Fossil Inferences

Summary

Students will use their knowledge about fossils to arrange fossil pictures in sequence from oldest to youngest.

Materials

Pencils
Colored Pencils
Drawing Paper,
Cardstock
Handouts:
Nonsense Cards Set A,
Fossils Cards Set B (1),
Fossils Cards Set B (2),
Stratigraphic Section for Set B,
Fossil Map of Utah

Additional Resources

Books

The Amazing Earth Model Book, Donald M. Silver & Patricia J. Wynne, ISBN # 0-590-93089-3

- *The Big Beast Book*
, Jerry Booth, ISBN #0-316-10266-0
- *Dinosaur-The story behind the scenery*
, Allan Hagood, ISBN # 0-916122-10-7
- *Dinosaurs of Utah and Dino Destinations*
, Pat Bagley and Gayle Wharton, ISBN #1566846013
- *The Dinosaur Alphabet Book*
, Jerry Pallotta
- *Everything You Need to Know About Science*
, Anne Zeman and Kate Kelly, ISBN # 0-590-49357-4
- *Eyewitness Books, Fossil*
, Dr. Paul D. Taylor, ISBN # 0-7566-0682-9
- *Eyewitness Books, Rocks and Minerals*
, Dr. R.F. Symes ISBN #0-7894-5805-5
- *The Extinct Alphabet*
, Jerry Pallotta, ISBN # 088106-471-8
- *The Fossil Factory*
, Douglas, Niles, and Gregory Eldredge, ISBN #1-57098-417-4
- *Kingfisher Young Knowledge, Rocks and Fossils*
, Chris Pellant ISBN, #0-7534-5619-2
- *Reader's Digest, Pathfinders, Dinosaurs*
, Paul Willis, ISBN # 0-7944-0001-9

Videos

Earth Science for Children, All About Fossils
Eyewitness Dinosaur
Eyewitness Prehistoric Life

Additional Media

University of Utah Museum of Natural History Fossil Kit Lorie Millward

Background for Teachers

Scientists have good evidence that Earth is very old, approximately four and one-half billion years old. Scientific measurements such as radiometric dating use the natural radioactivity of certain elements found in rocks to help determine their age. Scientists also use direct evidence from observations of the rock layers themselves to find the relative age of rock layers. Specific rock formations are indicative of a particular type of environment existing when the rock was being formed. For example, most limestone represents marine environments, whereas, sandstones with ripple marks might indicate a shoreline habitat or riverbed.

The study and comparison of exposed rock layers or strata in different areas of Earth led scientists in the early 19th century to propose that the rock layers could be correlated from place to place. Locally, physical characteristics of rocks can be compared and correlated. On a larger scale, even between continents, fossil evidence can help in matching rock layers. The Law of Superposition, which states that in an undisturbed horizontal sequence of rocks the oldest rock layers will be on the bottom, with successively younger rocks on top of these, helps geologists correlate rock layers around the world. This also means that fossils found in the lowest levels in a sequence of layered rocks represent the oldest record of life there. By matching partial sequences, the truly oldest layers with fossils can be worked out.

By correlating fossils from various parts of the world, scientists are able to give relative ages to particular strata. This is called relative dating. Relative dating tells scientists if a rock layer is "older" or "younger" than another. This would also mean that fossils found in the deepest layer of rocks in an area would represent the oldest forms of life in that particular rock formation. In reading Earth history, these layers would be "read" from bottom to top or oldest to most recent. If certain fossils are typically found only in a certain rock unit and are found in many places worldwide, they may be useful as index or guide fossils in finding the age of undated strata. By using this information from rock formations in various parts of the world and correlating the studies, scientists have been able to construct the geologic time scale: This relative time scale divides the vast amount of Earth history into various sections based on geological events (sea encroachments, mountain-building, and depositional events), and notable biological events (appearance, relative abundance, or extinction of certain life forms).

Intended Learning Outcomes

1. Use Science Process and Thinking Skills
4. Communicate Effectively Using Science Language and Reasoning

Instructional Procedures

Invitation to Learn?

Teaching about Earth's history is a challenge for all teachers. The idea of millions and billions of years is difficult for children and adults to comprehend. However, "relative" dating or time can be an easy concept for students to learn.

