**HS-LS4 Biological Evolution: Unity and Diversity**

**HS-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.**

Further explanation: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.

Obtaining, Evaluating, and Communicating Information, Evidence of Common Ancestry and Diversity, Patterns

**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.**

Further explanation: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.

Constructing Explanations and Designing Solutions, Adaptation, Cause and Effect

**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.**

Further explanation: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations. Observe historical data for the distribution of humpback whales in the Gulf of Maine looking specifically at skin pigmentation.

Analyzing and Interpreting Data, Natural Selection, Adaptation, Patterns

**HS-LS4-4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations.**

Further explanation: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.

Constructing Explanations and Designing Solutions, Adaptation, Cause and Effect

**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.**

Further explanation: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.

Engaging in Argument from Evidence, Adaptation, Cause and Effect

**HS-LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.**

Further explanation: Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.

Using Mathematics and Computational Thinking, Biodiversity and Humans, Developing Possible Solutions, Cause and Effect