

Forensic Detectives: Archaeology at Work: Teacher's Guide

Grade Level: 6-8

Curriculum Focus: Forensics

Lesson Duration: Four class periods

Program Description

Remnants of the past tell remarkable stories about ancient cultures, civilizations, and cataclysmic events. Segments explore the history of China, Peru, and Jerusalem, and examine the Earth's magnetic poles. Spanning many locations and eras, this presentation invites students on a worldwide journey to study the forensic uses of archaeology and geology. This program includes one feature segment and four short segments.

Onscreen Questions

- What tools do archaeologists use?
 - How have archaeologists helped us learn about people in the past?
 - How do investigators collect, store, and analyze evidence from a crime scene?
 - How does the Earth reveal evidence of change in its past??
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Lesson Plan

Student Objectives

- Discuss the definition of archaeology and its applications.
- Compare two archaeological investigations.
- Write a mystery about the archaeological discovery of a body.

Materials

- *Forensic Detectives: Archaeology at Work* video and VCR, or DVD and DVD player
- Paper and pencil

Procedures

1. After watching *Forensic Detectives: Archaeology at Work*, ask students the following questions: What is archaeology? (the study of material remains of past activities) How does archaeology teach us about ancient cultures? (Artifacts, or recovered objects, can show us how people lived.) In addition to ancient cultures, what else do archaeologists study? (events in the recent past, such as crimes)
2. Tell students that archaeologists are like detectives. They search for evidence and analyze clues to reach a conclusion. Archaeologists often uncover evidence during digs, or excavations. Ask students to compare two digs featured in the program: the Chiribaya in Peru and the bones in Barrington, Illinois. What did these digs have in common? (They uncovered people who have died.) What did archeologists want to know about the Chiribaya mummies? (details about the ancient Chiribaya culture) What were the investigators in Illinois looking for? (the identity of the body, the cause of death, and, if a murder, who committed it).
3. Divide the class into two groups. Have one group focus on the Chiribaya and the other focus on the investigation in Illinois. Ask each group to describe the evidence and what each piece revealed. Have them record their answers in a chart. The charts below provide possible answers. For younger students, you could provide the evidence and have them complete the second column.

Chiribaya Mummies

Evidence	What It Reveals
Wool clothing	The Chiribaya used domesticated animals.
Decorated pots, beautiful jewelry, ornaments	They were craftsman, and they worked with gold and other metals.
Some bodies carefully preserved and buried with food, pots, and other objects	They believed in an afterlife.
Food offerings of corn, potatoes, peppers, and grains	These were typical foods.
A mummy buried with coca leaves inside the chest cavity	Artificially prepared body; must have been an important person.
Coca leaves' age determined by carbon 14	Death took place between 1350 and 1450.



Skeleton in Illinois

Evidence	What It Reveals
No zippers, elastic, or other objects in grave	Body buried without clothes
Body carefully laid out	Buried by someone who took care
Notch in the hipbone; larger forehead on skull	Male
Length of leg bones (femur and tibia)	Body about 1.5 meters tall
Gaps between the ends of long bones	An adolescent
Rust-colored stain (dried blood) on the right femur, which had started to heal	Old injury on right leg at the time of death
DNA from teeth	Related to the suspect and his ex-wife
Hospital record	The missing person believed to be the skeleton in an accident 6 months before disappearing.

4. Have the groups share their charts with the class and fill in any missing pieces of evidence.
5. Ask students to describe the tools and technology used and the experts consulted in both investigations. (The archaeologists used shovels, spades, brushes, X-rays, endoscope, and carbon-dating; they consulted with an expert on Chiribaya culture. The investigators in Illinois used hand shovels, rubber gloves, spades, newspaper archives, DNA analysis, and hospital records; they consulted forensic anthropologists.)
6. Challenge students to write a brief mystery about the archaeological discovery of a body. They can write about a mummy from an ancient culture or a person from the recent past. Their stories should describe at least five pieces of evidence, including where they were found and what each object revealed and the resources used (tools experts consulted). Stories should be no longer than two pages.
7. Have students choose a partner. Ask them to share their report with their partner and answer any questions. Then have each student summarize their partner's report for the class, including at least three interesting facts.