In this activity, students begin a sequencing activity with familiar items--letters written on cards. Once they are able to manipulate the cards into the correct sequence, they are asked to do a similar sequencing activity using fossil pictures printed on "rock layer" cards. Sequencing the rock layers will show students how paleontologists use fossils to give relative dates to rock strata.

Instructional Procedures

Part 1:

Hand out *Nonsense Cards* , Set A in random order. Students place on the table and work in small groups to sequence the eight cards by comparing letters that are common to individual

cards, and therefore, overlap. There should be lots of discussion. The first card in the sequence has "Card 1, Set A" in the lower left-hand corner and represents the bottom of the sequence. If the letters "T" and "C" represent fossils in the oldest rock layer, they are the oldest fossils, or the first fossils formed in the past for this sequence of rock layers.

Now, look for a card that has either a "T" or "C" written on it. Since this card has a common letter with the first card, it must go on top of the "TC" card. The fossils represented by the letters on this card are "younger" than the "T" or "C" fossils on the "TC" card and indicates fossils in the oldest rock layer. Sequence the remaining cards by the same process. When done you should have a vertical stack of cards with the top card representing the youngest fossils of this rock sequence and the "TC" card at the bottom of the stack indicating the oldest fossils.

Questions to ask:

After putting the cards in order, write down the sequence for easy checking. Start at the bottom going oldest to youngest.

How do you know "X" is older than "M"?

Explain why "D" in the rock layer represented by DM is the same age as "M."

Explain why "D" in the rock layer represented by the OXD is older than "D" in the rock layer represented by DM.

Part 2:

Look carefully at the second set of cards with sketches of fossils on them. Each card represents a particular rock layer with a collection of fossils that are found in that particular rock stratum. All of the fossils represented would be found in sedimentary rocks of marine origin. Figure A gives some background information on the individual fossils.

The oldest rock layer is marked with the letter "M" in the lower left-hand corner. Don't worry about the other letters at this time. Ask students to find a rock layer that has at least one of the fossils you found in the oldest rock layer. This rock layer would be younger as indicated by the appearance of new fossils in the rock stratum. Keep in mind that extinction is forever. Once an organism disappears from the sequence it cannot reappear later. Use this information to sequence the cards in a vertical stack of fossils in rock strata. Arrange them from oldest to youngest with the oldest layer on the bottom.

Extensions

Curriculum Extensions/Adaptations/Integration

Students research different fossils to see where they are on the geologic time scale.

Research the internet for fossil trivia, then write a question and answer game for the class.

Pair learners with special needs in groups with academically strong learners.

Students write a story telling the life of an animal that is facing extinction.

Draw a fossil pop up book. Write a short definition below each picture.

Family Connections

Students may take family field trips to a nearby fossil bed.

Visit dinosaur quarries if available.

Take home card sets A and B and teach a family member about the Law of Superposition

Assessment Plan

Checking individual stacks of cards.

Verbal answers to the questions.

Students write a short paragraph explaining the Law of Superposition.

Sequence information using items which overlap specific sets; students will relate sequencing to the Law of Superposition and then show how fossils can be used to give relative dates to rock layers.

Bibliography

Schmoker, M. 1999. The key to continuous school improvement. *Results 2nd Edition Association for Supervision and Curriculum Development* pg. 71
"We labor under the incorrect notion that students must master basic skills before they can learn higher-order skills or engage in complex activities. Studies in math, reading, and writing clearly demonstrate that the opposite is true. Students learn best when basic skills are taught in a vital challenging context that makes the skills meaningful. The very thing that keeps students from achieving in these areas is the dry irrelevant teaching strategies we often employ, especially with students who most need real challenges. " (Means, Chelemer, and Knapp, Teaching Advanced Skills to at Risk Students: Jossey-Bass 1991)
Schmoker, M. 1999 The key to continuous school improvement *Results 2nd Edition* ASCD pg. 73
Virtually every teacher has acquired some semblance of training in this highly effective method (cooperative learning), estimates are that only about 10 percent of teachers use cooperative learning. One of the simplest forms of cooperative learning--having students occasionally work in pairs to ensure each other's understanding of difficult concepts-- can be expected to bring immediate effects especially among low-achievers. They also found that such simple pairings are especially effective in helping students to succeed in math and science." (Joyce B. Weil and Showers 1992 Models of Teaching. New York: Allyn and Bacon.)

Authors

Utah LessonPlans