Environmental Science Institute
THE UNIVERSITY OF TEXAS AT AUSTIN

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BE A PALEONTOLOGIST

Lesson plan for grades 2-6
Adapted by Laura Sanders, Environmental Science Institute, March 2011
Length of Lesson: Two Class Periods

SOURCES AND RESOURCES:

- http://www.fossils-facts-and-finds.com/fossil_hunt.html Fossils-Facts-And-Finds Lesson Plans
- http://www.youtube.com/watch?v=B7zo2zY1Zqg "I am a Paleontologist" They Might Be Giants

SAMPLES OF POTENTIAL TEKS ADDRESSED THROUGH THIS LESSON:

§112.13. Science, Grade 2, Beginning with School Year 2010-2011. 1A, 1B, 2A, 2C, 2F, 3C, 4A
§112.14. Science, Grade 3, Beginning with School Year 2010-2011. 1A, 2F, 3C, 3D, 7A, 7B, 9C
§112.15. Science, Grade 4, Beginning with School Year 2010-2011. 1A, 2F, 3C, 3D, 7B,
§112.16. Science, Grade 5, Beginning with School Year 2010-2011. 1A, 2D, 2F, 3D, 4A, 7A, 7D
§112.18. Science, Grade 6, Beginning with School Year 2010-2011. 1A, 2E, 3B, 3D, 4A

PERFORMANCE OBJECTIVES:

The students will be able to:

- Compare and explain some processes of fossilization.
- Construct a model of an excavation site.
- Model the thinking skills and actions of a paleontologist.

OVERVIEW:

This lesson plan consists of two parts. In Part I, students examine the process of fossilization. In Part II, students act as paleontologists and go on a fossil hunt. After the students have successfully completed their cleaning and identification, a "museum" could be set up to show off their work. Collecting boxes are easy to come by and not expensive. Student labels can be fixed to the box and the fossil cradled on felt or cotton batting for protection from sliding or bumping on the sides of the box. It is recommended that as little is said as possible by the teacher, offering students the opportunity to express their own ideas.

NOTE TO TEACHERS:

The excavation process (Part II) can happen an hour after the plaster has set, but might work best (make the fossil hunt seem more realistic) if it is done several days after Part I has been completed. Another option is to pre-make an excavation site so one is ready to go whenever your group is ready for Part II.

Safety: Plaster of Paris can pose an inhalation hazard and excavation tools could cause bodily harm if used inappropriately. Review safety tips with your class before each part of this lesson.

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MATERIALS:

Part I

- Inexpensive fossils as an engagement example (if possible)
- Shrimp shell (A workable fossil substitute)
- Escargot shell (A workable fossil substitute)
- Plaster of Paris
- Pitcher of water
- Sifter
- Fine sand- must be fine enough to go through the sifter
- Waterproof container-small disposable aluminum baking pans work well.
- Small plastic or rubber dinosaur

Part II

- Prepared plaster of paris "rock" containing fossil specimens
- "Chisels": a metal butter knife or small screw driver set (ranging in size from a tiny eyeglasses screwdriver to about an eighth of an inch)
- Magnifiers of various types. It would be best if they could be mounted so the hands can stay free and working while looking through the magnifiers at the fossil being removed
- Small bottle of vinegar with an eyedropper
- Clear nail polish

TEACHER PREPARATION

Part I

Mix a small amount of fine sand with the plaster of Paris. DO NOT ADD WATER. Put about a third of the dry mixture in a water proof container. Separate the remaining mixture into two containers. Mix a small amount of dry tempera paint to create different shades of brown. Mix the colors into the containers to make two distinct colors of powdery sand so the layers will show as different "soil" as it is added.

Part II

Before the lesson, remove the solid plaster of Paris from the aluminum tray. Have enough tools set up so a group of four students can share a complete set.

PART I: FOSSILIZATION

ENGAGEMENT:

Pass around sample fossils. If possible, have examples of both cast and mold varieties. For an even better impression, try to have a sample that is the positive/negative impression of both cast and mold of the same fossil.

