



Lesson: Digging for Dinosaurs!

Grade Level: 1-8

Preparation Time: at least 24 hours in advance and 1 hour prior to activity

Activity Duration: 30 minutes

Concepts Addressed

- Many specific steps and techniques are followed and used between finding a fossil and displaying the fossil in a museum.
- Fossil preparation, completed by fossil preparators, is a step in the process of paleontology where fossils are carefully removed from matrix (dirt and rock), cleaned and prepared for study or display.

Background and key terms

- Preparation - the step in the process of paleontology when fossils are cleaned and prepared after they are excavated from the ground and brought back to the lab or museum in field jackets. The fossils still have rock and dirt matrix around them that needs to be carefully cleaned off. The people who do this careful work are called preparators. Preparators use small tools such as dental picks and toothbrushes, have good hand-eye coordination, and are very patient.
- Field Jackets - hard plaster shells put around fossils and a layer of rock and dirt (called matrix) when they are removed from the site where they were found and transported back to a lab or museum. Field jackets are made of burlap strips soaked in wet plaster. When the plaster dries, it hardens to form a solid shell. The plaster and matrix surround and protect fossils.
- Ethics - scientists and museums generally do not condone the non-scientific collection or sale of real fossils. However, sometimes when paleontologists collect fossils, they end up with extra pieces that do not appear to belong to the specimen they were collecting. These extra pieces may have ended up with the fossil being collected due to erosion and deposition either in the present or when the fossil was buried. Either

way, these pieces carry no scientific value on their own and are therefore available for educational use.

- Broken Fossils – many people often assume that dinosaur fossils are complete skeletons or at least complete bones. However, this is not the case. Due to millions of years of being exposed to pressure, erosion, and other geologic forces, dinosaur fossils are often broken, incomplete and strewn about in the rock. To explain this, the *Maiasaura* metatarsal (toe bone) can be used to show students how the fossil was once broken apart and is now glued together like a three-dimensional puzzle. Students will be more excited and have a better understanding of the fossil piece they find with this background
- Rocks vs. Fossils - You may choose to include a small, polished rock in the “field jacket,” to be found during preparation by the students. This not only gives the students another object to discover, but can allow for comparison between rocks and fossils. Determining whether a specimen is a rock or a fossil can be difficult in general. However, in this controlled case, the dinosaur fossil will likely be darker, more rough and less round than the rock. Students may say that fossils are rocks. At this level this is a valid argument (we will not study fossilization further in this lesson).
- Tools - fossil preparators use any tools they can find that will help them to remove the matrix from around the fossil without damaging the fossil in any way. Many fossil preparators have found that dental picks work well for gently scraping away matrix, and old toothbrushes work well for brushing away dust. Both of these tools are used gently, with gentle pressure, so that the fossil will not be scratched. Fossil preparators don't usually use the sharp tip of the dental pick. Fossil preparators often wear leather gloves, dust masks and eye protection to avoid dust and sharp objects. In this activity it is important to carefully monitor students' use of these potentially dangerous tool

Objectives

- Students will practice fossil preparation skills using real tools and techniques by removing a real dinosaur fossil from an artificial matrix.
- Students will be able to explain the difference between a chunk (broken piece) of fossil and a complete fossil bone.
- Students will be able to list reasons why broken fossils are more common than complete fossils in nature.

Materials

Plastic butter tubs (1 per student)
Sand
Plaster
Water
Bucket

Stir stick
Small rocks (1 per student)
Small plastic dinosaurs (1 per student)
Dental picks (with erasers on one end) (1 per student) or toothpicks
Toothbrushes (1 per student)
Plastic trays (1 per student)
Ziploc bags (1 per student)
Permanent markers

Lesson Procedure:

Set-up

1. At least 24 hours prior to the class, but not more than 2-3 days prior, create one “fossil jacket” per student, and a few extras, as following:
 - a. Set out plastic tubs on a flat surface that can get messy
 - b. Set out rocks and plastic dinosaurs so that they are easily accessible.
 - c. Combine 3 parts sand to 1 part plaster (a plastic cup is a good “part” measure—it makes enough in a batch to not take forever, but can be used before it dries out too much). Stir together with stick.
 - d. Add water and stir until consistency is thick - not runny, but also not dry.
 - e. Entirely completing one “jacket” at a time, place a handful of sand/plaster mixture into a ftub, press in one bone, one rock and one toy, and cover with more sand/plaster mixture. Repeat for each jacket until finished. You will likely have to mix several batches of sand/plaster mixture to finish all tubs.
 - f. Leave to dry in a dry place overnight. Placing a fan in front of the open tubs helps speed up the process.
****You may want to experiment with this process well before the class date so that you can judge the consistency you will need to make the sand/plaster mixture and the amount of time and materials necessary for your group. Also, the longer the jackets dry, the harder they become—plan accordingly for the age of your group.***
2. On the day of the activity, place all the finished jackets in the classroom.
3. Place plastic trays, dental picks and toothbrushes in the classroom.
4. Become familiar with background material.

Activity

1. Explain to the students that they will be performing the job of fossil preparators today. Discuss the role of fossil preparators in the process of paleontology.
2. Show students the real field jacket example to explain terminology.
3. Show the “field jackets” that we will be using and draw comparisons with the real field jacket.

4. Show students the tools that they will be using. Discuss proper and improper use of these tools.
5. Now the students are ready to excavate. Pass out a dental pick, toothbrush, tray and jacket to each student (it is helpful to have extra hands for this step).
6. Begin the preparation. You can decide (based on the age/frustration level of the group) whether or not they can dump the contents of the tub out to work on it. The most realistic model of real prepping would be to cut the sides of the tub down to the level of the matrix and just work from the top down, exposing more surface area as you go. However, if you don't want to cut the tubs, you can have the kids carefully remove the entire contents and then work from the top down. For very impatient kids you may want to let them work on the whole thing.
7. Monitor progress - most kids start out slowly and meticulously and then forget and start stabbing. Remind kids about proper technique. Also, watch to make sure kids don't stab their hands as they hold the jacket and press the sharp end of the tool towards their hand. I have seen this happen many times as kids concentrate.
8. Soon, someone will make a discovery. Hand out Ziploc bags (1 per student) and write each student's name on his/her bag. They can keep their finds in the bag so as not to lose them. As discoveries occur, talk to students individually about what they found - is it a rock? Is it a dinosaur? Why? How can you tell? Make sure that each student will be able to explain to their parents what they have found and how they are different.
9. As faster students finish you can assign them jobs to help clean up. If you still have finished students lingering and time left over, assign a fast student to help a slower one (make sure the slower one wants assistance - they usually do).
10. Anyone not finished at the end of the allotted time can take what they have left over home in their bag.

