

Bay Area Scientists in Schools Presentation Plan

Lesson Title: Fossil Formation

Presenters: Alice Riegert and Melinda Yang

Grade Level: 2nd Grade

California Science Standard Connections:

Fossils provide evidence about ancient life, scientists study fossils to learn about history.

Next Generation Science Standards:

3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. •Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS4-1)	LS4.A: Evidence of Common Ancestry and Diversity •Some kinds of plants and animals that once lived on Earth are no longer found anywhere. (Note: Moved from K–2) (3-LS4-1) •Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (3-LS4-1)	Cause and Effect •Cause and effect relationships are routinely identified and used to explain change. (3-LS2-1),(3-LS4-3)

Common Core Standards:

ELA/Literacy:

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (3-LS4-3)

Mathematics:

MP.2 Reason abstractly and quantitatively.

MP.5 Use appropriate tools strategically.

Teaser: Learn about fossils and have students make their own to bring home with them.

Objective: Students will learn about how fossils are formed and why they are important.

Vocabulary

- **Fossil** – a remain of an organism that has been preserved as rock.
- **Body Fossil** - a fossil that tells you something about the body of an organism
- **Trace Fossil** - a fossil that tells you something about the behavior of the organism (like footprints or poop)
- **Paleontology** – the study of fossils (study of old things)
- **Organism** – a living thing
- **Extinct Organism** – a type of organism that no longer lives on earth today

Materials

- Fossils and pictures to show
- paper plates
- clay
- plaster
- water
- cooking oil spray
- shells and toys

Classroom Set-up:

For the Introduction and Post-Activity, students will sit in the front of class on the floor in front of the blackboard. One of us will write the vocabulary words and their definition on the board as the other talks about them.

For the activity, students are at their tables in groups of 4-5. They will need plenty of workspace and it will be messy . . .

Classroom Visit

Introduction (personal and topic)

My name is Melinda...

My name is Alice...

We're here today to talk about fossils! We think fossils are fascinating because they teach us about what creatures used to live on this earth before us.

For example, did you know that Allosaurs (hold up a picture) lived in the US 95 million years ago? We know this because fossils of an allosaur have been found throughout North America (ALICE)

What is a fossil?

Who knows what a fossil is? Have you ever seen one? Have you ever been to the Lawrence Hall of Science or another dinosaur museum. A dinosaur bone is an example of a fossil. (Point to Melinda) Is she a fossil? (Allow time for an answer). No, she's not! Fossils are made of rock! Nothing currently living is a fossil. However, when an organism dies, over a really really long time, their remains can turn into a fossil! A **fossil** is a remain of an organism that has been preserved as rock. (ALICE)

What is an organism?

What is an organism? An organism is a living thing! Can anyone give an example of an organism? (Could be a plant, animal, fungus, bacteria, etc.) Every living thing is an organism! You are an organism. If you have a pet, your pet is an organism. Broccoli is an organism! The germs that make you sick are organisms! etc
(Hold up pictures of rocks, plants, animals, fungus, etc and ask them if it's an organism) (ALICE)

Learning Experience –

How are fossils made?

Every organism, after they die, can after a really long time, turn into a fossil. How are fossils formed? The best places are usually wet environments, or somewhere with a lot of mud. What kind of places do you find lots of soft mud? (lakes, oceans, swamps) When an organism is quickly buried by sand or dirt in these wet areas, then over a lot of time parts of the organism turn into rock and become fossils! These types of fossils are called **body fossils**. Generally the soft parts of an organism don't turn into rock which is why you always see bones, teeth and shells. (pass around or show off some body fossils, ammonite, petrified wood, dinosaur claw, fish imprint)

Sometimes, things the organism leaves behind get turned into rock too! When you're at the beach, what do you leave behind when you walk across the sand? Footprints! Fossils can show how an organism moved. Fossils of ancient footprints from human ancestors show that they also walked on two feet! Other things like poop can also get turned into rock! They tell you some stuff about the how the organism digested food, or at least tell you that type of organism passed by that area. These are also fossils, and they are called **trace fossils**. (pass around or show off some turtle poop)
So let's make some fossils of our own! (Mel)

Activity

Split students into groups at their tables and demonstrate what to do--make list of things to warn them about! Go around and help. (paper plates to write names on--Alice will give directions)

Every child will have a slab of clay. On each table there will be a few shells, a leaf or a toy dinosaur to choose from. They then push their item of choice firmly into the clay so that it makes a deep mold. The students will then put a thin layer of vaseline over the mold. We will then go around and pour the plaster into these molds. The molds will sit and dry and the teacher will help the students take them out once they dry (at least 45 minutes later) The students will write their name on their paper plate so they can keep track of what is theirs.

