

4. Grade 07 - Evidence of Common Ancestry and Selection and Adaptation

Content Area: **Science**
Course(s):
Time Period: **Week3**
Length: **14**
Status: **Not Published**

Unit Overview

In this unit of study, students analyze graphical displays and gather evidence from multiple sources in order to develop an understanding of how fossil records and anatomical similarities of the relationships among organisms and species describe biological evolution. Students search for patterns in the evidence to support their understanding of the fossil record and how those patterns show relationships between modern organisms and their common ancestors. The crosscutting concepts of *cause and effect*, *patterns*, and *structure and function* are called out as organizing concepts for these disciplinary core ideas. Students use the practices of *analyzing graphical displays* and *gathering, reading, and communicating information*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on MS-LS4-1, MS-LS4-2, and MS-LS4-3.

Students construct explanations based on evidence to support fundamental understandings of natural selection and evolution. They will use ideas of genetic variation in a population to make sense of how organisms survive and reproduce, thus passing on the traits of the species.

This unit is based on MS-LS4-4, MS-LS4-5, and MS-LS4-6.

Standards

Construct an explanation based on evidence that describes how genetic variations of traits in a population increase so surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability stc reasoning to construct explanations] ([MS-LS4-4](#))

Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologie:

technologies leading to these scientific discoveries.] ([MS-LS4-5](#))

Use mathematical representations to support explanations of how natural selection may lead to increases and decreases in populations over time. [Clarification Statement: Emphasis is on using mathematical models, probability statements, and support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include [MS-LS4-6](#)]

- MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
- MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

Big Ideas

Prior to middle school, students know that some living organisms resemble organisms that once lived on Earth. Fossils provide evidence about the types of organisms and environments that existed long ago. In this unit of study, students will build on this knowledge by examining how the fossil record documents the existence, diversity, extinction, and change of many life forms through Earth's history. The fossil record and comparisons of anatomical similarities between organisms and their embryos enable the inference of lines of evolutionary descent.

Students analyze images or data to identify patterns in the locations of fossils in layers of sedimentary rock. They can use their understanding of these patterns to place fossils in chronological order. Students may make connections between their studies of plate movement in grade 7 and the possible shifting of layers of sedimentary rock to explain inconsistencies in the relative chronological order of the fossil record as it is seen today.

Students can analyze data on the chronology of the fossil record based on radioactive dating. An explanation of radioactive dating can be provided to students along with data, but students are not expected to complete any calculations. Information can be provided in the form of data tables correlating fossil age with half-life. This information could also be presented in the form of a graph.

Students may analyze images from the fossil record to identify patterns of change in the complexity of the anatomical structures in organisms. For example, students can observe pictures of fossilized organisms with similar evolutionary histories in order to compare and contrast changes in their anatomical structures over time. Students may be placed in groups, with each group examining changes in anatomical structures over time within one evolutionary lineage (e.g., the whale, the horse, cycads). Once students have identified patterns of change within one evolutionary lineage, they can meet with students from other groups to discuss patterns of change across multiple evolutionary lineages. Students could then present their findings using a variety of media choices (PowerPoint, poster, short skit or play, comic strip, etc.). This activity would provide application of the real-world phenomenon that life on Earth changes over time.

Students could be provided with multimedia experiences in order to analyze visual displays of the embryological development of different species. They can analyze the linear and nonlinear relationships among the embryological developments of different species. For example, students can analyze data about embryological development to determine whether development across species shares a similar rate, similar size of embryos, or similar characteristics over a period of time. If these characteristics are consistent across species, a linear relationship can be inferred. At the

point where the rate, size, or general characteristics of development diverge, the relationship can then be classified as nonlinear.

Students can integrate the patterns they identified in the fossil record by studying sedimentary rock images and radioactive dating data provided by the teacher and the relationships they discovered through their study of embryological development with evidence from informational texts to develop an explanation of changes in life forms throughout the history of life on Earth. This explanation could be presented in the form of a claim, with students required to cite evidence from their studies of diagrams, images, and texts to explain that life on Earth has changed over time.

Content

- Genetic variations of traits in a population increase or decrease some individuals' probability of surviving and reproducing in a specific environment.
- Natural selection leads to the predominance of certain traits in a population and the suppression of others.
- Natural selection may have more than one cause, and some cause-and-effect relationships within natural selection can only be described using probability.
- Natural selection, which over generations leads to adaptations, is one important process through which species change over time in response to changes in environmental conditions.
- The distribution of traits in a population changes.
- Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common.
- Natural selection may have more than one cause, and some cause-and-effect relationships in natural selection can only be described using probability.
- Mathematical representations can be used to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
- In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding.
- In artificial selection, humans choose desirable, genetically determined traits in to pass on to offspring.
- Phenomena, such as genetic outcomes in artificial selection, may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.
- Technologies have changed the way humans influence the inheritance of desired traits in organisms.
- Engineering advances have led to important discoveries in the field of selective breeding.

- Engineering advances in the field of selective breeding have led to the development of entire industries and engineered systems.
- Scientific discoveries have led to the development of entire industries and engineered systems.

Skills

Explain some causes of natural selection and the effect it has on the increase or decrease of specific traits in populations over time.

Use mathematical representations to support conclusions about how natural selection may lead to increases and decreases of genetic traits in populations over time.

Construct an explanation that includes probability statements regarding variables and proportional reasoning of how genetic variations of traits in a population increase some individuals' probability surviving and reproducing in a specific environment.

Use probability to describe some cause-and-effect relationships that can be used to explain why some individuals survive and reproduce in a specific environment.

Assessment

Accommodations for students with IEPs and learning difficulties:

- Model how to perform specific roles when conducting experiments
- visual sentence frames using academic vocabulary for discussion
- use science "Reading Essentials" packets in place of textbook sections
- print lesson vocabulary in premade flashcard fashion to be used as a study guide
- allow verbal responses in place of written responses
- provide graphic organizers for comparing and contrasting science concepts
- modify graphic organizers/worksheets to reduce choices

-Use visuals to show important vocabulary for students to make connections

-Vocabulary word banks and strategies

-Think alouds and Think-Pair-Share

For ELL students:

-visuals for vocabulary

-word wall

-additional word work such as illustrating vocabulary and playing vocabulary games

-partner reading

-choral reading

-color-coded sticky notes for close reading to identify which sticky notes pertain to vocabulary

-questions about text, etc.

-When students make an error in speaking, answer or restate what they said using the correct form without drawing attention to the mistake.

For gifted students:

-additional self-selected science resources to explore the characteristics of life

-offer bonus points for "Reaching Higher" critical thinking questions

Resources

McGraw-Hill.com online resources

Glencoe Science book chapter

Embryology identification game

Making Fossils activity

BrainPop videos

Reading Essential Packets

Reflection
