Fourth-grade students embark on an archaeological investigation.

By Heather Gibb and Nicole Miller-Struttman

Archaeological sites are found all around us: in our backyards, school yards, local parks—right under our feet! Archaeology provides the chance to ask questions about human culture, past and present, using artifacts as evidence. By studying archaeology, students learn about how people in their region found and prepared food, responded to changes in their environment (e.g., flooding, earthquakes, droughts), and interacted with other peoples.

During a science outreach event at a local university with fourth- and fifth-grade students, we delved into an archaeological site to learn about the past. In this investigation, fourth-grade students used archaeological methodology and their own knowledge of the world to discover how humans lived in the past. During this 60-minute lesson, students collected measurements of a simulated archaeological site, drew a sketch map of the site area, and
made evidence-based inferences about how the artifacts were used. After documenting their site and collecting evidence regarding the artifacts they found within it, students engaged in a cordial debate of their conclusions.

Engage: Introducing the Archaeological Site

We fostered student engagement by telling the students that a nearby archaeological site needed to be documented, and by analyzing that site, they were going to be archaeologists for the day! Of course we could not disturb an authentic archaeological site, so we created a simulated archaeological site (including animal bones, stone tools, and a fire pit) in a greenhouse on school property (see Site Creation on p. 72 for the how-to). While we conducted this activity in a greenhouse, any outdoor location can be used, because archaeological sites are often found right beneath our feet! Archaeological sites are typically partially or completely covered by soil or plants. Artifacts become visible following erosion and/or disturbance events that shift the soil, making the discovery of archaeological sites a perfect venue for students to encounter natural and human-driven disturbances (e.g., erosion via wind/water, earthquakes, fire, plowing, burrowing by animals). For example, we asked the students how they thought artifacts went from being buried to found on the ground surface. If they had difficulty, we reminded them of previous lessons on erosion and disturbances, as they would have encountered these lessons in fourth grade within our school district.

If teachers wish to establish their simulated archaeological site off-campus, it is important that they work with land managers to acquire permission for use and check the premises for safety concerns, such as trash, poison ivy, or animal life. See NSTA Connection for outdoor safety tips. Both the engagement and exploration portion of the activity occurred at our simulated site. The remainder of the activity can be completed at the site or in an alternate location, such as your classroom.

Before introducing the students to the site, we lead them in a discussion of important archaeological terms and background content. To ensure that students have the same level of background knowledge, we suggest the teacher prepare a five-minute presentation using famous and/or local archaeological sites at the relevant time scale. Our activity was geared toward the late Archaic (ca. 1000–3000 B.C.) so we discussed important terms such as atlatl (a spear-thrower), site, and prehistoric (see Figure 1 for additional vocabulary). North American prehistoric sites date to before European colonization, while historic sites date to periods after European colonization. We used “past” to refer to all human culture in North America prior to current day. After exposing students to a few images of archaeological sites and artifacts left by other prehistoric peoples, we led students in a discussion of the components of a map and why they

FIGURE 1. Archaeology vocabulary.

| Artifact: | an object that owes its attributes to humans. This can be objects like a stone tool or a wall trench that was dug as part of a shelter. |
| Atlatl: | a spear-thrower |
| Compass Rose: | a north indicator typically used on a map |
| Culture: | Learned behaviors and traits that are taught and shared by a group, or a way of life shared by a group of people. |
| Ecofacts: | animal and plant remains that are the result of human activity. |
| Material Culture: | artifacts, but focuses on the relationship between artifacts and culture. |
| Provenience: | the three dimensional find location of an artifact. This refers to the distance from a known point, length, width, and depth. |
| Prehistoric: | the period of time prior to recorded history; this varies based on location. |
| Historic: | the study of human cultures in cultures following the start of historic documentation. |
| Site: | a cluster of artifacts, typically representative of prehistoric/historic human activity. |
| Transect: | a linear survey unit |
| Wall Trench: | a feature, identified as a change in color or texture of the soil because of the wall that had been found there in the past. |
are important. These short discussions were sufficient to ensure that the students had the background knowledge required for this activity. Finally, before walking to the archaeological site, we defined the safety guidelines. One of the most important guidelines was to leave artifacts where they are found! The site must be documented before anything is moved because excavation is destructive. Maps preserve observations of where artifacts are in relation to each other for future analysis by archaeologists (Hester, Shafer, and Feder 1997).

