

Unit 02: The Fossil Record (Weeks 4-9)

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

Standards Alignment

New Jersey Student Learning Standards

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

Make a quantitative and/or qualitative claim regarding the relationship between dependent and independent variables. Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.

Practice 8. Obtaining, evaluating, and communicating information

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.

Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source.

Communicate scientific and/or technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, mathematically).

LS3: Heredity: Inheritance and Variation of Traits

LS3.B: Variation of Traits

Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (HS-LS3-2),(HS-LS3-3)

LS4: Biological Evolution: Unity and Diversity

LS4.A: Evidence of Common Ancestry and Diversity

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

LS4.B: Natural Selection

Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-2),(HS-LS4-3)

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

LS4.C: Adaptation

Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (HS-LS4-2)

Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS4-3),(HS-LS4-4)

Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS4-3)

Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. (HS-LS4-5),(HS-LS4-6)

Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (HS-LS4-5)

ESS3: Earth and Human Activity

ESS3.B: Natural Hazards

Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1)

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| LA.RH.11-12 | Reading History |
| | Key Ideas and Details |
| LA.RH.11-12.1 | Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of primary and secondary sources, connecting insights gained from specific details to develop an understanding of the text as a whole. |
| LA.K-12.NJSLSA.R1 | Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. |
| SCI.1-LS3 | Heredity: Inheritance and Variation of Traits |
| SCI.1.LS3.B | Variation of Traits |
| 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.3-ESS3 | Earth and Human Activity |
| SCI.3.ESS3.B | Natural Hazards |
| SCI.HS-LS4 | Biological Evolution: Unity and Diversity |
| SCI.HS-LS4-1 | Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. |
| SCI.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. |

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

Integration of Career Readiness, Life Literacies and Key Skills

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| 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

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| TECH.8.1.12 | 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.8.1.12.A | Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations. |
| TECH.8.1.12.A.2 | Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review. |
| TECH.8.1.12.A.5 | Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results. |

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

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| LA.RL.11-12 | Reading Literature Key Ideas and Details |
| LA.K-12.NJSLSA.R1 | Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. |

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| LA.RL.11-12.1 | Cite strong and thorough textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain. |
| LA.RL.11-12.8 | (Not applicable to literature) |
| 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. Range of Reading and Level of Text Complexity |
| LA.K-12.NJSLSA.R10 | Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed. |
| LA.RI.11-12 | Reading Informational Text |
| LA.RI.11-12.1 | Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain. |
| 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.K-12.NJSLSA.W2 | Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. Range of Reading and Level of Text Complexity |
| LA.K-12.NJSLSA.W9 | Draw evidence from literary or informational texts to support analysis, reflection, and research. |
| LA.RI.11-12.10a | By the end of grade 11, read and comprehend literary nonfiction at grade level text-complexity or above with scaffolding as needed. |
| LA.RI.11-12.10b | By the end of grade 12, read and comprehend literary nonfiction at grade level text-complexity or above. |
| LA.W.11-12.1 | Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. |
| LA.K-12.NJSLSA.SL | Speaking and Listening |
| LA.W.11-12.1.A | Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence. |
| LA.W.11-12.1.B | Develop claim(s) and counterclaims avoiding common logical fallacies and using sound reasoning and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level, concerns, values, and possible biases. Comprehension and Collaboration |
| LA.K-12.NJSLSA.SL1 | Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. |
| LA.K-12.NJSLSA.SL2 | Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. |
| LA.W.11-12.2 | Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. |
| LA.W.11-12.2.B | Develop the topic thoroughly by selecting the most significant and relevant facts, |

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| | extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic. |
| LA.K-12.NJSLSA.SL5 | Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations. |
| LA.K-12.NJSLSA.L | Language |
| LA.K-12.NJSLSA.L2 | Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. |
| LA.W.11-12.9 | Draw evidence from literary or informational texts to support analysis, reflection, and research. |
| LA.SL.11-12 | Speaking and Listening Comprehension and Collaboration |
| LA.SL.11-12.1 | Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively. |
| LA.SL.11-12.1.A | Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well reasoned exchange of ideas. |
| LA.SL.11-12.1.C | Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. |
| LA.SL.11-12.2 | Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. |
| LA.SL.11-12.5 | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |
| LA.L.11-12.2 | Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. |
| LA.L.11-12.2.B | Spell correctly. |

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

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale

Unit Rationale

The purpose of this unit...

To comprehend the history of human evolution and migration out of Africa, as well as, the environmental pressures that shaped human evolution.

Meaning

Essential Questions

Essential Questions

Where did the first humans migrate to and why were those migrations necessary?

Does the environment or heredity have the greatest impact on an individual's characteristics?

What effect does the environment have on development of a species?

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

Students will understand that:

Human evolution is the lengthy process where modern Homo sapiens diverged from ape-like ancestors 6 million years ago.

Humans migrated out of Africa and colonized different continents over the course of tens of thousands of

years.

An individual's characteristics rely on both their genetic makeup and the influences of the environment

Humans developed specific characteristics based on different environmental pressures.

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know...

The theory of evolution based on natural selection (Darwin).

The fossil record, comparative anatomy, and comparative embryology are other evidence to support the theory of evolution.

Humans did not evolve from apes, rather from a common ancestor six million years ago.

Around 5 mya the hominid lineage split up through approximately 25,000 ya when modern humans were the only remaining hominid species.

Approx. 60,000 ya humans began to migrate out of Africa.

Humans share common DNA with other hominid species, such as Neanderthals.

Skills

Skills

Student will be skilled at ...

Observe and make conclusions about the relationships between humans and chimpanzees.

Construct and explain a timeline of human descent with modification.

Research and provide evidence that demonstrates the process of human migration.

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

Teacher derived notes

Powerpoint

Worksheets

Articles

Lab materials

<http://humanorigins.si.edu/education/introduction-human-evolution>

http://evolution.berkeley.edu/evolibrary/search_results.php?cx=003224187473994356885%3Ayllsipkdpfm&q=human&sa=Search&cof=FORID%3A11

<https://geneed.nlm.nih.gov/>

Formative Assessment Strategies

Formative Assessment Strategies

Informal assessments (All call, thumbs up, Kahoot)

Daily Do-Nows

Exit tickets (Short answer responses, feedback forms)

Quizzes

Lab reports

Learning Activities/Unit of Study

Learning Activities/Unit of Study

Lectures and notes on evolution and terms, hominid timeline, and environmental pressures

Long day discussion questions

Human Journey (Educational Documentary)

Pick an ancestor/hominid (group-fill in chart)

Compare DNA sequences between humans and Chimpanzees

Hominid skull photo lab

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.