

Teacher Tool 47: Explore! Fossils Study Guide

Study Guide for Geology 1: Explore! Fossils

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Explore! Fossils

Original Air Date: January 28, 2015

Grade Levels: 3-6

Program Description:

Learning about fossils begins with discovery and continues with meticulous investigation until the conditions are just right to safely remove the specimen from its natural environment. Then the real exploration begins. . . in the laboratory. Where can fossils be found? How can they be successfully extracted? What do they tell us about life on our planet before our time? Want to find out?

For this episode of *Explore!* we investigate fossils and ask the big picture question, "How can artifacts from our past teach us about life before our time and help guide our future?" Through the course of this energetic and interactive cross-curricular program, students get a chance to answer that question for themselves and listen to the answers of others as they interact with paleontologists, geologists, geographers, fossil hunters, and others involved in the discovery and exploration of fossils.

To investigate the program's theme and big picture question through a cross-curricular approach, each episode of *Explore!* utilizes Who, What, Where, When, Why and How questions:

Who does that? gives students a chance to meet someone who works in the field or does an activity related to the program's theme.

What do you want to know? guides our segments when we go to questions from participating groups.

Where is that? focuses on a geographic exploration related to the program's theme.

When did that happen? takes us back in time to people, places, events related to the program's theme.

How does that work? lets students discover the workings of a machine or concept related to the program's theme.

Why you ask? delves into more detail/explanation/background on a topic related to the program's theme.

For this episode, we explore those questions in a number of ways. Students will look at maps used to search areas suitable for fossil exploration. We investigate a geologic time line and learn how geologists use the science of stratigraphy to help them search for fossils and understand what they have found. We employ the scientific method as we look at fossil specimens to learn what they can tell us about the animals and plants that lived on earth before us. Students interact with experts who have dug for and successfully extracted fossils and see how the fossil remains of a dinosaur were carefully removed from its natural environment and taken to a lab for further investigation. We meet a scientist researching why certain fossils glow under ultraviolet light and learn how that phenomenon might help fossil exploration in the future. Through it all, we weave in student questions for the experts joining us.

Program Objectives:

Students will:

1. Engage in critical and creative thinking.
2. Engage in interactive activities and discussion about the nature of fossils themselves, fossil exploration, fossil extraction, and fossil reconstruction.
3. Interact with professionals whose work involves fossils and learn about their careers.
4. Develop an answer for themselves to the question: “How can artifacts from our past teach us about life before our time and help guide our future?”

Program Format:

The program consists of the following segments. **Time codes are provided in blue to help you find specific segments in the program.**

I. Welcome and Introduction—An overview of the program’s theme and importance of the topic will be presented as student groups are welcomed to the program. Video, images, factual information and vocabulary words related to each topic will be integrated throughout the segment.

A. Who Does That? (00:00 to 04:07)

In this segment we meet the fossil expert joining us for the program and define the following vocabulary words.

1. Paleontology
2. Archaeology
3. Geology

B. Where Is That? (04:08 to 08:45)

This geographic segment uses maps to demonstrate how paleontologists, geologists and other fossil hunters find good locations to search for fossils. Vocabulary words included in this segment are listed below.

1. Geography
2. Topography
3. Stratigraphy

C. When Did That Happen? (08:46 to 11:33)

Historic events linked to the discovery of fossils or other historic remains are presented.

II. Learning from Fossils—In this segment we explore the wide variety of information fossils can teach us about the earth and the creatures that have lived on it. Video, images, factual information and vocabulary words related to each topic will be integrated throughout the segment.

A. Exploring Fossil Specimens (11:34 to 19:16—subpoints A through C)

1. What is a Fossil?
2. Looking at what micro fossils can teach us about the environment

B. What Do You Want to Know?

Student questions are woven into this segment based on the topics we have explored so far in the program.

Student Questions Included in this Segment:

How do you dig out fossils without breaking them?

What do you put the fossil in to get it back to the museum safely?

C. How Does That Work? Extracting a Dinosaur Fossil

This segment explores the processes used to successfully extract a dinosaur fossil from its natural environment.

1. Locating it in Montana
2. Process to remove the specimen from the earth
3. Preparing the specimen for preservation and transport
4. Arrival in the lab
5. Seeing the dinosaur fossil up close
6. What the specimen tells us about the dinosaur it came from

D. Lab Activity—Using Fossil Footprints (19:17 to 24:10)**E. What Do You Want to Know? (24:11 to 29:19)**

Student questions will be woven into this segment based on the topics we have explored so far in the program.

Student Questions Included in this Segment:

How do you clean the fossils?

What's the biggest dinosaur you've ever found?

What causes the sharp break in the fossil record?

Can you describe how fossils are formed?

What do fossils have to do with fuels?

Do you have to get special permission to search for fossils?

III. Why You Ask? Why Shine Ultraviolet Light on Fossils (29:20 to 35:15—subpoints A and B)**A. How Does That Work? Ultraviolet Light and Fossils**

This segment explores the properties inherent to mineral fossils and how the process of shining ultraviolet light makes them glow.