While walking to the archaeological site, we asked students why they think archaeological sites should be recorded or described. We then briefly described how archaeologists find sites to provide the students with a context for their survey method, pedestrian survey. During a pedestrian survey, archaeologists walk evenly spaced transects (lines) through an area while looking for artifacts visible on the ground’s surface (Hester et al. 1997). Several common archaeological misconceptions became apparent during these discussions. Initially, students did not recognize bones as artifacts; instead artifacts were only pots and “arrowheads.” Once students were exposed to possible artifacts, they discussed how researchers could use observations about animal bones to learn about past peoples. We suggest that teachers use local historic or prehistoric replicas as artifacts and have the students use their knowledge of regional history, integrating previous social studies lessons, to inform their analysis of these artifacts. Many artifact replicas can be found or made by the instructor or even other students for a relatively low cost (see Site Creation). Since specific curricula will vary among districts, we suggest instructors find a unique component of their local prehistory that will resonate with students. In this activity, the skulls and other bones of local native animals

**FIGURE 2.**

An artifact cluster at the site.
were used in the creation of our simulated site.

**Explore: Surveying the Site**

When we arrived, we divided students into groups of three to five and supplied them with measuring tapes, clipboards, and record sheets. The archaeological site was split into sections based on the number of groups, with one group for each section. Students surveyed the area first by walking along their section and identifying artifact clusters (Figure 2). Artifact clusters can provide insight on the activities that occurred at archaeological sites. Then, students measured the site perimeter to determine its dimensions and documented all artifact clusters in their section on their record sheet. As students observed possible artifacts, we discussed how researchers use various types of artifacts (e.g., animal bones, fire pit) to learn about past peoples. We had students collaborate on what their standards for measuring distance would be (e.g., would they measure from the closest point of the artifact cluster or the center?) and take turns measuring cluster locations. Each group acted as experts for their section and shared measurements at the end of the survey with their colleagues, so students could map all of the artifact clusters. The students were very excited to share their findings, often guiding other groups through their section with an impromptu tour.

**Explain: Creating the Map**

Once students made their measurements, they regrouped and sat on the ground. Each student drew a map of the archaeological site, including all artifacts and important characteristics (e.g., compass rose, legend) using the graph paper on the back of their record sheet. We guided the students in starting their map by reminding them that each map would need a title, compass rose, key with labels, the artifacts found, and the measurements they gathered. We asked the students what shape they would draw the greenhouse containing the archaeological site. The students would then add the artifacts that their group measured. When this was completed, we reminded the students of the artifacts that the other group measured.

While students created their maps, we asked questions about how their map could be used by others. This reinforced the importance of map standardization but also encouraged students to think critically about the purpose of each part.
of the map. The students examined each other's maps to gather information about the other group's artifacts. We emphasized that one map is not right or wrong as long as the required information was found and labeled on the map. For instance, students differed on which landmark they used to situate their site. Some students chose a specific tree, while others recognized that a tree might die or be cut down and chose a doorway, an integral part of the building's construction. Another good reference point may be a stone outcrop or finding the latitude and longitude coordinates of the site. Many students will be familiar with the use of GPS, and a brief discussion of how scientists use latitude and longitude to map and relocate sites is encouraged. We then reminded the students that professional archaeologists also make maps that include all the necessary parts but are still different, depending on the individual making the map.

