Biology
Essential Curriculum

Unit 1: Biodiversity and Stability (Macroecology)

Use a mathematical model to describe the transfer of energy and matter from one trophic level to another and how that energy and matter is conserved as it cycles through ecosystems.(HS-LS 2-4)

Use computational representations to explain what affects carrying capacity. (HS-LS 2-1)

Using graphical comparisons of data, analyze the trends of factors affecting biodiversity on the health of populations within different trophic levels of an ecosystem. (HS-LS 2-2)

Evaluate how changes in environmental conditions impact the complex interactions of organisms within an ecosystem and how alterations of the conditions may result in new ecosystems. (HS-LS 2-6)

Unit 2: Cycling Matter and Energy Dynamics in Ecosystems (Molecular level)

Use a model to illustrate how photosynthesis transforms light energy, carbon dioxide and water into stored chemical energy of carbohydrates while releasing oxygen. (HS-LS1-5)

Demonstrate how the atoms of sugar molecules combine with other elements to form amino acids and other large carbon-based molecules. (HS-LS1-6)

Illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. (HS-LS1-7)

Construct and revise an explanation based on evidence for the cycling of matter from photosynthesis and respiration to explain the flow of energy in aerobic and anaerobic conditions. (HS-LS 2-3)

Develop a model to show that photosynthesis and respiration are important components in exchanging carbon amongst the biosphere, atmosphere, oceans and geosphere. (HS-LS 2-5)

Changes in the atmospheric composition are due to organisms, including humans, capturing and releasing carbon dioxide in a closed system. (HS-ESS 2-6)

Using computational representation from published data, discover how the biosphere, ocean and atmosphere interactions are affected by human activities. (HS-ESS3-6)

Unit 3: Human Impact with Environmental Literacy Project (SSL Component)

Design, evaluate and refine a solution for reducing the impacts of human activities on the environment and biodiversity. (HS-LS 2-7)

Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity, such as loss of biodiversity, or a lack a genetic variation. (HS-LS 4-6)

Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and the preservation of biodiversity. (HS-ESS3-3)

Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. (HS-ETS1-1)

Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. (HS-ETS1-3)

Unit 4: Homeostasis and Body Systems

Illustrate how cells, tissues and organs interact in the body to provide specific life-sustaining functions within body systems and how body systems interact within an organism. (HS-LS1-2)

Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (HS-LS1-3)

Access valid and reliable health products and services to enhance student health. (HES-3.12.5)

Evaluate the influences and effect of media, culture, technology and other factors on personal, family, and peer health in regard to Nicotine and vaping. (HES-2.12.5)

Analyze how some health risk behaviors can influence the likelihood of engaging in unhealthy behaviors, such as heroin use. (HES-2.12.9)

Use career oriented goal-setting skills to assess personal health practices and overall health status. (HES-6.12.1)

Develop a plan to attain a personal health goal that addresses strengths, needs, and risks. (HES-6.12.2)

Unit 5: DNA and Heredity

Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. (HS-LS1-1)

Ask questions to clarify relationships about the role of DNA and chromosomes and coding instructions for genetic traits passed from parent to offspring. (HS-LS 3-1)

Use a model to illustrate the role of cellular division (mitosis) and how differentiation produces and maintains complex organisms. (HS-LS1-4)

Make and defend a claim based on evidence that inheritable genetic variations may result from new genetic recombination through meiosis and sexual reproduction, viable errors during replication, and/or mutations caused by environmental factors. (HS-LS 3-2)

Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. (HS-LS 3-3)

Unit 6: Evolution

Construct an explanation based on evidence that the process of evolution primarily results from the potential for a species to increase in number, the heritable genetic variation within the species due to mutations and sexual reproduction, competition for limited resources and the proliferation of those organisms that are better able to survive and reproduce in their environment, all which allow for the process of natural selection. (HS-LS 4-2)

Apply concepts of statistics and probability, using genotypic allelic frequencies, to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. It is not necessary to complete Hardy-Weinberg Calculations. (HS-LS 4-3)

Construct an explanation based on evidence for how natural selection leads to adaptations within populations. (HS-LS 4-4)

Evaluate the evidence for how the role of group behaviors, like flocking, schooling, herding and cooperative behaviors like hunting, migrating and swarming, may lead to an increase in individuals and species' chances for survival and reproduction. (HS-LS 2-8)

Support claims that changes in environmental conditions may result in increases in the number of individuals of some species, the emergence of new species over time, and the extinction of other species.
(HS-LS 4-5)

Construct an argument based on evidence about the simultaneous coevolution of Earth's systems, both atmospheric, hydrospheric and terrestrial, and life on Earth, the biosphere. (HS-ESS2-7)
Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence, such as anatomical, biochemical and embryological evidence. (HS-LS 4-1)