

Zoology: Natural Selection and Evolution

Stage 1 Desired Results		
ESTABLISHED GOALS: <u>Competencies:</u> <i>Patterns</i> Students will demonstrate the ability to observe and describe patterns in natural and human designed phenomena and use those patterns to support claims about the observed or predicted relationships among phenomena. <i>Stability & Change in Systems</i> Students will demonstrate the ability to investigate and analyze static and dynamic conditions of natural and human designed systems in order to explain and predict changes over time. <i>Nature of Science</i> Student will demonstrate the ability to work collaboratively and individually to generate testable questions or define problems, plan and conduct investigations using a variety of research methods in a various settings, analyze and interpret data, reason with evidence to construct explanations in light of existing theory and previous research, and effectively communicate the research processes and conclusions. - Students will demonstrate the ability to analyze and summarize text and integrate knowledge to make meaning of discipline-specific materials. - Students will demonstrate the ability to produce coherent and supported writing in order to communicate effectively for a range of discipline-specific tasks, purposes, and audiences. - Students will demonstrate the ability to speak purposefully and effectively by strategically making decisions about content, language use, and discourse style. <u>Content Standards:</u> - HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. - 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. - 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. - HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. - HS-LS4-5. Evaluate the evidence supporting claims that changes in	<i>Transfer</i>	
	<i>Students will be able to independently use their learning to make informed decisions based upon their understanding of the evolutionary relationships among species.</i>	
	<i>Meaning</i>	
	ENDURING UNDERSTANDINGS <i>Students will understand that...</i> - different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. - empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.. - scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future.. - empirical evidence is needed to identify patterns. - much of science deals with constructing explanations of how things change and how they remain stable.	ESSENTIAL QUESTIONS <i>What's the best way to classify organisms?</i> <i>How connected are organisms based on the variability of genetic and genomes?</i>
	<i>Acquisition</i>	
	<i>Students will know...</i> - that genetic information provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. - that natural selection occurs only if there is	<i>Students will be skilled at...</i> - communicating results and scientific information. - constructing an explanation or argument based on evidence. - applying concepts of statistics and probability to support explanation. - evaluating evidence.

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. • HS-ESS2-7 Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.	both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. • that the traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. • that evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. • that natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. • that adaptation also means that the distribution of traits in a population can change when conditions change. • that changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species.	
--	--	--

- that species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost.
- that gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.
- that the many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it.

vocabulary:

pectoral, pelvic, frontal plane, ventral, lateral, dorsal, medial, sagittal plane, systematization, hierarchical system, taxa/taxon, systematization, binomial nomenclature, cladogram, phylogenetic tree, comparative anatomy, domain, kingdom, phylum, class, order, family, genus, species, commensalism, symbiotic relationship, mutualistic, parasitic, consumer, herbivore, carnivore, heterotrophic, chordate, notochord, dorsal hollow nerve cord, pharyngeal pouches/slits, postanal tail, segmentation, gnathostomes, agnathan, hagfish, lampreys, fishes, cartilaginous and bony fishes, lateral line system, clasper, oviparous, viviparous, placenta, monotreme, marsupial, operculum, endothermic, ectothermic, osmotic regulation, swim bladder, tetrapod, salamander, reptile, amniote, pneumatized, air sacs, gizzard, crop, archaeopteryx, diaphragm, mammary glands, hominids, ethology, innate, habituation, imprinting, cooperative behavior, social, territorial, courtship, homing, playing, insight, altruism, reciprocity, communication, niche, population, predation, carrying capacity, invasive species, limiting resources, competition

- RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics*.
- RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
- RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
- WHST.11-12.1 Write arguments focused on *discipline-specific content*.
- WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- WHST.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
- WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

- *reason effectively*
- *make judgments and decisions*
- *think creatively*
- *collaborate with others*
- *communicate clearly*
- *problem solve*

Stage 2 - Evidence

<i>Evaluative Criteria</i>	<i>Assessment Evidence</i>
	PERFORMANCE TASK(S):
	OTHER EVIDENCE:

Stage 3 – Learning Plan

Summary of Key Learning Events and Instruction

<i>Language Arts Integration</i>	<i>Mathematics Integration</i>
• 1.OA.1 Use	• MP.2 - Reason abstractly and quantitatively. • MP.4 - Model with mathematics. • HSF-IF.B.5 - Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. • HSS-ID.B.6 - Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
<i>Technology Integration</i>	<i>District Materials</i>
• 1.OA.1 Use	

Science and Engineering Practices	
S&EP 2. Developing and using models S&EP 4. Analyzing and interpreting data S&EP 6. Constructing explanations (for science) and designing solutions (for engineering) S&EP 7. Engaging in argument from evidence S&EP 8. Obtaining, evaluating, and communicating information	