability to regulate body temperature from the inside

	4.3 Vertebrate Classification	<p>The study of the diversity of animals involves understanding and knowledge of taxonomy/classification, using characteristics unique to each group of organisms.</p> <p>Patterns and characteristics of animals represent a basic theme from simple to complex.</p> <p>Scientists group Living things based on shared characteristics.</p>	<p>Students will classify various groups of vertebrates using psychological characteristics, adaptations, and processes to maintain homeostasis of the organism.</p>	<ul style="list-style-type: none"> The 50,000 species of living vertebrates are placed in nine classes: hagfish, lampreys, cartilaginous fish, ray-finned fish, lobe-finned fish, amphibians, reptiles, birds, and mammals
				<p>Exclusion Statement: Nucleic acids and DNA will be discussed but not tested.</p>

