Engage: Paleontologist for a Day: Uncovering Connections in the Fossil Record

INSTRUCTOR:
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Learning Goal:

By the end of this activity, you will be able to:

- *Explain how fossils show that species are connected.*
- *Identify how traits change over time by looking at fossils.*
- *Share your ideas using simple explanations and pictures.*

What Are Fossils and Why Are They Important?

Fossils are the remains or traces of plants and animals that lived long ago. They can be bones, shells, imprints, or even marks left behind by ancient creatures. Scientists study fossils because they are clues about how life has changed over time. For example, some fish fossils have fins that look like the early beginnings of legs, showing how fish might have evolved into land animals like amphibians.

Fossils also help us understand how different species are connected. For instance, if two fossils share similar traits, like the shape of their bones, it might mean they share a common ancestor. Over time, new traits appear in species to help them survive better in their environments. The fossil record—the timeline of all the fossils we've discovered—shows how life on Earth has changed and adapted. This is why fossils are called evidence of evolution: they help scientists piece together how species have evolved and what traits connect them.

By studying fossils, we can answer important questions about how traits like walking, flying, or having fur first appeared. Each fossil is like a puzzle piece that helps complete the picture of Earth's history.

What You'll Do:

1. **Read the Background Information:** Learn why fossils are important.
2. **Pre-Activity Questions:** Answer questions to share what you already know.

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3. **Fossil Puzzle Activity:**
    - Work with a partner to put fossil puzzle pieces in the right order.
    - Use pictures, facts, and the timeline to guide your choices.
    - Explain your thinking using sentence starters.
4. **Post-Activity Reflection:** Answer questions about what you learned.

Before We Start – Pre-Activity Questions:

1. What do you know about fossils?
    - Sentence starter: ***"I know fossils are ___ because ___."***
2. Why do scientists study fossils?
    - Sentence starter: ***"I think scientists study fossils because ___."***
3. What kind of traits might help you connect one fossil to another?
    - Sentence starter: ***"Some traits that might help are ___, such as ___."***

Fossil Puzzle Activity:

Steps:

1. Look at the fossil puzzle pieces your teacher gives you. Each piece has a picture and a description of the fossil.

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2. Use the timeline to help figure out where each fossil belongs.
3. Work with your partner to put the puzzle pieces in order to show how one species might have changed into another.
4. Talk about your choices using these sentence starters:
    - ***"I think this fossil goes here because it shows ___."***
    - ***"This fossil connects to ___ because ___."***
    - ***"The timeline helps us understand ___."***

5. When you finish, explain your puzzle to the class and your teacher.

After the Activity – Reflection Questions:

1. How do fossils help us understand how species are connected?
    - Sentence frame: ***"Fossils help us understand because they show ___."***
2. What changes did you notice in the traits of fossils over time?
    - Sentence frame: ***"I noticed that fossils changed by ___, which shows ___."***
3. Was there a fossil that was hard to place or surprised you? Why?
    - Sentence frame: ***"The fossil that surprised me was ___ because ___."***
4. What did you learn about how species change over time?
    - Sentence frame: ***"I learned that species change over time by ___."***

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Tips for Success:

- Work together with your partner and share your ideas.
- Use the sentence starters to explain your thinking.
- Ask questions if you're unsure about anything.

By the end of this activity, you'll know how fossils can show the amazing ways that life has changed and how species are all connected!

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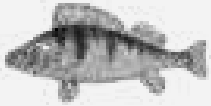
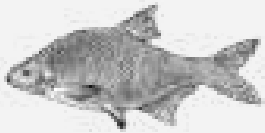
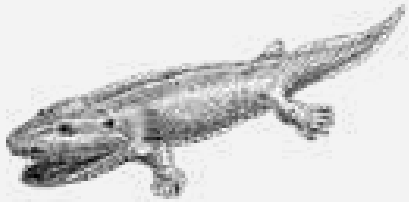
“Puzzle Pieces” – cut out







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Teacher Instructions

Purpose of the Activity:

This activity engages students in understanding the fossil record and how it provides evidence for evolution and common ancestry. Through a hands-on puzzle activity, students will analyze traits, make connections between species, and practice explaining their reasoning.

Preparation:

1. **Materials:**
    - Simplified fossil timeline with labeled visuals.
    - Fossil puzzle pieces with images, traits, and descriptions.
    - Sentence starter handouts for students.
2. **Setup:**
    - Print and laminate puzzle pieces for durability.
    - Arrange students into pairs or small groups for collaborative work.
    - Review the timeline and puzzle pieces to ensure you're ready to guide discussions and answer questions.
3. **Background Information:**
    - Be prepared to explain how fossils provide evidence of evolution by showing changes in traits over time and connections between species.
    - Review key vocabulary like *fossil*, *traits*, *evolution*, and *common ancestor*.

Step-by-Step Instructions:

1. Introduce the Activity (10 Minutes)

- **Begin with a class discussion:**
    - Ask students what they know about fossils and why they think fossils are important.
    - Show the simplified fossil timeline and give examples of species transitions (e.g., fish to amphibians).
- Explain that their task is to act like paleontologists, using fossils to piece together the story of life on Earth.

2. Pre-Activity Questions (5-10 Minutes)

- Have students answer pre-activity questions individually or in pairs.
- Encourage students to use the sentence starters to help structure their ideas.

3. Fossil Puzzle Activity (20-25 Minutes)

- Distribute fossil puzzle pieces and the timeline to each pair or group.
- Explain the goal: Arrange the puzzle pieces to show how species are connected and how traits change over time.
- Provide guidance:
    - Remind students to use the timeline to help them order fossils.
    - Encourage discussion using the sentence frames provided.

4. Class Discussion and Explanation (10-15 Minutes)

- Have students share their completed puzzles and explain their reasoning.
- Ask guiding questions to deepen understanding, such as:
    - "Why do you think this fossil comes after this one?"
    - "What traits do you see that connect these fossils?"

5. Post-Activity Reflections (10 Minutes)

- Students complete reflection questions individually.
- Encourage them to use the sentence starters to organize their thoughts.

Differentiation Strategies:

For Students Who Need Extra Support:

- Pair them with a strong partner who can help guide discussions.
- Provide extra visuals or a simpler version of the fossil puzzle with fewer pieces.
- Offer one-on-one support to clarify directions or concepts as needed.

For Advanced Learners:

- Challenge them to explain the evolutionary significance of specific traits (e.g., fins turning into limbs).
- Ask them to predict what might come next in the fossil record based on the patterns they see.
- Encourage them to research a specific fossil and present its importance.

For Visual Learners:

- Use larger, colorful diagrams and images of fossils.
- Provide highlighters or markers for students to color-code traits as they work.

For Auditory Learners:

- Encourage group discussions and verbal explanations of their reasoning.
- Read key parts of the instructions or background material aloud.

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Helpful Hints for Success:

1. Guide Without Giving Answers: Ask questions like, “What do you notice about this trait? How might it connect to this fossil?”
2. Use the Timeline Often: Encourage students to refer back to the timeline for context and support.
3. Encourage Collaboration: Remind students to talk with their partners and share ideas before making decisions.
4. Check for Understanding: Circulate the room, listen to student conversations, and clarify misconceptions.
5. Praise Reasoning: Focus on how well students explain their choices rather than getting the "right" answer immediately.