> *INSTRUCTORS ASK: What is this? What do you notice about these fossils? What seems the same? What seems different? How do you think these differences happened? How are fossils formed? What can fossils tell us?*

Your discussion could include experiences they might have had: making clay or dough molds, baking a Bundt cake, making molded candies or a Jell-O mold. Have the class come up with a definition of a fossil and write it on the board.

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EXPLORATION and EXPLANATION:

Scientists think that life in the ancient seas might have been similar to modern sea life in many ways, such as salty water, sea plants, and invertebrates (animals with no backbone) such as sea snails who have an exoskeleton on the outside of their bodies. We know about these ancient animals because they leave fossils.

INSTRUCTORS ASK: How do you think these fossils of sea invertebrates would have been formed?

Discussion could include the shells falling to the sea floor, becoming buried in the sediment and filling with the soft sand of the ocean bottoms.

Bring out the prepared container of plaster of Paris and explain that this is a model of the ancient sea floor.

INSTRUCTORS ASK: What is a model? How is this model of the ancient sea floor the same or different from the actual thing? How can models help us explore ideas? What could we do to make this model a better learning tool for us?

Discussion could include the fact that the model is soft, sandy and powdery. However, it is not wet as it would be at the bottom of the sea. It is not as large as the sea floor, which is good for students because it fits in the classroom, but is significantly smaller and doesn't show other life or things that might exist there.

1. Place the shells in the dry plaster of Paris.
2. Pour a small amount of water onto the layer of plaster of Paris and shells.
   INSTRUCTORS ASK: Adding water reminds us that this is a model of the ancient ocean. What else would the animals bodies be exposed to? *[Possible answers include: currents, waves, turbulence, predators or scavengers eating the soft fleshy part of the bodies and leaving behind the hard shells.]*
   Discussion could include that as the soft bodies decomposed, the hard shell would fill up with sediments and mineral-laden water.
3. Using the sifter, sift a small amount of the remaining plaster and sand evenly over the water, allowing it to sink in and cover the shells. This models that sand and other sediments would eventually cover the ancient animals' bodies.
4. Continue to sift the plaster until a soft mud is formed. (Keep adding the plaster until all of the water is soaked up. The plaster will now dry fairly quickly. Plaster of Paris sets in about 30 minutes.)
   INSTRUCTORS ASK: How long would the process of fossilization take place? *[Possible answers include: days, weeks, thousands or millions of years.]*

Over time, the ancient sea might begin to dry up.

INSTRUCTORS ASK: Why would this have happened? How would this change the sea bed? What would happen to the shells?

Discussion could include that there are many possible causes, such as movements of the Earth's crust, changes in temperature, or volcanic actions. As the water level got lower and lower, muddy swamps and the thick

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vegetation they grew made good homes for species that could breathe the air. As they walked through the swamps, their heavy bodies left tracks in the soft mud.

5. Take a plastic or rubber dinosaur and make an imprint of their footprints.

   INSTRUCTORS ASK: What do you think will happen to these tracks? These footprints? What could we learn from these types of fossils?

Discussion could include the difference between fossils that are imprints and the fossil relics that will be left by the shells.

Allow the plaster to dry. Fossilization is a long, slow process. It takes many thousands or millions of years for a fossil to form. Minerals in the water and sediment are left in tiny holes or pores in the shell or bone. Eventually, one molecule at a time, the minerals replaces the original structures. What is left is a stone that looks exactly like the shell or bone that once was.

PART II: PALEONTOLOGY

ENGAGEMENT:

As students arrive, the song "I Am a Paleontologist" by They Might Be Giants could be playing in the background. This can be found on CD, or through video where the matching of dinosaur bones can be viewed along with the song at http://www.youtube.com/watch?v=B7zo2zY1Zqg. Part of the video shows children paleontologist guessing which dinosaur skeleton a particular bone fits in.

