

## Lesson 2: Observation and Inference: How Archeologists Know What They Know

*This lesson is divided into four sections: instructional goals, advance preparation, activity, and glossary.*

### Instructional Goals

#### Lesson Plan Overview

The student will learn the importance of differentiating between observation and inference when examining archeological materials. Students will explore this facet of archeology by examining first a photograph and second some artifacts and site features of a Wichita Indian grass house.

#### Standards this lesson correlates to

Geography (2005 Standards for History and Government; Economics and Geography)

Grade 6      Benchmark 4, Indicator 2

History (2005 Standards for History and Government; Economics and Geography)

Grade 7      Benchmark 1, Indicator 1

Science (2005 Standards for Science Education)

Grades 5-7    Standard 1, Benchmark 1, Indicators 1, 2 and 3

Standard 1, Benchmark 2, Indicator 1

Standard 7, Benchmark 1, Indicator 1

#### Objectives

- The student will know the meaning of inference and observation.
- The student will distinguish between observation and inference in the examination of a photograph, objects, and archeological site features.

#### Skills Taught

Observation, analysis, decision making, evaluation of sources other than written.

#### Student Prior Knowledge

The student should have an understanding that archeology is the study of past cultures mainly through the study of objects and other physical remains, such as traces of structures or fire pits found in the layers of soil. Archeologists use the information they learn to piece together a picture, or description, of the culture that produced the objects. “Lesson 1: What is Archeology,” the first lesson will provide students with this basic understanding of archeology.



## Advance Preparation

### Prepare Yourself

- Read “Background Information for Teacher” provided below.
- Pull items from the trunk that are needed (see “Use These Materials From This Trunk” below).
- Set up Wichita site features floor cloth. Lay the fabric on the ground and place the objects on the floor cloth where indicated.
- Photocopy Worksheets 1, 4 and 5 as indicated here.  
Worksheet 1 - One copy for instructor.  
Worksheets 4 and 5 - One copy per student and instructor.

### Use These Materials From This Trunk

#### Worksheets 1, 4, and 5

- 1: Myths & Misconceptions
- 4: Observing an Image
- 5: Observations and Inferences

#### Graphics 1, 3 and 8

- 1: Native American Woman Using a  
Bison Scapula Hoe
- 3: Wichita Grass House Village (drawing)
- 4: Wichita Indian Homestead  
(photograph)

#### Objects and related object cards

- Wichita site features floor cloth
- Bison scapula hoe blade
- Bone digging stick tip
- Partial ceramic pot
- Pottery sherd
- Stone scraper
- Stone arrow point
- Bone fragments

### Background Information for Teacher

**Is archeology a science?** Yes. Archeologists draw on the basics of science to develop as accurate and complete a picture of the past as possible. Science is concerned with gaining knowledge about the natural world and therefore seeks an understanding of all observable phenomena. Science proceeds by a disciplined search for knowledge, pursuing the description, ordering, and meaning of phenomena in a systematic manner. This search often involves controlled and repeatable laboratory experiments, such as those in chemistry. But it may also consist of detailed observation without experiment. Sciences such as geology, evolutionary biology, and archeology deal with evidence that was formed long ago, or has accumulated over a long span of time, and that must generally be studied as it has come down to us, not through experimentation.

Whatever the specific form of its search, science follows an approach to acquiring knowledge that is continuously self-correcting, with ongoing refinement of conclusions reached in earlier research. The widely accepted set of procedures that has been found to be trustworthy for gaining and testing our knowledge of the real world is called the scientific method — observation, hypothesis, experimental proof, theory, and principle or law.



**What is observation?** Observation is what a person is actually seeing, hearing, feeling, etc. If you walk outside on a fall day and feel a cold north wind cutting through your clothing, you might observe that it is cold outside.

**What is inference?** Inference is an assumption about a behavior, object, or picture, etc. If you stand inside your nice warm house on that same fall day and look outside to see the trees moving with the wind and leaves blowing around your yard, you might infer that it is cold outside. You're basing this on things you notice (the wind, the time of year, perhaps an overcast sky), but you are not actually observing the temperature as you stand inside your heated home.

**Why does archeology rely so heavily on observation?** Archeology is a science that uses the systematic approach of the scientific method. Because archeologists destroy a site when they dig it, the records and artifacts become the only source of information once the site has been dug. Correct interpretation of the site depends on the ability to re-create exactly where artifacts and features were. This is only possible with good observation and recording.

**What problems occur if information is based only on inferences?** Inferences can be very useful. They become the basis for a hypothesis, the next step in the scientific method. However, inferences can cause problems if they are taken as observations because they may be wrong, leading to further wrong ideas about a site. For example, a site feature may be dug with the assumption that it is a house, when in fact it is not. If the excavation recorders are not careful in writing down what they see, they may confuse their inferences with their observations and misinterpret the information. Good field records record all observations, and then the inferences made from those observations can be re-evaluated as new information about the site comes to light.

## Activity

### Opening Activity

1. Activate **prior knowledge** by asking the students what they know about archeology. (Worksheet 1: Myths & Misconceptions will provide the instructor with information about what some people erroneously assume archeology is.)

**Students' understanding of archeology needs to include the following two points.**

- **Archeologists study past human cultures (not dinosaurs).**
  - **Archeologists use mainly objects and traces of human habitation to study these cultures.**
2. Explain to the class that archeology is a science and what this entails.
    - Accuracy is important in archeology as with other sciences, such as chemistry.
    - Archeologists can not re-create the materials or situations they learn from. With some sciences, such as chemistry, experiments can be reproduced to check that observations were correct. Once an artifact is removed from its original resting place, it can not be returned.
    - Observation and accurate recordings of those observations are very important.



