**3-LS4-1 Biological Evolution: Unity and Diversity**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Students who demonstrate understanding can:   |  |  | | --- | --- | | **3-LS4-1.** | **Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they livedlong ago.**[Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.] [*Assessment Boundary: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.*] | | | |
| The performance expectation above was developed using [the following elements from the NRC document *A Framework for K-12 Science Education*](http://www.nextgenscience.org/pe/3-ls4-1-biological-evolution-unity-and-diversity##framework): | | |
| **Science and Engineering Practices**  [**Analyzing and Interpreting Data**](http://www.nap.edu/openbook.php?record_id=13165&page=61)  [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.](http://www.nap.edu/openbook.php?record_id=13165&page=61)   * [Analyze and interpret data to make sense of phenomena using logical reasoning.](http://www.nap.edu/openbook.php?record_id=13165&page=61) | **Disciplinary Core Ideas**  [**LS4.A: Evidence of Common Ancestry and Diversity**](http://www.nap.edu/openbook.php?record_id=13165&page=162)   * [Some kinds of plants and animals that once lived on Earth are no longer found anywhere. *(Note: moved from K-2)*](http://www.nap.edu/openbook.php?record_id=13165&page=162) * [Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.](http://www.nap.edu/openbook.php?record_id=13165&page=162) | **Crosscutting Concepts**  [**Scale, Proportion, and Quantity**](http://www.nap.edu/openbook.php?record_id=13165&page=89)   * [Observable phenomena exist from very short to very long time periods.](http://www.nap.edu/openbook.php?record_id=13165&page=89)     - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  ***Connections to Nature of Science***    **Scientific Knowledge Assumes an Order and Consistency in Natural Systems**   * Science assumes consistent patterns in natural systems. |

How Dinosaurs might have become trapped to become fossils: <https://www.youtube.com/watch?v=rzcMnb0yhxA> 3:04 min

Paleontologists excavating a 5meter tail <https://www.youtube.com/watch?v=maSjPJb4rbQ>

Adult Reference: Formation of Fossils: <https://www.youtube.com/watch?v=c_DCP4cLVNg>

**Show students:** How Fossils are made: <https://www.youtube.com/watch?v=3rkGu0BItKM> for younger students;

What are fossils? <https://www.youtube.com/watch?v=3rkGu0BItKM> 2:30 min

Tools for Digging up fossils <https://www.youtube.com/watch?v=oetS-bdZLOY> 2 min

La Brea Tar pits: <https://www.youtube.com/watch?v=G7FK59waeo0> 6 min <https://www.youtube.com/watch?v=9ySE6oY8BUg> 3 min. no narration

Students will participate in one activity that demonstrates how fossils are made and one activity involving the excavation of a “fossil”.

After Discussion of what is a fossil, show students “How Fossils are made”

Tell them they will make a cast of an actual fossil, then proceed with Activity 1.

**Activity 1 Identify fossils** (10 minutes)

**Materials needed:**

Fossils, fossils identifying keys

Magnifying lenses (1 per student)

**Process:**

Allow students to select fossils to examine and identify.

**Activity 2 Fossil cast** (10 minutes)

**Materials Needed:**

Flour and salt molding material: Make by combining 1cup salt/ 1 cup flour add sufficient water to make a soft dough. Make enough so that each student gets about ¼ cup molding material

Fossil molds and fossil ID sheet

Small paper plates (1 per student)

Cupcake liners can be substituted for the plates.

**Process**:

Have students work their modeling material into a piece about the size of a thick hamburger patty. Allow the students to examine the fossils and see if they can identify a few. They can then select one to make an impression of the fossil l by pressing it gently into the modeling material. They can also make an impression of a thumb to remind them that footprints can also become fossils. They should write their name on the plate as well as the name of the fossil. Remind them that back in the classroom the impressions will dry after a day or two.

**Activity 3: Fossil “excavation”** (20 minutes)

**Materials needed:**

This can be somewhat messy, so you may choose to cover the table with paper. The trays do contain most of the mess.

Small plastic pieces of dinosaur toys, one small bag per student (save the directions for putting the toy together. These are to be distributed at the end of the activity.)

Using large white bowels, prepare a mixture of 5 Tablespoons school glue to 2 ½ cups water that is used to moisten sand, into which the separate pieces of one toy have been placed in individual cupcake liners and the “excavation” left to dry. Drying time can vary, depending on how wet the sand was to begin. Suggest you allow 4 days drying time. Each student gets their own “excavation”

Chopsticks/skewers

Paintbrushes

Toothbrushes

Trays (to contain the excavation and tools, one per student)

Snack size baggies for students to take plastic “fossils” home.

**Process:**

You can show “Tools for digging up fossils”. Tell students that they will become paleontologists and will be excavating a promising site to locate “fossils”. They will use the tools of chopsticks, paintbrushes and toothbrushes to carefully remove the specimen from their dig site.

NOTE: Remind them that the “fossils” may be very small, so they should work carefully.

Allow students to explore their “dig” and to use their tools to dig out their specimens. Put student names on their baggies so that they can take their specimens home.

**Debrief at the end:**

Ask students to describe how easy or difficult it was to remove a specimen? Did it always come out intact? In pieces?

**Activity 3:**

Show the video on the La Brea Tar Pits and the Paige Museum as a location where students can see many fossils. Also point out that Sierra College has a good collection of fossils available for public viewing.

**Supply List**

Flour

Salt

Paper plates/cupcake papers

Fossils

**Plastic dinosaurs (can be purchased intact from Amazon** Vinyl Mini Dinosaurs (72 count) **or** [US Toy - Assorted Dinosaur Skeleton Toy Figures, Made of Plastic, (1-Pack of 12)](https://www.amazon.com/US-Toy-Assorted-Dinosaur-Skeleton/dp/B00362OM26/ref=sr_1_54?s=toys-and-games&ie=UTF8&qid=1480727581&sr=1-54&keywords=dinosaurs+in+toys" \o "US Toy - Assorted Dinosaur Skeleton Toy Figures, Made of Plastic, (1-Pack of 12))

Play sand

# Magnifying glasses

# School glue

# Snack size baggies

# Plastic trays