**Extend: Inferring Use of Artifacts**

Next, students made inferences about what activities occurred at the archaeological site, using their maps and personal experience for evidence. Multiple artifact clusters were located within the archaeological site, including piles of animal bones, projectile points, a fire pit, and several animal skulls. We asked the students to make predictions about how prehistoric people might have used each artifact. Students compared observations with peers and provided alternate predictions. For example, some students noticed stone tools near a deer skull. The students hypothesized that the deer had been killed and butchered by the humans. A common misconception is that stone tools are all arrowheads (they were not). To assess student prior knowledge of artifacts, we asked them what would happen if large stone points were placed on a small stick and shot from a bow. Most students quickly changed their prediction to the tool being used as a knife or spear tip. By using observations from their record sheet and maps, and analogy, students debated the merits of their artifact-use predictions. For example, most students knew that modern people use bows and arrows to hunt, thus their prior knowledge of the artifacts informed their interpretations about the prehistoric use of the artifacts.

This was a wonderful time for students to handle some of the artifacts and use these experiences with the items as evidence or support for their claim. At this point, we discussed the ethics behind preserving and investigating the cultural heritage of a region with the students. For instance, we prompted students to discuss the role of the public and scientists in studying an archaeological site by asking, “Do you think anyone should be able to dig at an archaeological site?” These discussions can extend further into social studies and language.
Site Creation

Locate a place (preferably outdoors or in a natural-looking environment) where students will be able to walk around, measure items, and collect some of those items for identification. Places that might make for a good archaeological site location include any surface with mown grass or where vegetation allows the surface of the ground to show through. A wooded area works exceptionally well because there is vegetation, but placement of the artifacts among the understory on the bare ground helps create the impression of a naturally exposed site. Some examples could include soccer fields, vacant lots, garden plots, lawns, and agricultural fields. Previous applications of this activity were completed in a greenhouse with a centrally located plant bed that appeared to be open to the soil beneath. Artifact clusters were placed in between and below patches of plants. See below for an example of site configurations and artifact clusters.

Some common prehistoric artifacts include chipped stone tools, ground stone tools, pottery, animal bones, bow and arrow, spear thrower, spear, fire pit with charcoal, burned corn cobs or other burned food plants, and mussel shells. The items for artifacts need to be made of materials that will not be damaged by contact with moisture, soil, and plants, unless they are intended for limited use. Wood, unless preservation conditions were exceptionally ideal, would not be likely to survive for a long time in most archaeological sites. In this case, the wooden tools are useful examples and provide the students with context for determining the age of a site and discussing change over time. If no prehistoric artifacts are available, then historic artifacts such as old bottles, metal farm implements, broken crockery, silverware, old coins, and more can be substituted. These materials can be chosen based on the area where the archaeological site is located, so that social studies lessons on prehistoric and historic people can be integrated into the science lesson.

When setting up the archaeological site, the site maps above can be used as a guide. Otherwise, think of setting up the area by creating activity areas. People might use certain areas of a site for different types of activities. Those activities could include making stone tools, preparing food, cooking, sleeping, or throwing away trash. Artifact replicas and some homemade tools can be substituted for the fragile and priceless originals. Below we cite several links to websites or documents that provide instructions on how to make some prehistoric tools.

- [www.ilovehistory.utah.gov/fun_stuff/how_to_make_an_atlatl.pdf](http://www.ilovehistory.utah.gov/fun_stuff/how_to_make_an_atlatl.pdf)
  - Feathers can be glued on in place of duct tape fletching for the arrows.
- [www.thudscave.com/npaa/designs/umatlatl.htm](http://www.thudscave.com/npaa/designs/umatlatl.htm)

For projectile points, I suggest purchasing replicas. The skill and materials required for making a projectile point typically make it unfeasible to teach yourself. Depending on the quality of the replica, many can be found for a small amount of money. If replica stone tools are unavailable, chert flakes can be used to suggest that a tool had been made and removed from the site location. Many replicas are available from local flint knappers, individuals who make stone tools, for a low cost. You can also contact your local archaeological society for suggestions for replica sources.