B. What We Could Learn from the Glow

1. Identifying bite marks, scratches and other miniscule features of the fossil
2. Using a portable unit to utilize the technology while out in the field

C. What Do You Want to Know? (35:16 to 39:58)

Student questions are woven into this segment based on the topics we have explored so far in the program.

Student Questions Included in this Segment:

How do fossils get inside the rock?

While fossils are in the ground can they disintegrate?

What are fossils used for?

Can anyone find fossils or do you have to be a special scientist?

How do fossils get really deep into the ground?

IV. Summary and Closing—We offer a few more fascinating facts about fossils and dinosaurs, say thank you and goodbye. **(39:59 to 41:25)**

Featured National Standards:

The following **Common Core Standards for English/Language Arts and Literacy in History/Social Studies, Science and Technical Subjects** are referenced in this program:

Grades 3-6 College and Career Readiness Anchor Standards for Reading

7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

Grades 3-6 College and Career Readiness Anchor Standards for Writing

6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

Grades 3-6 College and Career Readiness Anchor Standards for Speaking and Listening

1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
5. Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

Grades 3-6 College and Career Readiness Anchor Standards for Language

6. Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

Program-Related Activity Suggestions: Building on the content and activities explored in the program, consider the following options as extension/enrichment activities for your students to engage in individually, in small groups, or as an entire class.

1. Learn More About It—The links below provide a wide variety of activities related to fossils, dinosaurs, paleontology, geology, and mineralogy.

<http://www.brainpop.com/educators/community/bp-jr-topic/fossils/> -- Brainpop Educators website with lesson ideas and activities related to fossils

<http://www.e-learningforkids.org/science/lesson/exploring-fossils-and-fossil-records/> -- E-Learning for Kids website with lessons on exploring fossils and the fossil record

<http://www.akronfossils.com> -- Website of the Akron Fossils and Science Center

http://www.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.lp_funfossils/fun-with-fossils/ -- PBS Learning website with videos, lessons, and activities related to fossils

<http://www.amnh.org/explore/ology/paleontology> -- American Museum of Natural History website on Paleontology

<http://www.lsa.umich.edu/paleontology/> -- University of Michigan Museum of Paleontology

<http://www.kidsgeo.com/geology-for-kids/> -- Geology for Kids website

<http://www.sciencekids.co.nz/geology.html> -- Science Kids website on geology

<http://www.mineralogy4kids.org> -- Mineralogy for Kids website

<http://www.nhm.ac.uk/kids-only/ologist/mineralogist/> -- Natural History Museum website on mineralogy and being a mineralogist

2. Share Your Video “Our State Fossil”—The purpose of this activity is to provide students the opportunity to share a video they have created that provides information about their state fossil (if their state has one) and potentially have that video published as part of the resources available to all students and teachers on Educate.Today. If you are interested in having your student video published, please e-mail us at live@hectv.org. Put “Our State Fossil Video” in the subject line.

3. Share Your Video “The Fossil I Found”—The purpose of this activity is to provide students the opportunity to share a video they have created that provides information about a fossil they have found and potentially have that video published as part of the resources available to all students and teachers on Educate.Today. If you are interested in having your student video published, please e-mail us at live@hectv.org. Put “The Fossil I Found Video” in the subject line.

4. Thank A Guest—Have students write a letter to one of the guests from our program detailing an insight the student gained from interacting with them, an appreciation for their participation, and/or another focus area of their choice. Letters can be e-mailed to us at live@hectv.org or mailed to us at:

HEC-TV

Attn: Educate.Today

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Suite 106

St. Louis, MO 63044

Vocabulary:

The following vocabulary words will be highlighted in the program:

Archaeology
Fossil
Geography
Geology
Paleontology
Stratigraphy
Topography

Supplemental Resources:

Students can learn more about fossils and other topics explored in this program at the websites below:

<http://www.museumoftherockies.org> -- Museum of the Rockies website

<http://www.blm.gov/wo/st/en.html> -- Bureau of Land Management website

<http://www.brainpop.com/educators/community/bp-jr-topic/fossils/> -- Brainpop Educators website with lesson ideas and activities related to fossils

<http://www.e-learningforkids.org/science/lesson/exploring-fossils-and-fossil-records/> -- E-Learning for Kids website with lessons on exploring fossils and the fossil record

<http://www.akronfossils.com> -- Website of the Akron Fossils and Science Center

http://www.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.lp_funfossils/fun-with-fossils/ -- PBS Learning website with videos, lessons, and activities related to fossils

<http://www.amnh.org/explore/ology/paleontology> -- American Museum of Natural History website on Paleontology

<http://www.lsa.umich.edu/paleontology/> -- University of Michigan Museum of Paleontology

<http://www.kidsgeo.com/geology-for-kids/> -- Geology for Kids website

<http://www.sciencekids.co.nz/geology.html> -- Science Kids website on geology

<http://www.mineralogy4kids.org> -- Mineralogy for Kids website

<http://www.nhm.ac.uk/kids-only/ologist/mineralogist/> -- Natural History Museum website on mineralogy and being a mineralogist