What's Under Our Feet?

Evidence of Common Ancestry and Diversity

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Grade Level	8th Grade	**Time Frame**	200 minutes
Subject	Science	**Duration**	3-4 class periods

Essential Question

How can I use patterns in fossils to understand the diversity of life forms that have existed in the past and in the present?

Summary

In this lesson, students use an online fossil database to explore changes in life forms throughout the history of life on Earth. Students also make predictions about environmental changes and how those changes affect organisms living in different environments. Students then analyze anatomical similarities and differences between modern-day organisms and fossilized organisms.

Snapshot

Engage

Students make predictions about past life in Oklahoma based on fossils.

Explore

Students use the online fossil database paleobiod.org to track the number and locations of fossilized species once found in Oklahoma.

Explain

Using a modified 3-2-1 strategy, students answer prompts about their findings from the Explore portion.

Extend

Students analyze and evaluate information about fossils found in Oklahoma.

Evaluate

Students create a presentation to share what they learned about their species in the Extend portion.

Standards

Oklahoma Academic Standards (8th Grade)

8.LS4.1 : Analyze and interpret data to identify patterns within the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth.
8.LS4.1.1: The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found) 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.
8.LS4.1.2: Because of the conditions necessary for their preservation, not all types of organisms that existed in the past have left fossils that can be retrieved.
8.LS4.2 : Apply scientific ideas to construct an explanation for the patterns of anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer ancestral relationships.
8.LS4.2.1: Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record serve as evidence of ancestral relationships among organisms and changes in populations over time.

Attachments

- 3-2-1-What-s-Under-Our-Feet - Spanish.docx
- 3-2-1-What-s-Under-Our-Feet - Spanish.pdf
- 3-2-1-What-s-Under-Our-Feet.docx
- 3-2-1-What-s-Under-Our-Feet.pdf
- Exploring-the-Fossils-of-the-World-What-s-Under-Our-Feet - Spanish.docx
- Exploring-the-Fossils-of-the-World-What-s-Under-Our-Feet - Spanish.pdf
- Exploring-the-Fossils-of-the-World-What-s-Under-Our-Feet.docx
- Exploring-the-Fossils-of-the-World-What-s-Under-Our-Feet.pdf
- Extending-Your-Knowledge-What-s-Under-Our-Feet - Spanish.docx
- Extending-Your-Knowledge-What-s-Under-Our-Feet - Spanish.pdf
- Extending-Your-Knowledge-What-s-Under-Our-Feet.docx
- Extending-Your-Knowledge-What-s-Under-Our-Feet.pdf
- I-Notice-I-Wonder-What-s-Under-Our-Feet - Spanish.docx
- I-Notice-I-Wonder-What-s-Under-Our-Feet - Spanish.pdf
- I-Notice-I-Wonder-What-s-Under-Our-Feet.docx
- I-Notice-I-Wonder-What-s-Under-Our-Feet.pdf
- Lesson-Slides-What-s-Under-Our-Feet.pptx
- Tweet-Up-What-s-Under-Our-Feet - Spanish.docx
- Tweet-Up-What-s-Under-Our-Feet - Spanish.pdf
- Tweet-Up-What-s-Under-Our-Feet.docx
- Tweet-Up-What-s-Under-Our-Feet.pdf

Materials

- Lesson Slides (attached)
- I Notice, I Wonder handout (attached; one half-sheet per student)
- Exploring the Fossils of the World handout (attached; one per group)
- 3-2-1 handout (attached; one per student)
- Extending Your Knowledge handout (attached; one per group)
- Tweet Up handout (attached; one half-sheet per student)
- Poster paper or chart paper
- Markers
- Student devices with internet access

20 minutes

Engage

Teacher's Note: I Notice, I Wonder Preparation

Before you begin the activity below, print and prepare one I Notice, I Wonder handout (attached) for each student. There are two half-sheets per page—each student needs one.

Introduce the lesson using the attached **Lesson Slides**. Display **slide 3** to share the lesson's essential question and **slide 4** to go over the lesson objectives. Review these slides with students to the extent you feel necessary.

Go to **slide 5** to show students side-by-side images of a fossilized aquatic organism and a similar modern-day species. Next, give each student a half-sheet from the attached **I Notice, I Wonder** handout. Have students use the I Notice, I Wonder strategy to record their observations and questions about the images.

After giving students 3–5 minutes to write what they notice and wonder, invite a few volunteers to share out what they wrote. Then, inform students that these types of fossils can be found in Oklahoma and ask them how such fossils could be found in a landlocked state.

Teacher's Note: Conversation Starters

If students have difficulty coming up with things to write, you may ask guiding questions to help them get started, such as:

- What kind of organism is this?
- What environment do you think it might live in?
- Does it look like any animal or plant that you have seen before?
- Why would we find this in Oklahoma?
- Are there other marine organisms that once lived in Oklahoma?

