Archaeo-Tech:
Documenting an Archaeological Site

Cultural Resources Education

Created by Jacob Hamill, SCDNR Heritage Trust Public Information Coordinator (2019).

Grade Levels
3^{rd} – 7^{th}

Estimated Time
1 hour

Goal
Students will learn how documentation is an important part of every archaeological excavation. For archaeologists, accurately documenting a site is very important because when a site is excavated, it is also destroyed. Materials removed from a site for analysis during an excavation cannot be returned to the site the exact way they were before they were removed. Archaeologists employ a variety of documentation methods to capture as much information about a site and its context as possible. Students will compare three different methods of documentation: scaled drawings, traditional photographs, and photogrammetry, and discuss the merits of each method of documentation.

Objectives
After completing the activity and viewing the *Archaeo-Tech: Photogrammetry* video, students will be able to:

1. *Define* what archaeology is and *explain* how an archaeologist studies past human activity.
2. *Discuss* how archaeologists document archaeological sites and record data in the field.
3. *Explain* why accurately and thoroughly documenting an archaeological site during an excavation is important.
4. *Demonstrate* how to create a scaled drawing of an excavation unit that accurately captures information representative of real-world data.
5. *Compare* the accuracy and efficiency of creating a scaled drawing to taking a photograph.
6. *Explain* what photogrammetry is and *discuss* its application / uses in archaeology.
7. *Compare* the data collected by traditional photography and scaled drawings to the data captured by photogrammetry.
8. *Consider* the pros and cons of traditional documentation methods and *compare* them to the pros and cons of photogrammetry.
9. *Investigate* uses of photogrammetry in current archaeology and historic preservation.

South Carolina Academic Standards

Mathematics

3.MDA.3 Collect, organize, classify, and interpret data with multiple categories and draw a scaled picture graph and a scaled bar graph to represent the data.

4.MDA.2 Solve real-world problems involving distance/length, intervals of time within 12 hours, liquid volume, mass, and money using the four operations.

5.G.1 Define a coordinate system.

a. The x- and y-axes are perpendicular number lines that intersect at 0 (the origin);
b. Any point on the coordinate plane can be represented by its coordinates;
c. The first number in an ordered pair is the x-coordinate and represents the horizontal distance from the origin.
d. The second number in an ordered pair is the y-coordinate and represents the vertical distance from the origin.

5.G.2 Plot and interpret points in the first quadrant of the coordinate plane to represent real-world and mathematical situations.

5.MDA.1 Convert measurements within a single system of measurement: customary (i.e., in., ft., yd., oz., lb., sec., min., hr.) or metric (i.e., mm, cm, m, km, g, kg, mL, L) from a larger to a smaller unit and a smaller unit to a larger unit.

6.GM.3 Apply the concepts of polygons and the coordinate plane to real-world and mathematical situations.

a. Given coordinates of the vertices, draw a polygon in the coordinate plane.
b. Find the length of an edge if the vertices have the same x-coordinates or same y-coordinates.

7.GM.1 Determine the scale factor and translate between scale models and actual measurements (e.g., lengths, area) of real-world objects and geometric figures using proportional reasoning.

Science

3.S.1 The student will use the science and engineering practices, including the processes and skills of scientific inquiry, to develop understandings of science content.

- **3.S.1A.3** Plan and conduct scientific investigations to answer questions, test predictions and develop explanations: (1) formulate scientific questions and predict possible outcomes, (2) identify materials, procedures, and variables, (3) select and use appropriate tools or instruments to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures.
- **3.S.1A.4** Analyze and interpret data from observations, measurements, or investigations to understand patterns and meanings.
- **3.S.1A.5** Use mathematical and computational thinking to (1) express quantitative observations using appropriate English or Metric units, (2) collect and analyze data, or (3) understand patterns, trends and relationships.

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- **4.S.1A.4** Analyze and interpret data from observations, measurements, or investigations to understand patterns and meanings.
- **4.S.1A.5** Use mathematical and computational thinking to (1) express quantitative observations using appropriate English or Metric units, (2) collect and analyze data, or (3) understand patterns, trends, and relationships.