ELABORATION:

Note to Instructors: Dialogue is included in ***bold and italics.*** Things you would do during the lesson are in CAPITAL LETTERS.

1. ***The rock in front of you is ready for the painstaking process of removing fossils from it. The paleontologist who sent these to us needs your help to carefully expose or remove the fossil. Since the fossil could be fragile and easily damaged, we need to do this with a great deal of care. The slightest chip in the work place could ruin the fossil we are trying to expose.***

2. ***When paleontologists are working at a dig site, they might see just a small part of a fossil sticking out of the rock formation or even just an impression above the ground that would lead them to suspect a fossil was contained in the rock at that location.***
   The first step of the fossil hunt is to decide where the fossil might be hiding. Look at your rock to see if there are any bumps or ridges that might indicate a fossil burial.

   ALLOW STUDENTS TIME TO DECIDE WHERE THE FOSSIL COULD BE HIDDEN BENEATH THE SURFACE. HELP THEM TO USE A PENCIL TO OUTLINE THE AREA. BUMPS OR IRREGULARITIES IN THE SURFACE ARE TYPICAL CLUES.

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3. ***Once you decide where you want to start your dig and have marked it with a pencil, use a metal butter knife or scraper to gently scrape off the top layer of rock just outside the pencil lines. As you work, you may begin to see the edges of the fossil. Carefully scrape around the edges until you think you have a good outline of the fossil.***

   IT WILL TAKE SOME TIME FOR THE FOSSIL TO REVEAL ITSELF. IT IS IMPORTANT FOR STUDENTS TO REMOVE THE MATRIX A LITTLE AT A TIME USING A SCRAPING TECHNIQUE. IN THIS EXERCISE, YOU WON'T NEED TO USE ANY CHIPPING WITH HAMMERS.
   THE FOSSIL MAY STAY EMBEDDED IN THE ROCK MATRIX, USING THE MATRIX AS A SORT OF READY MADE STAND. IN THIS CASE, THE STUDENT WOULD CLEAN A NEAT "TROUGH" AROUND THE EDGES OF THE FOSSIL, AND THEN CLEAN THE SURFACE OF THE FOSSIL. ALTERNATIVELY, THE STUDENT CAN WORK AT REMOVING THE FOSSIL ENTIRELY. THIS MAY TAKE A BIT LONGER, BUT IT WILL ALSO GIVE THE OPPORTUNITY TO TRY SOME ADDITIONAL TECHNIQUES FOR REMOVAL. **SEE #5 BELOW.**

4. ***Next use a brush to gently remove the "rock" that is covering the fossil. If some of the rock is thick you can carefully scrape at it with a chisel. Be extra careful, though, because you could chisel off a part of the fossil.***

   STUDENTS WILL CONTINUE WORKING TO REMOVE THE ROCK AROUND THE FOSSIL. THE FOLLOWING ARE SOME SUGGESTIONS THAT IMITATE THE WORK OF THE PALEONTOLOGIST IN THE LAB.

5. ***If the fossil is tightly embedded and scraping away the matrix seems too great a challenge, you can use a mild acid solution to help dissolve the matrix away. In the lab, paleontologists, protect the exposed parts of the fossil from the acid by painting it with a special glue.***

   STUDENTS CAN IMITATE THIS PROCESS BY USING VINEGAR DROPS ON THE MATRIX AROUND THE FOSSIL. SINCE VINEGAR IS SO MILD, THEY CAN EVEN USE IT RIGHT ON THE FOSSIL TO REMOVE EXCESS MATRIX. ONCE MOST OF THE FOSSIL IS CLEANED, YOU CAN HAVE THE STUDENT COAT THE FOSSIL WITH CLEAR NAIL POLISH TO IMITATE THE PROTECTIVE GLUE COATING.

6. ***The last step to completing your fossil hunt is to note the type of fossil, date of acquisition or discovery, and the location. Once your fossil is cleaned and ready for display, make a small information card that shares the name of the fossil, the geologic time period and the location where it was found.***