

Tracing Life's Roots

An Investigation Into Animal Ancestry

DIGITAL EXPLORATION EDUCATOR GUIDE



TRACING LIFE'S ROOTS

Using this Digital Exploration, students will act as zoologists to investigate common ancestry. They will obtain information about four different species to determine which two animal species are the most closely related. Students will compare embryonic development stages, anatomical evidence and genetic evidence to support their conclusion. Although species may look very similar, students will find that physical appearance doesn't always signify close relation between animals. Finally, students will examine the diverse range of careers in zoology.

TIME REQUIRED

25–30 minutes

TOPICS

- Evidence of common ancestry and diversity
- DNA and Mutations
- Careers in Science, Technology, Engineering and Mathematics

HARDWARE RECOMMENDATION

Tracing Life's Roots is accessible on any device. However, for optimal user experience, it is recommended that explorations are accessed via desktop or tablet. This exploration is functional for use on mobile devices (iOS and Android).

TECHNICAL SPECIFICATIONS

While the **Tracing Life's Roots** exploration will function in all browsers, including Internet Explorer, Safari, Google Chrome and Firefox, browser load speeds will vary. For best performance, it is recommended that the most current version of your browser of choice is used when accessing the modules. Please note, connection speeds may be impacted by factors such as highly trafficked shared Wi-Fi access, public Wi-Fi and accessing modules behind a firewall.

OVERVIEW

This Digital Exploration has four main sections:

INTRODUCTION

What evidence shows that different species are related? Students will be introduced to four species and will be asked to predict the two they believe are most closely related using observable characteristics.

INVESTIGATE:

Using the same four species, students will explore how embryological and anatomical evidence is used to identify relationships between organisms.

ACT

Students will run a sample of each species' DNA using gel electrophoresis. They will select the two organisms that have the most similar DNA sequence by comparing the bands. Finally, using different lines of evidence, students will conclude which two species are most closely related.

ANALYZE

To summarize, students will discover how professionals in STEM-related careers study our biological past and future.

PROCEDURE

This exploration is designed to be flexible to meet the needs of many different learning environments.

ONE-TO-ONE ENVIRONMENT

Students using the exploration for independent, self-paced learning can simply move through the exploration at their own pace.

WORKING IN PAIRS OR AT CENTERS

Students can take turns answering the questions throughout the exploration or work together to answer the questions. As students may have different reading levels, you will want to guide them to provide each group member with an opportunity to read and comprehend the information before moving on.

CLASS ENVIRONMENT

If you are leading a group in a one-to-many environment, you can use a projector and screen or whiteboard to make the exploration the focus of instruction and discussion. Use the questions in this

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guide and a show of hands, or other checking for understanding strategies, during each topic to gauge student comprehension.

CUSTOMIZED INSTRUCTION

You may also choose to use discrete elements from the exploration that fit your timeframe and curriculum.

PATH TO DISCOVERY

1. Explain that the purpose of this Digital Exploration is to use embryological, anatomical and genetic evidence to identify relationships between organisms.
2. Read the discussion questions before starting the Digital Exploration.
3. Guide students to respond to the questions, in writing, using evidence from the Digital Exploration.
4. Explain that you will be available to support students as they work.
5. Review student responses to the discussion questions after they have completed the exploration.

DISCUSSION QUESTIONS

- What types of evidence show that different species may be related? Use examples from the Digital Exploration in your response.
- Scientists use technology and laboratory techniques to support biological research. What types of technologies were used in this exploration? What type of data do they collect?
- During the Digital Exploration, you investigated how embryological, anatomical and genetic evidence can provide important indicators for relatedness. How does this compare with environmental factors that can influence traits?
- The fossil record documents the existence, diversity, extinction and change of many life forms and their environments through Earth's history. What types of evidence for our biological history can fossils preserve?
- Describe why it's important to study our biological past and future through various career paths. Use evidence from the Digital Exploration in your response.

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NATIONAL STANDARDS

Next Generation Science Standards

MIDDLE SCHOOL

Science and Engineering Practice

Constructing Explanations and Designing Solutions

Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events.

Disciplinary Core Idea

LS4.A Evidence of Common Ancestry and Diversity

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.

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

Crosscutting Concept

Patterns

Patterns can be used to identify cause and effect relationships.

HIGH SCHOOL

Science and Engineering Practice

Obtaining, Evaluating, and Communicating Information

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

Disciplinary Core Idea

LS4.A Evidence of Common Ancestry and Diversity

Genetic information, like the fossil record, 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.

Crosscutting Concept

Patterns

Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.