Is It a Fossil?

A fourth-grade class at Jones Elementary School went on a field trip. The students took a bus ride out of the city and into the country. Then they hiked to a large, open field. Their teacher, Mrs. Esposito, told them it was a fossil bed, or a place where many fossils are located. The field had been used as a farm, and many years of plowing and erosion had brought the fossils close to the surface of the ground.

Mrs. Esposito divided the class into teams and told them to find as many fossils as they could. Each time teams found a fossil, they wrote down what type of fossil they found and put an X on their map to mark the spot. They didn’t take the fossil so other people could enjoy the fossil bed, too.

Here is a list of objects that one team saw on the fossil hunt. Which of these are fossils? Put an X next to each fossil on the list.

- [ ] a dead leaf
- [ ] a twig
- [ ] a rock with the print (impression) of a shell on it
- [ ] a striped rock
- [ ] a rock that is shaped like a shell
- [ ] a shell
- [ ] a rock with a dark print (impression) of a plant on it
- [ ] a bone

How did you decide which objects were fossils? Explain your thinking.

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Rosa, Mia, and Devon found many fossils of shells during the fossil hunt. Each one had a different explanation for why shell fossils would be found in the middle of a large field.

**Mia:** Someone brought these fossils here and left them for people to find.

**Rosa:** Millions of years ago, this area was covered by an ocean. The fossils are the remains of the plants and animals that lived in that ocean.

**Devon:** There was a huge flood that washed all these fossils to this field.

Whose idea do you most agree with? Describe your ideas about how shell fossils could be found in an area with no lakes, rivers, or ocean.

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Teacher Notes

**Purpose**
The purpose of this assessment probe is to elicit students’ ideas about fossils and the fossil record before any formal instruction occurs. The probe is designed to determine whether students can differentiate between fossils and nonfossils and whether they can make inferences about the past environment from a fossil. Use this probe to guide your lesson planning and teaching strategies.

**Related Concepts**
Plate tectonics, geology, sedimentary rocks, stratigraphy, geologic time

**Explanation**
There are three fossils on the list:

- The rock with the impression of a shell. This is a mold fossil. It is formed when an organism’s remains are covered by soft sediment. As the sediment hardens, the impression of the shell is left in the sedimentary rock.
- The rock in the shape of a shell. This is a cast fossil. It is formed when sediments fill in a mold fossil and harden. The resulting three-dimensional fossil is a replica of the organism’s shell.
- The rock with a dark impression of a plant in it. This is an impression fossil. It is formed when the carbon in a plant leaves a dark impression as the plant decays over time.

Students may also select the bone as a fossil. Actual bones are not considered fossils. The dinosaur bones often displayed in museums, and other hard parts such as teeth, have been chemically altered and preserved. Over time, the original chemical material is replaced with other minerals. Another good example is petrified wood. A piece of petrified wood is not actually wood, but rock that has replaced the wood over a long period time.

A rock with lines, stripes, or other noticeable features may be confused with fossils. These and other pseudo-fossils are rock structures that resemble fossils, but lack the detailed structure of true fossils.

The dead leaf, twig, and shell are remains of actual living organisms. A fossil is not the remains of an organism, but a preserved trace of an organism.

Rosa’s explanation is the best. The Earth’s surface has changed over long periods of geologic time. Areas that were once covered by ocean may now be open areas of land or even mountains. The shell fossils were formed when ancient marine organisms died and were covered with sediments that, over time, hardened and formed sedimentary rock. Mold and cast fossils, as described above, were formed through this process.

http://beyondpenguins.nsdl.org/
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Is It a Fossil?

Curricular and Instructional Considerations
Students in the elementary grades should have hands-on experiences with real and simulated fossils. Examining real fossil specimens provides an opportunity for students to practice making observations, drawing, and recording data. Every effort should be made to include the widest variety of fossil types possible, and to include locally found specimens in these activities. Furthermore, students should have opportunities to simulate the various processes in which fossils are formed and excavated. Students can begin to explore the idea of dating fossils through their location in the fossil column (stratigraphy), although the concept of geologic time may be very difficult for these concrete thinkers to comprehend. Additionally, students can begin to make inferences about the past environment from the observation and study of fossil specimens. Explicit instruction and modeling may be needed to support students as they begin to think inferentially.