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** Students were active in class discussions; recalled several pieces of evidence and what each revealed; wrote a creative mystery that included at least five pieces of evidence and what each revealed; clearly described resources used.
- **2 points:** Students participated in class discussions; recalled a few pieces of evidence and what each revealed; wrote a satisfactory mystery that included four or five pieces of evidence and what each revealed; adequately described at least one resource used.
- **1 point:** Students did not participate in class discussions; recalled few or no pieces of evidence and what each revealed; wrote an incomplete mystery that included three or fewer pieces of evidence and did not explain what each revealed; did not include resources or provided unclear descriptions of how they were used.

Vocabulary

archaeology

Definition: The study of material evidence of past human life and culture

Context: The field of archaeology helps piece together information about the past by examining bones and artifacts.

evidence

Definition: An object or information used to reach a conclusion

Context: Examples of evidence from a crime scene include fingerprints and hair, blood, or fiber samples.

excavation

Definition: The process of digging a hole or cavity for the purpose of locating and removing artifacts from an archaeological site

Context: Archaeologists often use hand shovels, spades, brushes, and dental picks in the excavation of burial sites.

forensic archaeology

Definition: The use of conventional archaeology techniques to uncover physical evidence from a crime scene

Context: People working in the field of forensic archaeology may analyze bones and teeth to determine a crime victim's age, sex, and cause of death.

forensic science

Definition: The study of evidence discovered at a crime scene and used in a court of law

Context: Forensic science is used to investigate details of a crime, such as the identity of a victim or suspect or the time the crime took place.



Academic Standards

National Academy of Sciences

The National Science Education Standards provide guidelines for teaching science as well as a coherent vision of what it means to be scientifically literate for students in grades K-12. To view the standards, visit <http://books.nap.edu>.

This lesson plan addresses the following science standards:

- Science as Inquiry: Understandings about scientific inquiry
- Physical Science: Properties and changes of properties in matter
- Science in Personal and Social Perspectives: Science and technology in society
- History and Nature of Science: Science as a human endeavor

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit <http://www.mcrel.org/>.

This lesson plan addresses the following national standards:

- Science – Nature of Science: Understands the nature of scientific inquiry
 - Language Arts – Viewing: Uses viewing skills and strategies to understand and interpret visual media; Writing: Uses the general skills and strategies of the writing process, Gathers and uses information for research purposes
 - Technology – Understands the nature and uses of different forms of technology
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Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the DiscoverySchool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>
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DVD Content

This program is available in an interactive DVD format. The following information and activities are specific to the DVD version.



How To Use the DVD

The DVD starting screen has the following options:

Play Video – This plays the video from start to finish. There are no programmed stops, except by using a remote control. With a computer, depending on the particular software player, a pause button is included with the other video controls.

Video Index – Here the video is divided into five parts (see below), indicated by video thumbnail icons. Watching all parts in sequence is similar to watching the video from start to finish. Brief descriptions and total running times are noted for each part. To play a particular segment, press Enter on the remote for TV playback; on a computer, click once to highlight a thumbnail and read the accompanying text description and click again to start the video.

Curriculum Units – These are specially edited video segments pulled from different sections of the video (see below). These nonlinear segments align with key ideas in the unit of instruction. They include onscreen pre- and post-viewing questions, reproduced below in this Teacher's Guide. Total running times for these segments are noted. To play a particular segment, press Enter on the TV remote or click once on the Curriculum Unit title on a computer.

Standards Link – Selecting this option displays a single screen that lists the national academic standards the video addresses.

Teacher Resources – This screen gives the technical support number and Web site address.

Video Index

I. Lost City of Shang (5 min.)

More than 3,000 years after the Shang ruled China, archaeologists are still discovering the secrets of China's first historical dynasty.

II. Mummies of Peru (8 min.)

Investigate how archaeologists and historians are using carbon-14 dating to uncover clues about Chiribaya civilization.

III. Jerusalem's History (4 min.)

Jerusalem is the spiritual home of Islam, Christianity, and Judaism. Journey to Israel to take a closer look at this city's many religious and cultural relics.

IV. Case Closed (21 min.)

What can scientists learn from an unidentified skeleton? Find out firsthand as forensic detectives crack a decades-old unsolved murder.

V. Magnetic Chaos (7 min.)

Earth is a gigantic magnet, with a magnetic field that stretches into space. Instead of staying completely still, the planet's poles can – and do – shift.



