

ASSIGNMENT DISCOVERY ONLINE CURRICULUM

Lesson title:

Dinosaur Detectives

Grade level:

6-8, with an adaptation for older students

Subject area:

Life Science

Duration:

One to two class periods

Objectives:

Students will—

1. Understand that discoveries about dinosaurs have a long history and that each paleontologist adds his or her work to a body of fossil evidence used to support theories about dinosaurs.
2. Find out that paleontologists often support one theory over another until additional fossil evidence either confirms or disproves the theory.
3. Understand that paleontologists can learn more about dinosaurs through new scientific techniques.

Materials:

For the class:

- Computers with Internet access (optional but very helpful)
- Encyclopedias
- Additional resources about paleontologists through history

For each student:

- Pens, pencils, and markers
- Large sheets of paper
- Books and magazines
- One copy of Classroom Activity Sheet: Paleontologist Profile
- One copy of Classroom Activity Sheet: Paleontologist Time Line

This lesson plan could be enhanced by purchasing a copy of the TLC School documentary *Discover Magazine: New Dinosaurs* from our School Store. *Discover Magazine: New Dinosaurs* airs on the Discovery Channel February 27, April 3, May 8, and June 12.

Procedures:

1. Ask students to brainstorm what they know about dinosaurs. Then ask them how we know this information, especially since dinosaurs have been extinct for millions of years. If students mention the study of fossils, add to their thinking by telling them that this specialty is called paleontology, the science dealing with life during past geological periods as known through the study of fossil remains. (If students are completely unfamiliar with this area of science, simply explain what the lesson will be covering.)
2. Explain that scientists began studying dinosaurs in the late 18th century, when they found fossilized bones that they couldn't identify. Specialists in anatomy, such as Georges Cuvier, realized that the bones were from animals from long ago. This led Cuvier to first introduce the idea of extinction. Before that time, people believed that the animals on Earth were unchanged and had always existed.
3. Discuss how over time, paleontology emerged as a specialty as scientists found enough fossilized bones to enable them to reconstruct entire dinosaur skeletons. By studying these skeletons, paleontologists have been able to propose theories about the world that existed millions of years ago.
4. Explain to students that they are going to conduct research about some major paleontologists and their discoveries. Divide the class into small teams of about 2-3 students. Each group will research a paleontologist to study in-depth and present an oral report to the class.
5. Following are paleontologists who have made significant discoveries. If students are familiar with paleontologists, they may want to choose one from this list or from their own research. If this is a new topic to students, you could assign a paleontologist to each group:
 - Georges Cuvier (1769-1832)
 - Gideon Mantell (1790-1852)
 - Mary Anning (1799-1847)
 - Othniel Marsh (1831-1899)
 - Edward Drinker Cope (1840-1897)
 - Roy C. Andrews (1884-1960)
 - Roland T. Bird (1899-1978)
 - Robert Bakker (1945 -)
 - James I. Kirkland (1954 -)
 - Paul C. Sereno (1958 -)
6. Give each group a copy of the Classroom Activity Sheet: Paleontologist Profile to help them organize their research. They will use this sheet to answer the following questions while conducting their research:
 - What is the paleontologist's name?
 - When did he or she live?
 - Where did they carry out their fieldwork?

- What are their major discoveries?
- What theories do (or did) they support?
- What technology aided them in their work?*

* Point out to students that advances in technology have given paleontologists new insight into the world of dinosaurs. For example, with accurate carbon-14 dating, scientists can place the bones correctly in the geological time span. With CAT-scan technology, they can see inside fossilized dinosaur skulls. Computers can now create virtual dinosaurs that show scientists how the giant beasts once moved. The examination of fossilized dinosaur dung, called coprolite, can give scientists an idea of what dinosaurs ate.

Encourage students to include maps of where the fieldwork took place and drawings of the scientists' major discoveries.

7. Suggest that students use the following Web sites as part of their research:
 - Georges Cuvier: <http://www.ucmp.berkeley.edu/history/cuvier.html>
 - The geological time scale link at: <http://www.ZoomSchool.com/subjects/dinosaurs>
 - General sites on paleontologists:
 - <http://www.ZoomSchool.com/subjects/dinosaurs/glossary/Paleontologists/shtml>
 - <http://www.dinohunters.com/Hunters/hunter.htm>
 - <http://www.dinohunters.com/Hunters/chronology.htm>
 - <http://www.lhl.lib.mo.us/pubserv/hos.dino.welcome.htm>

You may also want to direct them to this excellent children's book on the science of paleontology:

- Clinton, Susan. Reading Between the Bones. New York: Franklin Watts, 1997.
8. Have groups present their findings to the class in the first person, taking on the persona of their selected paleontologists. They could come to class dressed in appropriate costumes and could present the maps, drawings, and other visual elements as though they had originally developed them. If appropriate, students could challenge the theories of other paleontologists. During the presentations, have students take notes on the Classroom Activity Sheet: Paleontologist Timeline. As a homework assignment, ask them to use their notes to create a timeline of significant discoveries and people in paleontology.
 9. Encourage students to expand their timelines in creative ways. For example, they could include an illustration of a dinosaur next to the paleontologist who helped "discover" it or drawings of the paleontologist showing his or her distinctive features, such as a black hat always worn or a particular tool always used.

