Elaborate: Fossil Clues and Bone Connections: Discovering Evolution's Story



Objective:

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You will explore how fossils and bones from different animals show that some species share a common ancestor. By comparing the shape and location of bones, you'll see how animals are connected through evolution.

Key Words to Know

- Fossil evidence: Preserved remains or traces of plants and animals from the past.
- Homologous structures: Bones or body parts in different
 animals that look similar because they come from a shared ancestor, even if they are used
 differently.
- **Common ancestry**: The idea that some animals share the same ancient relatives.
- **Evolution**: The way species change over time.
- Anatomical: About the structure of body parts.

Background Information: Fossil Evidence and Homologous Structures

When scientists study how animals are related to each other, they look at fossil evidence and **homologous** structures. Fossils are the preserved remains or traces of organisms that lived long ago. These can include bones, shells, footprints, or even plant leaves. By studying fossils, scientists can learn what life was like in the past and how species have changed over millions of years.

Another clue about how animals are related comes from homologous structures. These are body parts, like bones, that look similar in different animals because they share a common ancestor. For example, the forelimbs of humans, bats, birds, and whales all have the same basic set of bones: the humerus (upper arm), radius, and ulna (lower arm). Even though these animals use their forelimbs for different things—like flying, swimming, or grabbing—they have the same basic structure. This similarity shows that these animals evolved from a shared ancestor.





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This idea is part of the theory of evolution, which explains how species change over time. When you compare the shape and location of bones in different animals, you can see patterns that provide evidence of these relationships. These patterns help us understand how life on Earth is connected.

Use this information as you explore diagrams and models in the activity. Look closely at the shape and position of bones to decide which animals might be related and how fossils and bones show evidence of evolution.

What You Will Need

- 1. Diagrams of animal bones (color-coded to make them easy to compare).
- 2. 3D models or raised diagrams of bones for hands-on exploration.
- 3. A chart to sort and group fossils and bones.

Activity Instructions

Step 1: Get Ready! (10 minutes)

- Look at pictures of bones from different animals (like a human, bat, bird, and whale).
- Your teacher will explain important words like **fossil evidence** and **homologous structures**.
- Think about this question: "Why do some animals have bones that look similar but are used for different things?"

Step 2: Explore the Bones (30 minutes)

- Use the diagrams and 3D models to compare the **forelimbs** (arms) of different animals. Look for these bones:
 - **Humerus**: The upper arm bone.
 - **Radius** and **Ulna**: The two bones in the lower arm.
- Ask yourself:
 - "Which bones are the same shape?"
 - "Are they in the same spot on each animal?"

Step 3: Sort the Bones

- Use a chart to group bones based on how they look or where they are located.
 - Group them under categories like **Shape** or **Function**.

• Write down your observations using these sentence starters:

- "I noticed that the ______ bone in the ______ and _____ looks similar because _____."
- "The ______ in the ______ is different because ______."

Step 4: Explain Your Findings (20 minutes)

- Write about what you learned. Use this sentence starter:
 - "The bones are similar in structure because _____. This shows that

• Share your ideas with a partner. Listen to what they learned too!

Reflection Questions

Before You Start

- 1. What do you already know about fossils or bones?
 - "I know that fossils are _____."
- 2. Why do you think animals might have similar bones?

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• "I think animals have similar bones because _____."

After the Activity

- 1. What did you notice about the bones of different animals?
 - "I noticed that _____."
- 2. What does this tell you about common ancestry?
 - "This shows that animals are related because _____."
- 3. What question do you still have about fossils or evolution?
 - "I wonder ____."

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Organism	Bone 1 - Humerus Function	Bone 2 - Ulna Function	Bone 3 - Radius Function	Bone 4 - Carpels Function	Bone 5 - Metacarpals Function

Teacher Instructions

Objective

Guide students through a hands-on exploration of fossils and homologous structures to develop their understanding of common ancestry and evolution.

Preparation Steps

- 1. Materials Setup:
 - Print color-coded diagrams of forelimbs (e.g., human, bat, bird, whale).
 Highlight key bones (humerus, radius, ulna).
 - Provide pre-labeled diagrams for students who may need extra support.

2. Vocabulary Review:

- Display a word bank with terms such as fossil evidence, homologous structures, common ancestry, evolution, and anatomical.
- Create a glossary students can keep at their desks.

3. Pairing and Grouping:

- Pair students strategically for peer support, mixing skill levels.
- Prepare small groups for collaborative sorting and discussion.

4. Scaffolding Materials:

- Have sentence starters ready for students to use during discussions and written responses.
- Offer visuals with additional labels or written explanations for students needing extra clarity.

Lesson Plan

Introduction (10–15 minutes)

1. Begin with a short discussion or video about fossils and evolution, focusing on how scientists use bones to study relationships between species.

- 2. Review key vocabulary and ensure students understand terms before moving to the activity.
 - Ask, "Why do you think animals might have similar bones even if they live in different environments?"
- 3. Show a model forelimb or diagram, pointing out key features like the humerus, radius, and ulna.

Activity Instructions (50 minutes)

Step 1: Exploring the Models (15 minutes)

- Give each pair of students a set of diagrams and models.
- Instruct them to examine and compare the bones for similarities and differences.
- Prompt questions:
 - "What do you notice about the shape of these bones?"
 - "Are these bones in the same places in each animal?"

Step 2: Sorting Fossils and Structures (15 minutes)

- Students use sorting charts to group bones into categories:
 - "Similar Shape"
 - "Different Shape"
 - "Evidence of Common Ancestry"
- Encourage discussion as they work, using prompts:
 - "What clues tell you these animals might be related?"
 - "Why might these bones look similar but have different uses?"

Step 3: Explaining Relationships (20 minutes)

- Students write a short explanation using sentence starters:
 - "The bones are similar in structure because _____. This shows that ."
 - "Even though the function is different, the structure of the _______."
- Facilitate peer sharing: have pairs or groups present their findings to the class.

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Wrap-Up (10 minutes)

- Lead a class discussion on what the activity reveals about common ancestry and evolution.
- Ask reflection questions:
 - "What patterns did you notice across the bones?"
 - "How does this evidence support the idea of evolution?"

Differentiation Strategies

1. For Students Who Need Extra Support:

- Provide pre-labeled diagrams and a simplified sorting chart with examples.
- Offer tactile models for hands-on learners who may struggle with visual diagrams.
- Work with them in small groups to guide their analysis.

2. For Advanced Students:

- Challenge them to research additional homologous structures (e.g., pelvis bones in mammals and rep**tiles).**
- Ask them to explain why some animals lose homologous structures (e.g., snakes losing limbs).

3. For English Language Learners (ELLs):

- Use visuals, gestures, and physical models to explain concepts.
- Provide bilingual word banks or translations of key terms.
- Allow students to discuss findings in their native language before presenting in English.

4. For Students with Visual Impairments:

- Use raised tactile diagrams and 3D models.
- Pair them with a partner who can describe visual details verbally.

5. For Highly Collaborative Students:

 Organize group discussions where each student takes on a role (e.g., "reporter," "analyzer," "presenter").

Assessment and Reflection

- Collect students' sorting charts and written explanations to check for understanding.
- Use reflection questions to assess their ability to connect the activity to the idea of evolution.
- Provide verbal or written feedback highlighting their use of evidence and vocabulary.

By using these instructions and differentiation strategies, all students can meaningfully engage with the activity and deepen their understanding of fossils and evolution.