Curriculum Units

1. A Mythical People

Pre-viewing question

Q: Why is archaeology an important science?

A: Answers will vary.

Post-viewing question

Q: How was the first evidence of the Shang detected?

A: When a Chinese scholar fell ill in 1899, his friend noticed strange markings on the surface of the medicinal animal bones next to the scholar's bed. Upon study, they realized they had discovered one of the earliest forms of writing ever recorded. Visits to local pharmacies led them to the site of the bones' origin. Archaeologists began digging there in 1928, and they're still digging today.

2. Secrets of the Shang

Pre-viewing question

Q: What are the most important archaeological finds to be uncovered?

A: Answers will vary.

Post-viewing question

Q: What did the oracle bones reveal about the dynasty's end?

A: That rival clans were threatening to overthrow the Shang.

3. Messengers From the Past

Pre-viewing question

Q: What can mummies tell us about a culture?

A: Answers will vary.

Post-viewing question

Q: What clues do the mummies give about how the Chiribaya lived?

A: The wool clothing found on some of the mummies indicate that the Chiribaya were more than just farmers. They kept domesticated llamas and designed beautiful textiles. They were skilled fisherman, and also worked with gold and other metals to make jewelry and ornaments. The Chiribaya buried clay pottery, food offerings, and other items with the bodies, indicating a belief in an afterlife.

4. A Last Mummy

Pre-viewing question

Q: How does your culture honor the dead?

A: Answers will vary.

Post-viewing question

Q: How does carbon-14 dating work?

A: Plants and all other living organisms take in carbon-14 until they die; then, the amount of carbon-14 in their tissues steadily decreases over time. Scientists are able to count the amount of carbon-14—the more of it found, the younger the sample.



5. Land of Traditions

Pre-viewing question

Q: What important monuments are in your city or state?

A: Answers will vary.

Post-viewing question

Q: What do you think it's like to live in Jerusalem?

A: Answers will vary.

6. A Burial Site

Pre-viewing question

Q: If you found bones buried in your yard, what would you do?

A: Answers will vary.

Post-viewing question

Q: What did the depression in the grass tell the archaeologists?

A: It indicated that something, such as a body, had settled there and might be found beneath the grass.

7. The Search

Pre-viewing question

Q: What steps would you take to locate a lost friend or family member?

A: Answers will vary.

Post-viewing question

Q: Do you think the skeleton is Butch's remains?

A: Answers will vary.

8. Reading the Bones

Pre-viewing question

Q: What can bones tell us about how a person lived?

A: Answers will vary.

Post-viewing question

Q: Can you identify gender from a skeleton?

A: Yes, the size and shape of some bones indicate gender. For example, the notch found in a male's hipbone is narrower than the notch found in a female's hipbone, and males have a broader, more protruding forehead than females.

9. Dead Ends

Pre-viewing question

Q: What should police do when they cannot solve a crime?

A: Answers will vary.



Post-viewing question

Q: What can a skeleton tell us about a person's age at death?

A: By examining the bone ends, scientists can determine if the person had reached maturity. Bone ends remain open to accommodate new tissue until maturity, when the ends fuse and the gaps disappear. If the bones of a skeleton have fused edges, the person had reached maturity.

10. Piecing It Together*Pre-viewing question*

Q: What evidence should exist for a murder conviction?

A: Answers will vary.

Post-viewing question

Q: Why are teeth a good source of DNA?

A: Because their hard enamel exterior acts as a shield, protecting genetic material for long periods of time

11. Magnetic Fields*Pre-viewing question*

Q: Does Earth's magnetism affect your daily life?

A: Answers will vary.

Post-viewing question

Q: How is a magnetic field created?

A: By the movement of electrons spinning around the nucleus of an atom. A single atom by itself won't have a very strong magnetic field. However, the magnetic fields of billions of atoms can combine to form more powerful magnetic forces.

12. Measuring Earth's Magnetism*Pre-viewing question*

Q: If Earth's magnetic field disappeared, would your life be changed?

A: Answers will vary.

Post-viewing question

Q: What have we learned by measuring Earth's magnetic fields?

A: We know that Earth's magnetic poles are not stable. Instead of staying completely still, the poles can, and do, shift.