Adaptation for older students:

Have students create a time line highlighting any changes in paleontologists' theories. Students may choose a current question in paleontology among those listed below:

- Were dinosaurs warm- or cold-blooded?
- Were dinosaurs ancestors of birds?
- What are the theories behind dinosaur extinction?

Then have students research and write a paper that supports one side of a particular theory. Have students share their reports with the class.

Questions:

1. Which paleontologist do you think contributed the most to the field of paleontology? Why do you think that contribution is particularly significant?
2. Discuss how the work of paleontologists has changed because of technology. Can you imagine additional kinds of technology that would help paleontologists? What do you think these forms of technology would enable scientists to learn about dinosaurs?
3. Discuss what character traits a good paleontologist should have. Why are these qualities important?
4. What is the value of studying dinosaurs? What does investigating the past teach about the present?
5. If you could travel back in time and join one of these paleontologists on a dig, who would you want to work with and why?
6. Has studying different paleontologists piqued your interest in this kind of work? What aspect of paleontology seems most interesting to you? Why?

Evaluation:

Use the following three-point rubric to evaluate students' work during this lesson. Students should be able to develop a thorough report, fill in their time lines completely, and make an interesting presentation to the class.

Three points: student answered the stated questions in his or her report; gave a logical oral report using some graphics such as maps or drawings; took notes that he or she used to fill in his or her time line completely

Two points: student answered the stated questions in his or her report; student gave a logical oral report; student took notes and partially filled in his or her time line

One point: student answered most of the stated questions in his or her report; student gave a somewhat logical oral report; student added some new information to his or her time line

Extensions:

Dream Dig

Challenge students to describe a dinosaur dig—either real or imaginary—they would most like to be on. Encourage them to include details such as the weather at the field site, the experience of finding an important fossil, and the difficulties of the excavation.

Dinosaur Hunter Trading Cards

Suggest that students transform the information from their reports into paleontologist trading cards. Students can illustrate their cards with pictures of paleontologists or of the dinosaurs they discovered. Tell students that the cards should contain the basic facts as well as something really interesting or unusual about the paleontologist or dinosaur featured on the card.

Suggested Readings:

Walking with Dinosaurs: A Natural History

Tim Haines, Dorling Kindersley, 1999.

Incredibly realistic state-of-the-art computer graphics and a personalized, narrative text take the reader back to see and feel what life may have been like during the time of the dinosaurs. Covering several specific periods of the dinosaurs reign on earth, this book presents the everyday lives of common dinosaurs in a way that no reader will forget.

Dinosaur Lives: Unearthing an Evolutionary Saga

John R. Horner and Edwin Dobb, HarperCollins, 1997.

The author, a celebrated paleontologist, brings the reader along with him into the field on digs for dinosaurs and into the laboratory to search for answers to the controversies surrounding the dinosaurs' origins, lives and extinction.

Web Links:

Dinosaurs (Southwest Educational Development Laboratory)

Dinosaur unit of study, including lesson overview, objectives, and lesson plans.

<http://www.sedl.org/scimath/pasopartners/dinosaurs/dinohome.html>

Sue at the Field Museum

Information about “Sue,” the world’s largest, most complete, and best-preserved Tyrannosaurus rex.

<http://www.fmnh.org/sue/default.htm>

Dinosaurs: Facts and Fiction

Information site listing common facts and fictional beliefs about dinosaurs.

<http://pubs.usgs.gov/gip/dinosaurs/>

Dinorama

Photographs and information about dinosaurs.

<http://www.nationalgeographic.com/features/dinorama/frame.html>

Geological Time Scale

A web link to a geological time scale.

<http://www.ZoomSchool.com/subjects/dinosaurs>

When Dinosaurs Ruled

Complete lesson plan, including discussion questions, activities, vocabulary, suggested readings, and web links.

<http://school.discovery.com/lessonplans/programs/dinosaursruled/index.html>

Connecting Students (Themes and Units–Dinosaurs)

A wealth of K–12 lesson plans about dinosaurs and related topics plus resources, books, handouts, and web-based activities.

<http://www.connectingstudents.com/themes/dinos.htm>

Vocabulary:

carbon-14 dating

Context: Paleontologists have come to depend on carbon-14 dating to determine the age of fossil remains.