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- **7.S.1A.3** Plan and conduct scientific investigations to answer questions, test predictions and develop explanations: (1) formulate scientific questions and predict possible outcomes, (2) identify materials, procedures, and variables, (3) select and use appropriate tools or instruments to collective qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures.
- **7.S.1A.4** Analyze and interpret data from observations, measurements, or investigations to understand patterns and meanings.
- **7.S.1A.5** Use mathematical and computational thinking to (1) express quantitative observations using appropriate English or Metric units, (2) collect and analyze data, or (3) understand patterns, trends, and relationships.

Activity Type: In-Class

This lesson is to be done as an in-class activity. The teacher will provide the required materials and necessary instructions. Additional research and activities can be completed outside of class.

Materials

- Multiple different colored sheets of craft paper
- Markers
- Pencils
- Small, ordinary household objects or cut out images of historic / prehistoric artifacts
- Graph Paper
- Measuring tapes or folding rulers
- Compass
- Digital Cameras (Optional)

Pockoy Shell Ring Background Information

- **Pockoy Island** (pronounced Pock-ee) is a remote South Carolina sea island and a part of the SC Department of Natural Resource's Botany Bay Heritage Preserve and Wildlife Management Area. The property is located on the northeastern corner of Edisto Island in Charleston County.
- Botany Bay is one of the largest relatively undeveloped wetland ecosystems on the Atlantic Coast, providing a critical habitat for numerous wildlife species.
- The **cultural resources** of Botany Bay are equally important, with sites dating from approximately 4,000 years ago to the nineteenth century. Several sites are listed on the National Register of Historic Places, including the outbuildings from Bleak Hall Plantation, granite markers from the 1850 Alexander Bache U.S. Coast Survey, and the Fig Island Shell Rings.
- The shell ring on Pockoy Island was first identified in early 2017 by analysts studying Hurricane Matthew's effect on South Carolina's coastline. When studying maps produced by aerial light detection and ranging, or LiDAR, analysts noticed strange circular features on the coast of Pockoy Island, indicating the presence of a shell ring. Shovel testing began in the summer of 2017, which confirmed the ring's existence. Radiocarbon dating conducted on recovered animal bone revealed that the site was approximately 4,300 years old, making it the oldest known shell ring in South Carolina.
- Testing continued in late 2017, and large-scale **excavations** were conducted in May and December of 2018, and May of 2019.
- Shell rings are structures found along the coasts of South Carolina, Georgia, and Florida, dating to the Late Archaic period (roughly 5,000 – 3,000 years ago). Dating suggests that the shell ring on Pockoy Island was built over a relatively short period of time, around 20 – 30 years.
- As the name indicates, shell rings are large circular or semi-circular structures made from piled shell. Some are C-shaped and U-shaped, while others are irregularly shaped or made up of multiple shapes. Pockoy's shell ring is doughnut shaped. Shell rings are primarily composed of oyster shell, but cockles, periwinkles, clams, and whelk shells are also commonly found. Shell rings range in size from 30 to 250 meters in diameter and are between 1 and 6 meters high. The Pockoy shell ring is approximately 60 meters in diameter.