3. Ask the class to explain the differences between observation and inference.  
**An observation is a factual statement made about what a person sees, hears, smells, etc. (If you walk outside on a fall day and feel a cold north wind cutting through your clothing, you might observe that it is cold outside.)**

**An inference is an assumption made about something a person sees, hears, smells, etc. (If you stand inside your nice warm house on that same fall day and look outside to see the trees moving with the wind and leaves blowing around your yard, you might infer that it is cold outside. You're basing this on things you notice — the wind, the time of year, perhaps an overcast sky — but you are not actually observing the temperature as you stand inside your heated home.)**

**It is very important that archeologists recognize the difference between observation and inference.**

4. Pass out Worksheet 4: Observing an Image. Give students a few minutes to study the image. Read these statements to the class and ask them to indicate whether each is an observation or inference. If students mistake any of the inferences for observations, discuss why they answered as they did, what the correct answer is, and why.
- **It is milking time.** (Observation)
  - **This photo is of a family and their livestock.** (Inference - We do not know if these people are a family or if the animals belong to them.)
  - **This family has four children.** (Inference - We do not know if these are the children of these adults or, even if they are, if all of their children are in the photo.)
  - **Most of the children in this family are not involved in milking.** (Inference)
  - **This farmstead has no barn.** (Inference)
  - **It is not summer.** (Inference - From this photo we can't tell if the lack of vegetation indicates a season of the year or is an indication that there was a fire, blight, grasshopper damage, etc.)
  - **There is a bridge near these people.** (Observation)
  - **There is a structure nearby.** (Observation)
  - **This family lives near a river.** (Inference - From the photo we don't know if they live here and we don't know if the bridge spans a river.)

## Learning Activity

1. Remind the class that archeologists use artifacts and site features when studying past human cultures.

Have the class look at the floor cloth representing Wichita grass house site features and objects. Make sure students know:

- This is the footprint of a Wichita grass house. Archeologists don't find grass houses, but they do find evidence of these structures if they have burned. The burned posts leave stains, and occasionally charcoal, in the postholes (the holes the support posts for the house were placed in). On this footprint the stains are post molds, the center feature is a hearth, a storage pit near the inside wall of the house, and a midden or trash pit outside.



This information is an inference based upon evidence and much past research. For the sake of this activity, the class should accept as fact that this is a grass house containing evidence of post molds, a storage pit, midden, and hearth.

- What each piece is before going any farther with this activity. Use the labels and key on the floor cloth for this purpose. (**NOTE:** Do not use the object cards as they provide too much information.)
  - This floor cloth provides information similar to what archeologists might encounter, although the format (cloth) is vastly different.
2. Hand out Worksheet 5: Observations and Inferences. Have the class complete the worksheet using the Wichita site features floor cloth.
  3. Review the answers to Worksheet 5: Observations and Inferences, using the answer sheet provided. Use information provided on the answer sheet to help clarify the reason for the correct answer. (More information about how archeologists use observation and inference to learn about Wichita grass houses is located at the end of the answer sheet.)

### Closing Activity

1. Initiate a discussion about whether this was easy or difficult and why. Questions to direct this discussion may include:
  - Was it easy or difficult to distinguish between an observation and inference?
  - Did you find yourself using information you know from some place else (other classes, movies, or readings) to answer these questions?
  - What difficulties might archeologists run into if they accepted inferences as observations?
  - How might our understanding of the Wichita Indian culture be changed if the information we inferred were taken as fact?
  - What are some other observations you can make about the Wichita grass house represented on this floor cloth?
  - What are some other inferences you could explore further to see if they are true?
2. Place the objects and site features on the floor cloth into perspective by showing the relationships between them and Graphics 1, 3 and 4. The object cards will assist with this.

**For example, point out the garden in Graphic 3, the arbors and drying racks in Graphic 4, and the woman using the hoe in Graphic 1 and relate this to the digging stick tip, the bison scapula hoe blade, and the storage pit (often used for storage of food between its harvest and consumption). Other relationships might include the post mold features on the ground cloth and the structures in Graphics 3 and 4.**

### Glossary for Lesson

**Arrow Point:** A relatively small, light chipped stone or metal projectile point mounted on an arrow shaft and shot with a bow.



**Digging Stick Tip:** The bone tip that is fastened to a straight wooden tool and used for loosening the soil, often for gardening purposes.

**Feature:** In archeology, nonportable archeological remains that provide evidence of use or alteration by humans that is worth noting within an archeological site, such as a hearth, posthole, or cluster of artifacts.

**Hearth:** An open fire pit or fireplace.

**Hypothesis:** A process used to evaluate arguments based on observations and resulting inferences.

**Inference:** An assumption about a behavior, object, or picture, etc.

**Midden:** A trash heap or refuse deposit.

**Observation:** A statement about what a person is seeing, hearing, feeling, tasting, or smelling.

**Post Mold:** A dark circular stain, sometimes containing the charred remains of wood, indicating the former placement of a structural support pole.

**Salvors:** People who salvage shipwrecks.

**Scapula Hoe:** A gardening implement made from the shoulder blade of a bison, attached to a wooden handle with sinew (tendon or other connective tissue).

**Scientific Method:** A process used in science to test a hypothesis by experimentation.

**Scraper:** Chipped stone tool used to clean or smooth materials such as hides.

**Sherd:** A fragment of a broken pottery vessel. (Also called potsherd or pottery sherd.)

**Storage Pit:** A hole dug in the ground and usually specially prepared to store dried foods. Wichita pits were usually bell-shaped and concealed from enemies. The Pawnee dug bell-shaped pits, carefully lined and sealed, for storage of dried meat and vegetables.

