Fossil Formation Fun

Summary

The activities in this lesson will help students compare and understand the three types of fossils: preserved organisms, mineral replacement fossils, and impression fossils.

Materials

Fossil Observation
- Science notebook
- Pencil
- Five different fossils
- Timer
- Fossil Chart (pdf)

Preserved Organisms- Model of Amber
- 3 x 5 index cards
- Crayons
- Hot glue gun and glue sticks
- Brown pipe cleaners or actual insects

Mineral Replacement- Sponge Fossil
- Sponges
- Scissors
- Sand
- Salt
- Water
- Large container with pouring spout
- Large Cool Whip containers
- Measuring cups
- Long handled spoon

Impression Fossils- Making Traces
- Bag of Plaster of Paris
- Bowl and spoon
- Water
- 8 oz. paper cup
- Measuring cups
- Plastic fossils
- Petroleum jelly

Additional Resources

Books
- *Adventures in Paleontology: 36 Classroom Fossil Activities*, by Thor Hansen and Irwin Slesnick; ISBN- 13: 978-0-87355-272-1
- *A Golden Guide from St. Martin's Press: Fossils*, by Frank H.T. Rhodes, Herbert S. Zim, and Paul R. Shaffer; ISBN 1-58238-142-9
- *Boy, Were We Wrong About Dinosaurs!*; ISBN 0-525-46978-8
- *Fossils Tell of Long Ago*, by Aliki; ISBN-13: 1978-0-06-445093-5
- *Linking Science & Literacy in the K-8 Classroom*, Edited by Rowena Douglas, Michael P. Klentschy, and Karen Worth, with Wendy Binder; ISBN-

13: 978-1-933531-01-4
- *New Dinos*
, by Shelley Tanaka; ISBN 0-689-85138-9
- *Reader's Digest Pathfinders: Dinosaurs*
; ISBN 1-57584-288-2
- *The Complete Book of Dinosaurs*
; ISBN 0-681-37578-7
- *Web-linked, Online: Dinosaurs*
; ISBN 0-7566-2228-X

Media

- *Reading Rainbow: Digging Up Dinosaurs*
; ASIN 6302033365
- *Eyewitness: Dinosaurs*
; ISBN 0-7894-0038-3

Articles

- *Science and Children*
(Nov 2006), NSTA.

Background for Teachers

The three fossil types that are dealt with in this lesson are those specifically required by the Utah State Core for this grade level, the first being preserved organisms. In preserved organisms, the actual organism is basically unaltered and stays intact, e.g., mammoths that have been found in ice and frozen ground. The soft body parts are preserved as well as the hard parts. Preserved organisms have been found in tar pits and amber. Amber is formed when the soft resin from conifers and tropical flowering plants hardens. Organisms, e.g., insects, spiders, leaves, flowers, mosses, and even frogs, have been found in amber. Organisms trapped in this resin may experience a degree of decomposition, but because resin has a strong antibiotic component the decay of the organism is minimal.

The next type of fossils is mineral replacement. In this type of fossil the organism is buried in sediment, and the soft parts decay quickly. Bones, teeth, claws, and other hard parts decay more slowly. Water seeps through the sediment and passes through the bone. The seeping water dissolves the bone, and minerals in the water replace the bone one cell at a time. This eventually becomes stone. The same process happens in wood except that wood is often covered with volcanic ash instead of sediments. The ash prevents the wood from rotting, and as rainwater falls on the ash over many years it seeps through the ash into the wood. The mineral replacement makes an exact replica of the original organism.

The last fossil type is impression fossils. These fossils may show detailed outlines of thin plants or small animals, e.g., leaves, feathers, and fish, which die in sediment. As they decay, they leave a carbon deposit that shows as a dark print of the organism. Impression fossils also include tracks, tail prints, body outlines, teeth marks, and burrows. Mold and cast are impression fossils made by larger organisms. When the organism dies it is covered by sediment. The organism decomposes slowly and leaves a mold (hole) in its place. If the mold is later filled with sediment, it produces a cast that will physically look like the outside of the original organism.

Be aware that students may become confused by pseudo-fossils when examining rock specimens. These are rock structures that resemble fossils in external form, but lack the detailed structure of true fossils. Sometimes concretions that are harder than the rock in which they occur are found on the surface of the rock, and resemble fossil material.

Intended Learning Outcomes

1. Use science process and thinking skills.
2. Manifest scientific attitudes and interests.
3. Understand science concepts and principals.
4. Communicate effectively using science language and reasoning.

Instructional Procedures

Invitation to Learn

Fossil Questions

Read each statement carefully. If you believe it is true, place a check in the "Agree" column. If you believe the statement is false, place a check in the "Disagree" column. After learning more about fossils, you may go back and change any of your answers using a different color of pencil.