- Another key feature of a shell ring is a central area called a plaza, which is devoid of shell. Archaeologists speculate that this area was maintained for ceremonial purposes or contained a structure.
- Archaeologists have been studying shell rings for decades but there is still a lot we do not know about them.
- Archaeologists are unsure if shell rings were intentionally built or not. Some argue that shell rings were inadvertently created from piles of discarded shell following meals over a long period of time. Others believe shell rings were planned structures built from leftover shells from ceremonial feasts and other quarried shell.
- Archaeologists are also unsure what shell rings were used for. Some believe shell rings were sites of general human occupation, while others theorize shell rings were ceremonial structures only used for specific purposes at specific times.
- Archaeologists have recovered thousands of **artifacts** from Pockoy and other shell ring sites. The most common artifacts are pottery, shell, and animal bone.
    - The pottery found at Pockoy belongs to the earliest types of ceramics found in South Carolina. Many of the potsherds found at Pockoy are decorated with punctations, incised lines, or stamped designs. The people who created this pottery used shells, reeds, and other natural materials to produce these effects.
    - Shells were not only used to build the ring, they were also used as tools and for decoration. The Late Archaic inhabitants of Pockoy modified whelk shells and other shells to create hammers, awls, adzes, hoes, and other necessary tools for everyday life. They also turned shells into jewelry by shaping them into beads.
    - Animal bone is normally not well preserved because of the acidity of South Carolina's soil. However, bone is plentiful at Pockoy because the calcium from the shell raises the soil's pH level, preserving the bone. Worked bone is frequently found at Pockoy and archaeologists have recovered numerous finely decorated bone pins.
- What archaeologists do not find at a site can also tell them a lot about the people that lived there. Very little stone has been found at Pockoy, telling archaeologists that the people that once lived there did not rely primarily on stone tools. Some archaeologists interpret this as evidence that the shell ring was not a site of human occupation, but others propose that this is reflective of the environment – good stone is hard to find on the coast so the people living there relied on tools made out of shell and bone.
- Due to Pockoy's location on the coast, the site is vulnerable to coastal erosion and rising sea levels. With a rate of 9.5 meters of coastline lost per year, Pockoy is expected to be completely engulfed by the ocean by 2024.
- Climate change, or "heritage at risk", poses a serious challenge to archaeologists, and Pockoy is not the only site facing destruction. According to a report by DINAA (The Digital Index of North American Archaeology), a one-meter rise in sea level would result in the loss of 13,583 archaeological sites across the Southeastern United States. It is imperative to salvage, protect, and study these vulnerable sites before they are gone.