60 minutes

Explore

Explain to students that they will look at where these types of fossils can be found in Oklahoma, using paleobiodb.org to track the number and locations of fossilized species in the state.

Display **slide 6** to show students how to get to the "Explore" part of the database. Next, go to **slide 7** to explain what each dot represents before allowing students 5–10 minutes to play around with the tools on the website.

Then, place students in groups, which they will stay in for the rest of the lesson. Groups should have 2–4 members to ensure that all students participate. Give each group a copy of the attached **Exploring the Fossils of the World** handout for navigating the simulation.

Display **slide 8** and explain the concept of scientific names (specifically, binomial nomenclature). Students will need this information because the website only allows searching by scientific name.

Teacher's Note: Prerequisite Knowledge

Some students will not have much experience with scientific names, and that's okay. Students need only a brief introduction since the website doesn't recognize common names. Don't spend too much time on it or over-explain—students need just enough information to use the website successfully.

Go to **slide 9** to help students get started with their exploration of the site. They will follow the instructions on the handout to go through the simulation and answer the analysis questions. Give students time to work through questions 1–8.

Before letting students proceed to questions 9–15, have students share out their responses and allow for a class discussion about what they have figured out so far. Then, invite each group to choose an animal they would like to investigate further, just as they've done with Cnidarians.

Teacher's Note: Guiding Student Research

Students should search by scientific name, whether on a family, genus, or species level. Recommend possible genera for students to explore if they are having trouble with picking an organism. Interesting explorations might include Mammuthus (mammoths), Saurophaganax (dinosaur), or Xenacanthus (prehistoric sharks).

For another method to help students find a group of organisms to research, you may recommend that students click on the dots that appear on the screen without any filters. When the "Information Box" pops up, invite students to select the "Occurrences" tab. There will be a list of the scientific names of the species found at that site. Students can then Google search the genus name to see what the organism looked like and find out more information about the organism.

Allow time for students to answer questions 9–15 about whichever organism they selected.

20 minutes

Explain

Display **slide 10**. Have students use the 3-2-1 strategy to connect their prior knowledge to the new discoveries they made during the Explore portion of the lesson. Provide each student with a copy of the attached **3-2-1** handout. Invite students to answer the following questions based on what they've learned so far:

- 3—What are three inferences you can make about the animal you chose to investigate?
- 2—What are two things you found interesting about the animal you chose to investigate?
- 1—Describe one modern-day animal that you think might be related to your animal.

60 minutes

Extend

Display **slide 11**. Students will work in their groups to create a presentation about the animal they chose to investigate. Presentations do not have to be limited to posters or slides—you may choose to have students brainstorm which delivery methods they think will work best for their groups.

Provide each group with a copy of the **Extending Your Knowledge** handout, which contains instructions for the presentation and a rubric to guide students in their creation. The handout also contains an Oklahoma map for students to display the location their organism was found.

Let students know their presentations must include the following information:

- The name of the species (both the common name and the scientific name).
- A picture or drawing of the organism.
- The location on an Oklahoma map where its fossils are usually found. (Students will use paleobiodb.org for this.)
- The time frame in which the organism was alive. When did it go extinct?
- A description of other species that are anatomically similar to your species. Would these species have existed before or after yours? Why? (This will help students observe changes in the complexity of species over time.)
- A prediction about the environment the organism would have lived in. Include the amount of water/rainfall, plants found in the area, temperature, and physical landscape. (This information should help students identify what causes certain species to go extinct and how others are able to survive.)

10 minutes

Evaluate

Teacher's Note: Tweet Up Preparation

Before you begin the activity below, print and prepare one Tweet Up handout (attached) per student. There are two half-sheets per page. There are two half-sheets per page—each student needs one.

Display **slide 12**. Give each student a half-sheet from the attached **Tweet Up** handout. Using the Tweet Up strategy, have students write a summary using 280 characters or fewer and include a hashtag in response to one of the following prompts:

- What patterns do you notice about the diversity and complexity of life over time?
- What similarities or differences do the fossil species from the beginning of the lesson have compared with the modern-day species?
- How might changes in the environment affect the patterns of diversity we see in the fossil record?
- How can fossils be used as evidence that modern-day species are related to species from the past?

Resources

- K20 Center. (n.d.). 3-2-1. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f5059a7b
- K20 Center. (n.d.). I Notice, I Wonder. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f507d1a7
- K20 Center. (n.d.). Tweet Up. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f505fb94
- St. John, J. (2011, January 30). Seirocrinus subangularis (fossil crinoid) [Image]. Flickr. https://www.flickr.com/photos/jsjgeology/35674916591/in/photostream/
- The Paleobiology Database. (n.d.). NSF. paleobiodb.org