

Phoenixville Area School District Understanding by Design (UbD) Science Unit Plan

Grade Level &/or HS Subject: **BIOLOGY**

Unit Name: **EVOLUTION**

Stage 1 Desired Results		
Overarching NGSS & PA Standards: HS-LS4-1 HS-LS4-2 HS-LS4-3 HS-LS4-4 HS-LS4-5 HS-LS2-8 Which branch(es) of science apply: BIOLOGY	<i>Transfer</i>	
	<i>Students will be able to independently use their learning to...</i> <ul style="list-style-type: none"> Obtain, evaluate, and communicate information (supported by evidence) Construct explanations and design solutions Analyze and interpret data using computational thinking 	
	<i>Meaning-Making</i>	
	<i>Students will understand that...</i> <ul style="list-style-type: none"> common ancestry and biological evolution are supported by multiple lines of empirical evidence. 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. organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. natural selection leads to adaptation of populations. 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. there is a role of group behavior on individual and species' chances to survive and reproduce. 	ESSENTIAL QUESTIONS <i>Students will keep considering...</i> <ul style="list-style-type: none"> What evidence shows that different species are related? How does genetic variation among organisms affect survival and reproduction? How does the environment influence population of organisms over multiple generations?
	<i>Knowledge and Skills Acquisition</i>	
	UNDERSTANDINGS	
	<i>Students will know...</i> <ul style="list-style-type: none"> 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. Natural selection occurs only if there is 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. 	<i>Students will be skilled at...</i> <ul style="list-style-type: none"> Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible.

	<ul style="list-style-type: none"> • The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. • Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, 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. • Adaptation also means that the distribution of traits in a population can change when conditions change. • 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. • 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. • Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. • How natural selection can impact allele frequencies of a population.* • The factors that can contribute to the development of new species (e.g., isolating mechanisms, genetic drift, founder effect, migration).* • How genetic mutations may result in genotypic and phenotypic variations within a population.* • Evidence supporting the theory of evolution (i.e., fossil, anatomical, physiological, embryological, biochemical, and universal genetic code).* • The scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.* <p style="text-align: center;">KEY VOCABULARY</p> <p>Adaptations, Allele frequency, Common Descent, Convergent evolution, Divergent evolution, Embryology, Extinction, Fact, Fitness, Fossil, Founder effect, Gene pool, Genetic drift, Homology, Hypothesis, Inference, Isolating mechanisms, Law, Migration, Natural Selection, Observation, Population, Speciation, Species, Theory, Vestigial organ</p>	<ul style="list-style-type: none"> • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. • Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. • Communicate scientific information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). • A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory
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		does not accommodate, the theory is generally modified in light of this new evidence.
Stage 2 – Evidence		
Evaluative Criteria	<i>Assessment Evidence</i>	
What criteria will be used in each assessment to evaluate attainment of the desired results?	<p>PERFORMANCE TASK(S):</p> <ul style="list-style-type: none"> • Natural Selection Modeling Lab • Evidence of Evolution Inquiry Stations • Isolating Mechanisms/Speciation Modeling 	<p>Differentiation Considerations:</p> <ul style="list-style-type: none"> • Grouping of students • Split Screen Activities • Scaffolding of Information
What criteria will be used in each assessment to evaluate attainment of the desired results?	<p>OTHER EVIDENCE:</p> <ul style="list-style-type: none"> • Quizzes and Unit Exams • Choice of the following: <ul style="list-style-type: none"> ○ Pocket Mouse Video Response ○ Virtual Gizmo Labs ○ Cladogram Activity ○ Breeding Bunnies Activity 	<p>Differentiation Considerations:</p> <ul style="list-style-type: none"> • Grouping of students • Split Screen Activities • Scaffolding of Information