Administering the Probe
Visual aids will be extremely helpful when administering this probe. An ideal set-up is to have each of the listed items (including the nonfossils) available for students to examine.

If suitable fossil specimens are not available, teachers can easily make the mold and cast shell fossils using plaster of Paris and these directions found at: http://onramp.nsdl.org/eserv/onramp:330/apr08_moldcast.pdf.

The impression fossil of a plant can be formed with clay or salt-dough, a leaf or fern, and the directions found at: http://onramp.nsdl.org/eserv/onramp:331/apr08_impression.pdf.

Pictures of the shell mold, shell cast, and plant fossil from a site like Fossil Museum (see Related Web Sites) could also aid students in completing the probe.

This probe is most appropriate for students in grades 3-5. For students in grades K-2, teachers could interview students and record their ideas. During the interview, the teacher could provide the student with a variety of objects and ask the student to group them into fossils and nonfossils. As the student sorts the object, the teacher could ask the student to explain his or her thinking.

Another modification for students is to administer this probe as a card sort. Place the words or pictures on cards and ask students to sort them by “fossil”, or “not a fossil.” A third category, “unsure” may also be used. Students should also be asked to provide explanations for each.

Students in grades K-2 may not be able to make inferences about past environments from fossils. Instead, teachers can ask students to explain how they think the fossils have been formed.

It may be helpful to read the probe aloud before students begin work. Clarify directions and provide definitions as needed, but be careful to not provide any scientific concepts about fossils that might influence student responses.
Is It a Fossil?

Related Ideas in National Science Education Standards (NRC 1996)
K-4 Properties of Earth Materials
Fossils provide evidence about plants and animals that lived a long time ago and the nature of the environment at that time.

5-8 Earth’s History
Fossils provide important evidence of how life and environmental conditions have changed.

Related Ideas in Benchmarks for Science Literacy (AAAS 1993)
K-2 Evolution of Life
Some kinds of organisms that once lived on earth have completely disappeared, although they were something like others that are alive today.

3-5 Evolution of Life
Fossils can be compared to one another and to living organisms according to their similarities and differences. Some organisms that lived long ago are similar to existing organisms, but some are quite different.

Related Research
Students of all ages may hold the view that the world was always as it is now, or that any changes that have occurred must have been sudden and comprehensive (Freyberg, 1985).

Students may not be able to differentiate between fossils and nonfossils. Some students will correctly choose fossils, but have no rationale to support their choice. Others are not sure what can be a fossil. Some will explain that all rocks are fossils (Matthews, 1996).

Suggestions for Instruction and Assessment
Students should have as many opportunities as possible to observe many different types of fossils and describe them according to their observable properties.

Comparing fossils and nonfossils through direct observation helps students define the term fossil.

The process of fossilization should be emphasized. Lessons and activities that allow students to model the creation of impression fossils, molds and casts, tracks, and preserved organisms should be included.

Whenever possible, connect the study to the local environment. Invite a paleontologist or geologist from a local university to speak to the class or take a field trip to locate fossils. Remember to respect local laws governing fossil collection!

Interactive, online activities and videos can aid students in visualizing the long process of fossilization. Teachers’ Domain, The Smithsonian Institute of Paleobiology, and the

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Is It a Fossil?
American Museum of Natural History all provide interactive activities. (See Related Web Sites for more information.)

**Related NSTA Science Store Publications and NSTA Journal Articles**


**Related Publications**


**Related Web Sites**

American Museum of Natural History
Paleontology site
Interactive activities relating to stratigraphy and paleontology.

Department of Paleobiology
Smithsonian Institute of Natural History
[http://paleobiology.si.edu/](http://paleobiology.si.edu/)
Interactive activities include “Dinosaurs” and “Life of a Vertebrate Fossil.”
Is It a Fossil?

Fossil Museum
Fossil Galleries
http://www.fossilmuseum.net/FossilGalleries.htm
An index of images of fossils grouped taxonomically. Try “Ammonites,” “Diverse Plant Fossils,” and “Mazon Creek Fossils.”

Teachers’ Domain
http://www.teachersdomain.org/
Videos and interactive activities are available free of charge on this site. Registration (free) is required. Search for “fossils.”

References