	Agree	Disagree
1. Scientists learn about Earth's history by studying fossils.		
2. Fossils are usually found in igneous rocks.		
3. Only the soft part of an organism can become a fossil.		
4. Impression fossils are also called track fossils.		
5. An organism can be preserved without changing by being frozen in ice.		
6. Amber is an insect found fossilized in rocks.		
7. Minerals that fill tiny holes in an imprint form mineral replacement fossils.		
8. Replacement fossils are all the same color.		

Instructional Procedures

Fossil Observations

In this activity, students will work in cooperative groups of five to six students (depending on class size) to use the process skills of observing, comparing, and inferring. When doing this activity it helps to use a timer; typically, about five to seven minutes allows them enough time to observe their fossil and record the information.

Students in each group should count off from one to five. Then students assemble with students from other groups who have the same number. Each numbered group will examine a different fossil, discussing the characteristics they observe.

Students will record their fossil observations in their own science notebook, along with a detailed drawing of the fossil. Their written observations should include such things as size, color, shape, texture, and any defining features.

Students go back to their original group to share what they have observed and learned about their fossil. Use the Fossil Chart to organize the group's information.

Students can then use their observations to ascertain similarities and differences among the fossils. They should use logical thought processes to show relationships and make inferences as to the fossil organism's original environment. It is also important that students use the

identified features to compare the fossils to living organisms that are familiar.

Each group can then share with the class as a whole.

Preserved Organisms- Model of Amber

Begin by discussing with students what a fossil is and how scientists use fossils to help explain Earth's past. Since there are currently no living dinosaurs, the only evidence we have about dinosaurs and other prehistoric organisms is what can be inferred from fossilized remains. Physical models that correspond to real objects and events can be used to explain and understand things and how they work. Using the process skill of formulating models, students will develop a physical representation of a preserved organism:

Give each student a 3 x 5 index card. Have each student draw about a one-inch circle on the left hand side of the index card. Have them color it the color that they think is closest the color of real amber.

Students should place the item representing the insect on the colored circle.

Students will bring the index card and insect to you to encase in hot glue, covering the colored circle and insect.

Discuss how this represents the resin that fossilized into amber over a period of millions of years, preserving the insect.

On the right hand side of the card, have them write the process that preserved the insect.

Mineral Replacement- Sponge Fossil

Using the process skill of formulating models, students will develop a physical representation of a mineral replacement fossil:

Each group will place their sponge shapes into a container holding sand, covering the sponge shapes completely. There should be a layer of sand below and above the sponges.

Mix two parts salt to 5 parts water in another container. Make sure that the salt is dissolved into the water.

Slowly poor the salt water on top of the sand until it completely soaks the sand.

Leave the container of sand in a warm, dry place until it completely dries. You can expedite the process by putting it in the oven at 250 degrees F for a few hours, but you will need to use a container that can go into the oven.

When it is dry, excavate the sponges with a spoon. Have students use a grid to record where each "bone" was found.

See how the sponges turned "bonelike." Discuss with students how when the salt water was added to the sand, it filled the pores in the sponge. When the water evaporated, the salt remained in those pores. This simulates how dissolved minerals replaced the cells in bones, wood, etc. Fossils are found in sedimentary rocks that are formed by cementation and compression.

Impression Fossils- Making Traces

In this model, Plaster of Paris represents the soft sediment that an organism would fall into before it becomes a fossil. Using the process skill of formulating models, students will develop a physical representation of an impression fossil:

Mix up Plaster of Paris to about the consistency of thick cream.

Pour approximately an inch into each student's cup, or have students mix their own in a margarine tub or their school milk carton that has been opened completely and rinsed out. Have them measure 12 cup of Plaster of Paris dry, then add approximately 1/4 cup water, and stir. Let it sit for a couple of minutes to start setting up.

Place their leaf, feather, shell, or other small item vein side down, gently into the Plaster of Paris until it makes complete contact with the surface. (I've had better results in getting the object out, if they have put a thin layer of petroleum jelly on the surface of it before putting it into the plaster.)

Allow this to cure for several hours.
After the object making the impression is removed, have students in different groups trade and match fossils with the objects that made the fossil.
Students should respond to these questions in their journals: How are your fossil models like a real fossil? How are your fossil models different from a real fossil? How can your fossil models help us to understand real fossils? What can real fossils tell us about the world at the time they were formed?
Follow the journal writing with a class discussion sharing their journal responses.

