Unit 04: Biological Evolution - Unity & Diversity (Week 25 - Week 30)

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **FY**
Status: **Published**

Standards Alignment

- **MS-LS4-1**: Analyze and interpret data for patterns in the fossil record, embryology, and anatomical structures to support the idea of common ancestry and biological evolution.
- **MS-LS4-2**: Construct explanations based on evidence from genetics, fossils, and comparative anatomy to support the idea of natural selection as a mechanism for evolution.
- **MS-LS4-3**: Explain how adaptation leads to the evolution of new species over time.
- **MS-LS4-4**: Use evidence from evolutionary biology to predict patterns of species distribution.
- **MS-LS4-5**: Provide evidence for how environmental changes can affect the survival and adaptation of species over time.

New Jersey Student Learning Standards

LS4: Biological Evolution: Unity and Diversity
LS4.B: Natural Selection

Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)

LS4: Biological Evolution: Unity and Diversity
LS4.A: Evidence of Common Ancestry and Diversity

The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)

Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2)

Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)

LS4.B: Natural Selection

Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)

In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5)

LS4.C: Adaptation

Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a

population changes. (MS-LS4-6)

LS4: Biological Evolution: Unity and Diversity
LS4.A: Evidence of Common Ancestry and Diversity

Genetic information provides evidence of evolution. DNA sequences varyamong species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred bycomparing the DNA sequences of different organisms. Such information isalso derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (HS-LS4-1)

LS4.B: NaturalSelection

The traits that positively affect survival are more likely to be reproduced,and thus are more common in the population. (HS-LS4-3)

LS4.D: Biodiversityand Humans

Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (secondary to HSLS2-7)

SCI.2.LS4.D	Biodiversity and Humans
SCI.3-LS4	Biological Evolution: Unity and Diversity
SCI.3.LS4.A	Evidence of Common Ancestry and Diversity
SCI.3.LS4.B	Natural Selection
SCI.3.LS4.C	Adaptation
SCI.MS-LS4-1	Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
SCI.MS-LS4-2	Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
SCI.MS-LS4-3	Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.
SCI.MS-LS4-4	Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
SCI.MS-LS4-5	Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
SCI.MS-LS4-6	Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Integration of Career Readiness, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.

CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.8.A.4	Graph and calculate data within a spreadsheet and present a summary of the results.

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math Section

LA.K-12.NJSLSA.R2	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
LA.K-12.NJSLSA.R8	Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
LA.RI.8	Reading Informational Text
LA.RI.8.2	Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.
LA.K-12.NJSLSA.W	Writing
	Text Types and Purposes
LA.K-12.NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.RI.8.8	Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.
	Text Types and Purposes
LA.W.8.1	Write arguments to support claims with clear reasons and relevant evidence.
LA.W.8.1.B	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale

Unit Rationale

The purpose of this unit…

Evolution is a topic that is fundamental to the study of Biology and links topics such as genetics, molecular biology, reproduction, anatomy and classification. In this unit, students will learn that all life on earth is connected and that new species are a result of small genetic changes in populations over time. Natural selection is the driving force of evolution and scientists are still collecting clues to provide evidence and to deepen our understanding of the history of life on earth.

Meaning

Essential Questions

Essential Questions

1. How do organisms change over time in response to changes in the environment?”

2. What does the phrase "common ancestor" mean and why is it important in understanding evolution?

3. How do genetic variations/mutations and recombination of genes during meiosis enable evolution to occur?

4. What does the phrase" natural selection is the driving force of evolution" mean, and why is it important in understanding evolution?

5. What evidence exists that all organisms on earth can be traced back to a common ancestor?

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

1. The theory of evolution explains how all life on earth evolved from a common ancestor that first appeared billions of years ago.

2. Variation exists in all species and allows some individuals to be better able to survive in a particular environment than others.

3. Natural selection is the process by which evolution occurs.

4. Fossils, embryology, molecular biology, and anatomical comparisons, can all be used to provide evidence for evolution.

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know…

The Theory of Evolution by way of natural selection results in biodiversity.

The Theory of Evolution is widely accepted by the scientific community as a result of being backed by adequate evidence collected by many scientists.

Variation results from meiosis (variation) and mutations (asexually and sexually reproducing organisms).

Variation allows certain individuals to survive better than others.

Our understanding of Evolution by natural selection is dynamic and evidence is contiually being collected by way of fossil evidence, embryology, biochemical evidence, and anatomical comparisions.

Skills

Skills

Student will be skilled at …

1. Explain why evolution is accepted even though it is “just a theory” and why it will never become a scientific law.
2. Compare and contrast the theories of Darwin and Lamarck and explain why Darwin’s theories are still accepted today.
3. Describe the important events that occured during Darwin's Journey on the HMS beagle
4. Identify “key events” in the evolution of life on Earth (geologic time)
5. Identify that evolution occurs to populations, not individuals (define species)
6. Describe how evolution can be used to connect the relationship between two different species
7. Explain how recombination of genes during meiosis can lead to variations/mutations
8. Explain how variations/mutations leads to evolution by way of natural selection
9. Comapre and contrast artificial and natural selection
10. Use fossils (fossil record, relative dating), embryology, biochemical evidence (amino acid sequences or DNA sequences), and anatomical comparisions to show how closely two organisms are related.

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

1. Projector

2. Lab Materials (see learning activities for more detail)

3. Elmo

4. Interactive notebooks

5.Interactive notebook materials

6. Student copies (see learning activities for more detail)

Formative Assessment Strategies

Formative Assessment Strategies

1. Quizzes (Wrap-ups)

2. Virtual labs

3. Interactive notebook activities/assignments

4. Labs (based on lab availability/scheduling conflicts).

5. Informal questioning

Learning Activities/Unit of Study

Learning Activities/Unit of Study

1. Evidece of Evolution Lab Stations (see attachment)
2. Virtual Lab: Natural Selection
3. Activity/Stations: Virtual Voyage of the Beagle
4. Bird Beak Lab
5. Geologic Timeline activity
6. Crayfish dissection adaptations/behavior

Evidence of Evolution Lab Stations.pdf
Virtual Lab: Natural Selection
Activity/Stations: virtual voyage of the beagle
Bird Beak Lab
Geologic Timeline Activity

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, GIfted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily

overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.