- [www.occpaleo.com/lithiccasts/woodlandperiodcasts.html](http://www.occpaleo.com/lithiccasts/woodlandperiodcasts.html)

Sharp, stone implements, which are common to archaeology, should be avoided to reduce risk of accidental injuries.
By engaging in the practices of archaeology, our students left with a new appreciation for the ground under their feet, the people who came before them, and the science that helped them discover it!

**Evaluate: Assessing Student Learning**

After students discussed their predictions with peers, they designed hypothetical experiments to test hypotheses that emerged from their exploration of the archaeological site. For example, some students predicted that the tools they found were used for hunting and suggested testing the stone tools for blood residue. Another suggestion was to check the animal bones for butchery marks, evidence the bones had been butchered so the meat could be eaten. Student record sheets on which they recorded observations and predictions were used as a summative assessment.

You could also formatively assess student understanding by evaluating their use of analogy in evidence-based arguments. For example, use a sentence form such as “I think that humans used _______ because it is like ___________, which humans use in modern times.” Providing these guides also assists in language development for ELL students.

**Conclusion**

During this investigation, students become archaeologists. They interacted with artifacts, invoked evidence and prior knowledge to infer the use of artifacts, and designed experiments to test their theories. They learned about past peoples and their relationships with the environment using foundational concepts of geology, anthropology, and social studies. By engaging in the practices of archaeology, our students left with a new appreciation for the ground under their feet, the people who came before them, and the science that helped them discover it!

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**References**


**Resources for Teachers**


**Internet Resources**

Archaeology for Kids www.nps.gov/Archeology/public/kids/index.htm

Archaeology for the Public: Lower Grade Level Lesson Plans www.saa.org/publicftp/public/resources/foredu_lessonplans.html

**Trade Books for Students**


**NSTA Connection**

Connecting to the *Next Generation Science Standards* (NGSS Lead States 2013):

4-Earth’s Place in the Universe, Earth’s Systems, Earth and Human Activity

www.nextgenscience.org/4es-earths-systems-processes-shape-earth

The materials/lessons/activities outlined in this article are just one step toward reaching the Performance Expectations listed below. Additional supporting materials/lessons/activities will be required.

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<th>Performance Expectations</th>
<th>Connections to Classroom Activity</th>
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| 4-ESS1-1: Identify evidence from patterns in rock formations and fossils in rock layers for changes in a landscape over time to support an explanation for changes in a landscape over time.  
4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. | Students:  
• observe and map artifacts in an archaeological site to detect patterns in their location.  
Explanations for the locations include changes in the landscape over time.  
• learn that the artifacts are exposed over time through weathering or erosion. Aspects of the landscape and types of erosion are discussed. |
| **Science and Engineering Practices** | |
| Constructing Explanations and Designing Solutions | Students:  
• use measurements to provide evidence for the location of an artifact on their map utilizing their own measurement strategy.  
• compare modern human artifacts and behavior to past artifacts and possible human behavior.  
• use their maps as evidence to compare and argue for their interpretations of human behavior at the archaeological site. |
| Planning and Carrying Out Investigations | |
| Analyzing and Interpreting Data | |
| **Disciplinary Core Ideas** | |
| ESS1.C: The History of Planet Earth | Students:  
• use the location of human artifacts to understand how past life might have occurred, and use a scientific map as evidence to support their explanations of human behavior and life. How these artifact locations might have been affected by erosion and other disturbances is discussed and considered in their arguments.  
• examine items that have been changed or manipulated by humans as found within an archaeological site. |
| • Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. | |
| ESS2.E: Biogeology | |
| • Living things affect the physical characteristics of their environment. | |
| **Crosscutting Concepts** | |
| Patterns | Students:  
• make and use maps to model past human behavior and artifact use.  
• deliberate how archaeological sites might be exposed by disturbance events.  
• use their understanding of modern human behavior as evidence of past human behavior and connecting what we see today as possible modifications of previous solutions to human problems. |
| Cause and Effect | |
| Influence of Engineering, Technology, and Science on Society and the Natural World | |