Extensions

Extend student learning by having students create a model that shows a dinosaur trackway. This can be done with various mediums such as clay or sand dough. Use different dinosaur models to make the tracks. Have students evaluate what information might be learned from the dinosaur trackway, such as: Does the dinosaur walk on two or four legs? Do you see evidence of a tail? Is there more than one type of dinosaur track? Can you see evidence of change of direction or increase in the speed of movement? What story is indicated from these tracks?
Use the book, *Fossils Tell of Long Ago*, by Aliki, as a read aloud. Then have students create a chart listing the different types of fossils described and how they were formed.
Vocabulary is often a stumbling block in science. Focus on vocabulary by creating a vocabulary study guide or by working with a group to illustrate the meaning of each important vocabulary word.
If accommodations are needed for students who may be in pull- out programs or absent on the day of the fossil observation activity, it can be done as a center activity. Students can record their information on the fossils and compile it in booklet form instead of using their notebooks. The drawback of this approach is that it doesn't allow for the use of comparing and inferring with classmates. This can also be used with students who have completed the group activity to focus a second time on making a better observation. Students will almost always increase the length and complexity of their responses.
If plaster of Paris is too messy for students to use, Play- Doh also works well for making an impression or track fossil. It dries completely in two days.
Using the fossils from the observation activity, students can write a riddle about their fossil. Students can then share their riddles with classmates. Classmates can try and match the fossil with the riddle.
Integrating with Language Arts: Sorting and Sifting the Fossil Date pdf

Introduce the Student Content Reading

Each student will individually read the Fossils pdf article to themselves silently.
Assign each student a partner. (Assign partners carefully, allowing the best reader to read aloud first. This will give the slower reader a second time through the material before their turn, and allow for better performance on the task.) Partner #1 reads the article aloud to their partner.
When finished with the reading, partner #1 retells the article information to partner #2, who uses the Fossil Retell pdf report form to record the retell.
Partner #2 then reads the article aloud to their partner. When finished with the reading, partner #2 retells the article information to partner #1, who uses the Fossil Retell report form to record the retell.
Partners should then discuss the information they learned from the article.
Randomly select students in the classroom to share with the class what they discussed with their partners.
Allow students to go back to their pre-assessments and change any responses that they now think were incorrect.

Family Connections

Students can take home the Fossil background reading and read to parents, discussing what they learned from the article.

As a family, take a trip to an Earth Science Museum or a dinosaur exhibit in your area. (See the website listed for more information.)

Assessment Plan

Pre-Assessment- See the Fossil Questions pdf blackline used as the Invitation to Learn.

3-2-1 Assessment: Have students write three facts that they have learned about fossils, two terms they want to remember, and one question that they have about fossils.

Using a tri-fold piece of paper, have students label and draw a different picture in each section that shows the formation of: a preserved organism, mineral replacement fossil, and an impression fossil.

Use the Fossil Assessment pdf which is included.

Bibliography

House, J. D. (2006). The Effects of Classroom Instructional Strategies on Science Achievement of Elementary-School Students in Japan: Findings from the Third International Mathematical and Science Study (TIMSS). *Academic Search Premier* (EBSCO HOST). Retrieved 11/21/2006

This article addresses how cooperative learning activities and active learning strategies have helped to improve student interest and achievement in science. The purpose of the study was to investigate the relationship between instructional strategies and student achievement. It was found that students who were frequently involved in cooperative learning and who frequently performed experiments in class earned higher scores.

Mercier, S., & Ostlund, K. (1999). *Rising to the Challenge of the National Science Education Standards: The Process of Science Inquiry*. California, Squaw Valley: S & K Associates

The beginning of this book gives a practical introduction to inquiry and implementing the National Science Education Standards. It also includes an overview to the process skills that are the key to success in science. There is a section on cooperative and collaborative learning groups and guidelines for helping students learn cluster, task, and camaraderie skills. Help with assessing social skills is also provided.

Puntambekar, S. (2006). Analyzing Collaborative Interactions: Divergence, Shared Understanding and Construction of Knowledge. *Academic Search Premier* (EBSCO HOST). Retrieved 11/21/2006

This article discusses the interaction between individuals during collaborative learning, sharing divergent perspectives, and shared knowledge bases. Learners move from divergent perspectives to collaborative knowledge building. Students create understanding from the discussions that they have. The purpose of the study was to understand how collaborative interactions develop over time.

Anderson, K.L., Martin, D.M., & Faszewski, E.E. (Sept 2006). Unlocking the Power of Observations. *Science and Children* (pp. 32-3).

This article discusses how observation is the cornerstone of the inquiry process that lays the groundwork for future scientific learning. Suggestions are given on how to help students make good observations and how to help students communicate those observations. Also given is an assessment checklist and rubric for assessing students' observation abilities.

Authors

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