

Subject: Science
Grade/Course: Biology
Unit of Study: Unit 8-Evolution
Length of Unit: 3 Weeks

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Practices of Science and Engineering (NGSS)

- ✓ 1. Asking questions (for science) and defining problems (for engineering)
 - ✓ 2. Developing and using models
 - ✓ 3. Planning and carrying out investigations
 - ✓ 4. Analyzing and interpreting data
 - ✓ 5. Using mathematics and computational thinking
 - ✓ 6. Constructing explanations (for science) and designing solutions (for engineering)
 - ✓ 7. Engaging in argument from evidence
 - ✓ 8. Obtaining, evaluating, and communicating information
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Performance Expectations for the Unit

- CO-LS.2.9b/NGSS-HS-LS4-1 Analyze and interpret multiple lines of evidence supporting the idea that all species are related by common ancestry such as molecular studies, comparative anatomy, biogeography, fossil record and embryology.
- CO-LS.2.9d/NGSS HS-LS4-2 Analyze and interpret data on how evolution can be driven by three key components of natural selection - heritability, genetic variation, and differential survival and reproduction.
- CO-LS.2.9e Generate a model - an evolutionary tree - showing how a group of organisms is most likely diverged from common ancestry.
- NGSS-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.

- **NGSS-HS-LS4-4/CO-LS.2.9a Construct an explanation based on evidence for how natural selection leads to adaptation of populations.**
- **NGSS-HS-LS2-8 Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.**
- **NGSS HS-LS4-5/CO-LS.2.9c 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.**

(CO = Colorado Academic Standards, NGSS = Next Generation Science Standards, CCCS = Colorado Community College System)

Essential Questions

1. Why are there so many different kinds of organisms on Earth?
 2. Are all organisms on Earth related to each other?
 3. Why would organisms change over time?
 4. What is Natural Selection?
 5. How is speciation linked to environmental change?
 6. Does behavior play a role in whether organisms survive and reproduce?
 7. What evidence is there that organisms have changed over time during the course of Earth's history?
 8. How can patterns of characteristics shared among organisms be used to categorize life's diversity according to relatedness?
 9. Have humans evolved from earlier forms?
 10. How are humans involved in controlling evolution?
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Big Ideas

1. The process of evolution drives the diversity and unity of life
2. According to specific evidence, all life on Earth evolved from a common ancestor through evolutionary processes.
3. Natural selection only occurs if there is variation in the genetic information between organisms in a population and variation in traits that leads to differences in performance among individuals in a given environment.
4. Traits that positively affect survival are more likely to be reproduced and thus are more common in the population.
5. Genetic diversity within the population allows for reproductive success in the event of environmental change.
6. Like different structures, different behaviors may have adaptive advantages for individuals in a certain environment.

7. Genetic information, like the fossil record, provides evidence of evolution.
 8. Multiple lines of descent can be inferred by comparing the DNA sequences of different organisms.
 9. Human anatomy and physiology reflect the fact that our species has evolved from a common ancestor that we share with all primates.
 10. Human activities can influence evolution of species both through actions upon the environment and directly through the manipulation of an organism's DNA.
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Key Vocabulary/Concepts

- Lamarckism
- Darwinism
- Evolution
- Descent with Modification
- Natural Selection
- Artificial Selection
- Sexual Selection
- Microevolution
- Mutation
- Gene Pool
- Gene Frequency
- Genetic Drift
- Gene Flow
- Bioinformatics
- DNA Sequence comparisons
- BLAST
- Molecular Clocks
- Toolkit Genes (HOX genes)
- Cladogram
- Speciation
- Macroevolution
- Comparative Anatomy
- Homologous Structures
- Fossil Record
- Embryology
- Biogeography
- Australopithecus
- Medial Angle
- Bipedal Locomotion

Major Engaging Learning Experiences and Labs

- Sequence Comparison Lab (BLAST alignment of DNA sequences to examine the degree of relatedness between different species). - [Link](#)
 - Evolution Survey and Discussion- [Link](#)
 - Did Darwin Do It All? Explanations of Evolution - [Link](#)
 - HHMI Video: Endless Forms Most Beautiful by Sean Carroll -[Link](#)
 - HHMI Video: Selection in Action by David Kingsley - [Link](#)
 - Artificial Selection Lab (Bean size lab or Jelly-Bean lab): collect and analyze data about bean morphology after multiple generations of selection from a pool of beans)
 - Natural Selection Simulation- PhET [Link](#)
 - Microevolution Webquest: Evolution 101 and Guppy Sexual Selection - [Link](#)
 - Human Body in Primate Time - Skull Comparison Lab - [Link](#)
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