Wrap Up

So you've learned about fossils and made some of your own. But, why are fossils important? Well, have you ever seen a living T-rex? Or a sabre-toothed tiger? Does anyone know why not? Because these



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organisms are extinct. An **extinct organism** is one that no longer lives on Earth today. There are lots and lots of extinct organisms and everyday, we are finding more as we find new fossils. Everything we know about the T-rex comes from studying its fossils! (Mel)

Why are fossils important?

Fossils are very important because they can teach us about these extinct organisms! Did you know that you can tell what a dinosaur eats just by looking at its teeth? (show teeth of carnivorous and herbivorous dinosaurs?) They are also important because they can teach us about the ancient environments these extinct organisms lived in by looking at the other fossils they have found in the same area. (Alice)

Paleontology is the study of fossils. *Paleo* means 'old; and *ology* means 'study of', so *paleontology* is 'the study of old things'. Paleontologists are people who study fossils. So If you have ever seen pictures of paleontologists digging up fossils, you will notice that often times they are in really dry areas maybe on a mountain side or cliff. These aren't the muddy areas that fossils are made in so what is the story there? Well, a long time ago, the rock could have been a field or forest or ocean bed and after millions and millions of years, that land has moved around, the mud has hardened and you get a layer of sedimentary stone full of fossils. So, let's be paleontologists. Last week, we went on a trip to dig for fossils on the side of a cliff, and we found several fossils! First we found this (hold up fish imprint). What type of fossil is this? (body fossil). What kind of environment do you think existed here in the past? (ocean, lake, stream, etc). Now, what if right before we left, we found this? (holds up petrified wood) Can we still be in the ocean? If this came from a tree, then the fish was probably near land. The site must have been in the water, but near land, like on a beach or in a stream!

The job of a paleontologist is to find fossils and start piecing together the clues to figure out what it was like in the past. Now you guys are on your way to being paleontologists too! (Mel)

Review:

(switch between the two of us) So, let's review! First, a body fossil is the remains of an organism that has turned into rock after a really long time. A trace fossil is what an organism leaves behind after a really long time! Paleontology is the study of fossils, which is really important because it can tell us about extinct organisms and what the environment looked like in the past! A good place to go see fossils today are museums, where you can see the fossils and read about what paleontologists have found out about the past!!

So to continue your journey as paleontologists in training, now that you have your own fossils, ask your parents to bring you to a museum to see more! Questions?

15 Minutes
(Total Minutes: 50 Minutes)

Differentiated Instruction:

English Learners: Repeat directions, if necessary, and physically model how to create fossils in clay. Write vocabulary, e.g. fossil, organism, on the board and read words aloud. Vocabulary words can also be visually demonstrated, e.g. using an illustration, and/or redefined in very simplistic terms. If possible, give familiar examples of vocabulary.

Advanced Learners: Have students create different fossils using different object placements. Students can write hypotheses about why the same fossil may appear differently.

Follow-up Possibilities

ELA Activity:

- Have students answer the following prompt:
“Write a letter to a friend describing what you learned about fossil formation.”

Reading Connections:

- Eyewitness: Fossil by Paul Taylor <http://www.amazon.com/Eyewitness-Fossil-Paul-Taylor/dp/0789458403>
- Prehistoric Life: The Definitive Visual History of Life on Earth by DK Publishing <http://us.dk.com/nf/Book/BookDisplay/0,,9780756655730,00.html>
- Fossils (Golden Field Guide Series) by Frank H. T. Rhodes, Paul R. Shaffer, and Herbert S. Zim http://www.amazon.com/Fossils-Golden-Field-Guide-Series/dp/1582381429/ref=pd_sim_b_9
- Smithsonian Handbooks: Fossils by David Ward http://www.amazon.com/Smithsonian-Handbooks-Fossils-David-Ward/dp/0789489848/ref=pd_sim_b_1

Mathematics Activity:

- Do word problems about fossils. Create a class graph using the students' different types of fossils.

Other:

PBS Kids Dragonfly TV – Can You Dig It?

http://pbskids.org/dragonflytv/web_assets/pdf/dftv_gpsedguide_babydinosaurs.pdf

Students make observations about the sizes of dinosaur bones listed in the chart and find things in the classroom that are comparable in size. Relates to linked video, DragonflyTV GPS: Baby Dinosaurs.

The following activity is a full inquiry investigation to determine the age of fossils based on where they are discovered. Groups of learners will dig for fossils embedded in a cake of multiple layers, carefully excavating each stratum and eventually preparing a chart from their notes for discussion with the group. The two main lessons from this exercise are that fossils from different layers come from different eras and that multiple interpretations of incomplete fossil evidence are possible.

American Museum of Natural History – Flesh out a Fossil

http://www.amnh.org/education/resources/rfl/pdf/dinoactivity_flesh.pdf

In this activity, learners discover how artists start with a skeleton and turn it into a realistic drawing of a dinosaur. Learners will examine how artists can recreate what a dinosaur may have looked like based on the fossils found by scientists. Learners follow the steps to draw an Oviraptor and then recreate a Velociraptor.