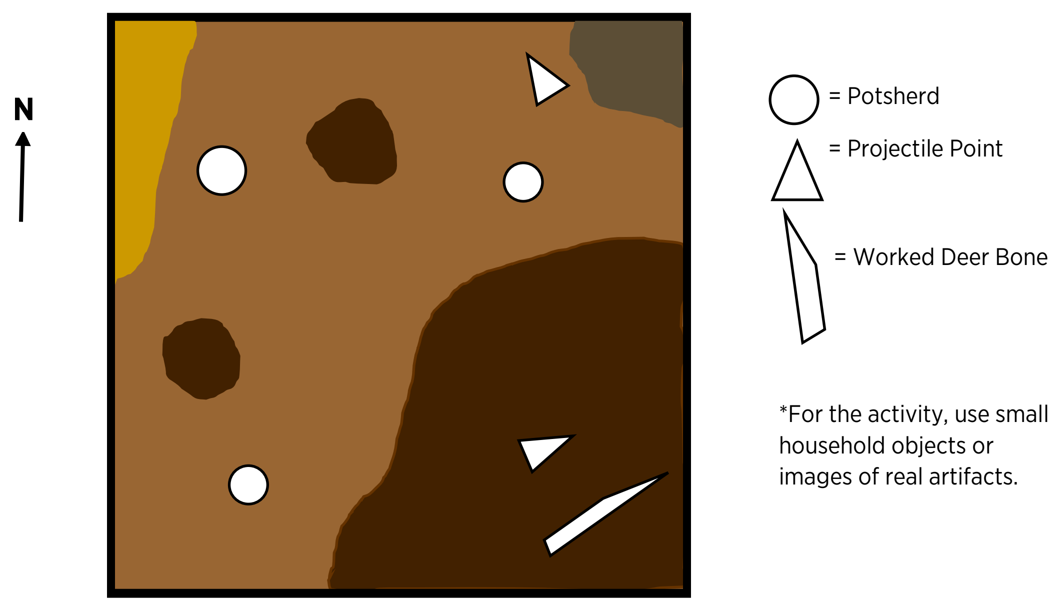
Vocabulary

- **Archaeological Site:** A place where human activity occurred and material remains were deposited.
- **Archaeologist:** An Anthropologist (social scientist) who studies the material remains of past human activity.
- **Archaeology:** The scientific study of past human cultures by analyzing the material remains (sites and artifacts) that people left behind.
- **Artifact:** Any object made, modified, or used by people.
- **Context:** The relationship of artifacts and other cultural remains to each other and the situation in which they are found.
- **Cultural Resources:** Evidence of past human activity. They include archaeological sites, historic homes, battlefields, burial grounds, shipwrecks, historic and prehistoric artifacts.
- **Data:** Information collected.
- **Excavation:** The systematic digging and recording of an archaeological site.
- **Feature:** Material remains that cannot be removed from a site such as roasting pits, fire hearths, house floors or post molds.
- **Field Notes:** Records, forms, notes, maps, photographs, and drawings made by archaeologists to record their work.
- **Grid:** A network of uniformly spaced squares that divides a site into units.
- **Level:** An excavation layer, which may correspond to natural strata. Levels are numbered from the top to bottom of the excavation unit, with the uppermost level being Level 1.
- **Material Culture:** Items that people make and use.
- **Photogrammetry:** The art and science of obtaining precise mathematical measurements and three-dimensional data from two or more photographs.
- **Postmolds:** Small, circular, dark stains in the soil that are the remains of wooden posts placed in the ground.
- **Provenience:** The geographic location from which the artifact was found. The three-dimensional location of an artifact or feature within an archaeological site, measured by two horizontal dimensions, and a vertical elevation.
- **Site Report:** A paper written by archaeologists that describes an excavation, analyzes the artifacts found, and tells the story of the store and the people who lived there.
- **Strata:** A layer of soil.
- **Stratigraphy:** The layering of deposits in archaeological sites. Cultural remains and natural sediments become buried over time, forming strata. General principle is that more recent artifacts are on the top, and the oldest artifacts are on the bottom.
- **Unit:** A defined area within an excavation. Dividing a site into units helps archaeologists with spatial relationships between artifacts.

Lesson

1. Before class, prepare the mock excavation unit your students will be documenting.
    a. The mock excavation unit should be measured in square meters. For larger classrooms, it is recommended that the mock unit be multiple square meters, subdivided into 1 square meter sections (such as a 2 x 3 block) so students can document different sections of the unit in teams. However, a single 1 x 1-meter unit will also suffice for this activity.
    b. Orient the unit in your classroom so one side is facing north, south, east, and west. Tape the corners down so the unit does not move during the activity. Assign each 1 x 1-meter quadrat an identification number.
    c. Use different colored craft paper to indicate features / different soil colors. Place artifacts around the unit. You can use ordinary household objects, or you can use cutout images of prehistoric or historic artifacts. Tape the objects / images down so they are not accidentally moved during the activity.
    d. Optional. Orient your mock unit to a datum point and assign coordinates to each 1 x 1-meter sub-unit.

Example



2. Begin the lesson by asking your students to discuss how scientists collect data. What tools might a scientist use to document and analyze their findings? Students might imagine a biologist, a chemist, or a geologist. Ask your students to brainstorm what tools an archaeologist might use to collect information and document their findings. Explain that an archaeologist is a scientist who studies the material remains of past human activity.
3. After explaining what an archaeologist is and what they do, tell your students that they will be documenting a mock archaeological excavation unit. Students will use graph paper, pencils, a measuring tape or folding ruler, and a compass to create a scaled drawing of the excavation unit. The compass will be used to find the north, south, east, and west sides of the unit.

    a. For larger classrooms and / or a mock excavation unit divided into multiple 1 x 1-meter subsections, divide your class into groups and assign each group a 1 x 1-meter unit to document. Students can then compile their drawings at the end of the lesson to have a scaled drawing of the entire excavation unit.
    b. Student should record soil color, the shape and color of all features, and the location of artifacts. Students should also label their drawing with the unit number and coordinates of each corner (if applicable) and include a scale and a compass rose.
4. Discuss the activity with your students. Have your students compare their scaled drawings.
5. Ask your students what if they took a photograph of the excavation unit instead of making a scaled drawing? What information does a photograph capture that a scaled drawing does not and vice versa? How much faster is taking a photograph compared to making an accurate scaled drawing?
    a. If digital cameras are available, students can photograph their mock units and print the image(s) on a sheet of paper to compare with their drawings.
6. Show your students the *Archaeo-Tech: Photogrammetry* video.
7. After watching the video, discuss the benefits of photogrammetry compared to scaled drawings and traditional photographs. What information does photogrammetry yield that scaled drawings and traditional photographs do not? What are some possible downsides to photogrammetry?
8. Discuss the importance of accurately documenting an archaeological site and how technology, like photogrammetry, can help with this. Why is context important for archaeologists? Stress that when context is lost, information is lost.
9. Optional. Higher grades / upper level students can independently research the use of photogrammetry in archaeology / heritage preservation and report their findings to the class in a small presentation or short paper.

References

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