

LESSON PLAN

THE FOSSIL RECORD GRADES 6-8

SUMMARY

In this lesson, students examine specimens from the fossil record and formulate claims based upon evidence about how organisms have changed over time.

NEXT GENERATION SCIENCE CORRELATION STANDARDS

MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

Science & Engineering Practices	Connections to Classroom Activity
Analyzing and Interpreting Data	 Students analyze five organisms that make up a part of the fossil record, make predictions about them, and revise their models in light of new evidence.
Disciplinary Core Ideas	Connections to Classroom Activity
LS4.A: Evidence of Common Ancestry and Diversity The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) 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.	 Students determine that fossils take many years to form, organisms can be placed in a specific chronological order, and that helps scientists to determine how old a fossil is as well as what other organisms it may be related to.

Cross Cutting Concepts	Connections to Classroom Activity
Patterns	 Students use evidence from the fossil record to develop models of how a group of organisms changed over millions of years.
DURATION	MATERIALS
45 min.	 Per student pair or small group: Image set (can either publicly display for the class or provide students sets of images)

Ask students to tell you about what it means for an organism to be extinct. Students will mention that extinction means all organisms of that kind have died. Ask them to give examples of extinction. Students will commonly discuss dinosaurs. Allow them to explain what they know about how or why dinosaurs became extinct, and what evidence we have today that dinosaurs lived millions of years ago. Students will indicate that fossils provide evidence that dinosaurs existed millions of years ago.



Show students the image of the *Pakicetus* fossil and a drawing of what scientists believed it looked like based on the fossil. (Insert image here). Ask students to observe the picture for two minutes by themselves. Have students write down things they notice and wonder about the image. Let students share with partners and in small groups what they notice and wonder about the image. Students may mention some of the following things:

- The first picture is a picture of a fossil.
- The animal looks like a dog or wolf that swims.
- The animal had legs for walking but also feet and a tail for swimming.
- The animal was a predator/carnivore because it has sharp teeth.

Encourage student discussion, specifically about fossils. Use probing questions with students such as the following:

- What is a fossil?
- What makes something become a fossil?

- What types of living things become fossils?
- Do all things that die become fossils? Why or why not?
- How do you tell how old fossils are?

Ask students to share any knowledge they have about fossils. Record these ideas on a poster paper or dry erase board to maintain visibility for students throughout the lesson. Students will mention fossils take millions of years to form, some but not all things that die become fossils, and catastrophic events like volcanic eruptions can preserve organisms as fossils.

Once students have shared ideas about fossils, have them generate ideas in small groups about how something becomes a fossil. Specifically ask students, "What makes fossils so rare?" Students will make predictions that things die and become buried in rock. Students may mention that it takes many years for fossils to form, and because of that, most of the organism decomposes during that period of time. Ask students to expand on this idea. Ask students, "How do you know?" "What evidence can you use to determine how old a fossil is?"

EXPLORE

Tell students the images you showed them are of a prehistoric animal called Pakicetus. Ask them to make predictions about where and when Pakicetus may have lived. Record student ideas on poster paper or a white board to display publicly for the class. Ask students what other questions they have about Pakicetus. Students may mention some of the following:

- Is it a mammal, or another type of organism?
- What types of animals could it be closely related to?
- Are these still alive today?
- What did, or does, it eat?

Tell students *Pakicetus*, estimated to have lived about 50 million years ago, was discovered in 1981 in Pakistan by a scientist named Phillip Gingerich. Tell students that other fossils have been found within the same time period, the early Eocene period. Those other organisms are called *Ambulocetus, Rodhocetus, Dorudon*, and *Basilosaurus*. (Provide students the next set of images found at the end of this lesson.) Scientists have predicted what they looked like based on their fossil skeletons, as they did with *Pakicetus*. Ask students to predict the evolutionary order, or sequence, of these organisms based upon patterns in their structures. Encourage students make specific predictions about how, when, and where these organisms lived, including what they ate. Have students make their thinking visible somehow—poster paper, white board, dry erase board, etc. Ask students to share their ideas with partners, small groups, and publicly with the class, encouraging them to provide both evidence and reasoning for their responses.

Have students watch the PBS video clip When Whales Walked: Journeys Deep in Time.

EXPLAIN

WATCH THE GENERATION GENIUS THE FOSSIL RECORD VIDEO AS A GROUP

Have students return to their groups and revise their models explaining the evolutionary patterns of Pakicetus, including how, where and when the animals lived. Ask students to think specifically about how their thinking changed after watching the video. Have students share these thoughts publicly with the class, emphasizing the process of science and how ideas change in light of new evidence.



There are multiple ways to assess your students' understanding of this topic. The exit ticket is an opportunity for students to use the science ideas they built in the lesson in a new context. Alternatively, you can use the Kahoot! quiz (which provides downloadable scores at the end of the game) and/or the paper quiz. All these resources are located right below the video in the assessment section.



EXTENSION

Have students use any materials they would like to build a three-dimensional model that represents how scientists use layers of sedimentary rock, or strata, to estimate the relative age of fossils. Formative assessment "look fors" include:

- Clearly distinguishable layers, sometimes formed with colored sand.
- Fossils found deeper beneath the surface are predicted to be older.
- Fossils found closer to the surface are predicted to be more recent.
- Earthquakes and other natural disasters can cause disruptions in these rock layers, which make other forms of dating fossils, like radiometric carbon dating more accurate.

"Next Generation Science Standards" is a registered trademark of Achieve, Inc. A non-profit dedicated to raising academic standards and grad<u>uation requirements.</u>

THE FOSSIL RECORD IMAGE SET



Pakicetus #1

Pakicetus #2

Ambulocetus



Rodhocetus



Dorudon



Basilosaurus