Definition: A heavy radioactive isotope used to date archaeological and geological materials.

CAT (computer-assisted tomography) scan

kat skan

Context: Paleontologists use CAT scans to investigate the inside of fossils, such as the nasal passage of a skull.

Definition: A three-dimensional picture of the internal structures of a solid object made by integrating an x-ray and a computer image.

coprolite

ka [umlaut over the a] [stress symbol] • preh • lit [long I symbol]

Context: Thin cross-sections of coprolite can be examined under a microscope to determine the ancient diet of the dinosaur.

Definition: Fossilized excrement.

Cretaceous

kri • ta [stress symbol] [long a symbol] • shehs

Context: The Cretaceous period of the geological time scale makes up the last third of the Age of Dinosaurs and is a time when mammals were becoming more widespread.

Definition: The last period of the Mesozoic era characterized by continued dominance of reptiles, diversification of mammals, and the extinction of many types of organisms.

fossil

fa [umlaut over the a, stress symbol] • sehl

Context: When paleontologists find a dinosaur fossil embedded in the earth, they have to be very careful not to damage it when they remove the fossil from the ground.

Definition: A remnant, impression, or trace of an organism of past geological ages that has been preserved in Earth's crust.

Jurassic

Ju • ra [stress symbol] • sik

Context: The Jurassic period of the geological time scale is well known for its diverse dinosaur populations.

Definition: The period of the Mesozoic era between the Triassic and Cretaceous periods marked by the presence of dinosaurs and the first appearance of birds.

Mesozoic

meh • so [long o symbol] • zo [stress symbol] [long o symbol] • ik

Context: The Mesozoic period of the geological time scale is also known as the Age of Dinosaurs.

Definition: Relating to an era of geological history (248 million to 144 million years ago) including the interval between the Permian and the Tertiary eras; this period is marked by the presence of dinosaurs, marine and flying reptiles, and the appearance of mammals and birds.

paleontology

pa [long a symbol] • le [long e symbol] • an [umlaut over the a] • ta [stress symbol, umlaut over the a] • leh • je [long e symbol]

Context: If you are interested in dinosaurs and fossils of ancient life-forms, you may enjoy a career in paleontology.

Definition: The science dealing with the life of past geological periods as known from fossil records.

Triassic

Tri [long I symbol] • a [stress symbol] • sik

Context: The Triassic period of the geological time scale is the first of three parts of the period known as the Age of Dinosaurs and is when dinosaurs first made their appearance on Earth.

Definition: The earliest period of the Mesozoic era marked by the first appearance of dinosaurs.

Academic standards:

Grade level:

6-8

Subject area:

Life Science

Standard: Understands the basic concepts of the evolution of species.

Benchmark 1: Knows that the fossil record, through geologic evidence, documents the appearance, diversification, and extinction of many life-forms.

Benchmark 2: Understands the concept of extinction and its importance in biological evolution.

Grade level:

6-8

Subject area:

Earth Science

Standard: Understands basic Earth processes.

Benchmark 1: Knows how successive layers of sedimentary rock and the fossils contained within them can be used to confirm the age, history, and changing life-forms of the Earth, as well as how this evidence is affected by the folding, breaking, and uplifting of layers.

Benchmark 2: Knows that fossils provide important evidence of how life and environmental conditions have changed on Earth over time.

All national academic standards used on this site are compiled and provided to Discovery Channel School by the Mid-continent Regional Educational Laboratory (McREL) in Aurora, Colorado.

Credit

Audrey Carangelo, freelance curriculum developer.

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Paleontologist Profile

Use this sheet to record information about the paleontologist you investigated.

Paleontologist's name: _____

When did he or she live? _____

Where did the paleontologist carry out his or her fieldwork? _____

What are his or her major discoveries? _____

What theories does (or did) he or she support? _____

What technology aided the paleontologist in his or her work? _____

Record any other interesting facts or details on the back of this sheet.

Paleontologist Time Line

As your classmates present their paleontologist profiles, use this sheet to record information about the different scientists. Place information about each paleontologist in the appropriate spot on the time line. On the back, create your own time line highlighting important discoveries in paleontology.

Name: _____

Name Date: Area studied: Important discoveries:	Name Date: Area studied: Important discoveries:	Name Date: Area studied: Important discoveries:	Name Date: Area studied: Important discoveries:	Name Date: Area studied: Important discoveries:
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1750	1800	1850	1900	1950	2000
Name Date: Area studied: Important discoveries:	Name Date: Area studied: Important discoveries:	Name Date: Area studied: Important discoveries:	Name Date: Area studied: Important discoveries:	Name Date: Area studied: Important discoveries:	Name Date: Area studied: Important discoveries: