Mystery Cemetery

An Analytical Challenge

by Shelby Brown (J. Paul Getty Museum)

Analysis of a small 3-D cemetery allows middle school and older students to practice skills of observation and inference useful across many subject areas, including history, social studies, art history, and science. The project is particularly relevant to archaeology because students must use observation and logic to interpret material remains despite missing information.

Acknowledgment: Many thanks are owed to Steve Daniels and Nicholas David, the creators of "The Cemetery of Bilj" (*The Archaeology Workbook*, University of Pennsylvania, 1982: 98–104). Their invented cemetery, with which Jeremy Rutter and I beguiled our students in a beginning archaeology class at Dartmouth College, convinced me of the value of inventing a less complicated, colorful project and introducing a three-dimensional option.

Warning: Teachers must use discretion and knowledge of their own students when introducing this lesson, since the excavation and analysis of burials can be culturally offensive. As originally presented in 3D, the challenge was designed to focus students on critical thinking during a time of Halloween excitement. The cemetery is assumed to be on the outskirts of an (unidentified) ancient city somewhere in the Mediterranean. The lesson emphasizes observation and inference and is not intended to expose students to professional mortuary analysis or excavation strategies (see AIA dig lessons). There are no culture-specific clues, and no forensic anthropologist has examined the bones to determine biological sex.

Grade levels

As presented, the cemetery project is primarily intended for students of grades 6–10, but it can easily be modified for older ages. College students and adults thoroughly enjoy the challenge, although they finish the analysis more quickly and analyze in greater depth.

- In most cases younger students must be told very clearly what to do and what to look for. The teacher will need to understand the cemetery thoroughly (by using -- and not sharing -- the master key) and to steer critical thinking by asking guiding questions. Many students may not notice and correlate all elements of the burials.

- Older students and adults finish the analysis more swiftly, and they can initially be left more on their own to figure out how to observe, categorize, and draw conclusions. If given sufficient time they can generally identify all the key attributes of each burial.

Goals

There are two areas in the cemetery. Students will examine the larger, main cemetery to identify the gender, age, and status of the people in each burial. They will discover two genders (A/B, or male/female), two levels of status (high/low or royal/non), and three ages (baby, child/adolescent, and adult, determined by skeleton size). People are identified by their sometimes-overlapping material culture (things, artifacts) along with other factors such as location. (For example, burials on the east side have fewer artifacts, and some children are buried near an adult.) Looking closely, students will start to group people they think are similar.

After deciphering the main cemetery, students turn to a northern walled-off area with three burials that do not follow the rules of material culture in the main area. The students' final task (at least for older students) is to understand the main area well enough to explain how rules of social identity do not work in this smaller section.

Students must find data to back up their conclusions. With close looking they will happen upon evidence in burial #10, which has an adult skeleton in a purple coffin, many burial goods, a long spear (nail), and beads (which can be easy to miss) spelling out K-I-N-G. This helps provide a basis for identifying an adult male of high status.

At the end of this exercise students should be able to:

- read a top plan.
- identify attributes and variables and categorize them meaningfully.
- use patterns to make predictions.
- separate observations from inferences.
- explain which attributes signal gender, age, and status.

Aside on gender: Material culture is physical things produced by culture (behavior and beliefs). It is very difficult to assign even dual (male/female) gendered behavior to material culture with certainty, and even more complicated to identify a spectrum of gender identities. This lesson must simplify to succeed, and it plays with bias and expectations. Many cultures in antiquity identified specific objects and activities as masculine or feminine, as many do today. Associations of material culture and behavior with gender have endured for thousands of years (for example, weapons/warfare with men, children/childcare with women). Similarly, the association of high status with money and many possessions endures. Participants in this challenge often jump to conclusions based on their assumptions, and sometimes they are right.

HOWEVER, a key message of this lesson is that even if inferences or assumptions may turn out to be correct, until there is evidence to base them on, they are not good enough.

Useful terminology

Artifact—a portable object made or altered by humans (for example, a coffin)
Category—a grouping of burials, skeletons, artifacts, with their attributes
Attribute—an observable characteristic, here of a skeleton, coffin, or artifact (for example, color, width)
Variable—a possible variation in an attribute (for example, white, wide; a variable can also be presence or absence)
Correlation—an association of attributes that belong together
Inference—a conclusion based on evidence and reasoning
Hypothesis—a proposed explanation of the evidence that can ideally be tested
Here the archaeologist would test by uncovering more of the cemetery and new burials would follow the logic identified during the first analysis.

Procedures

Introduce the cemetery challenge in brief and discuss terminology with students. Reinforce the distinction between what students can observe and what conclusions they can safely draw, with special stress on the unreliability of drawing conclusions without evidence.

- Discuss why we categorize: for convenience, for a sense of order, to avoid danger (categorizing the attributes of fish in two pools, one filled with piranha and one with goldfish, could prove helpful). Categorizing helps make meaning out of data.

For fun and learning, the class might practice correlating and making inferences using easy-to-understand artifacts such as small candies. An alternative might be clothing in students' closets – but candies can be brought to class.

- As they start to tackle categorizing, the teacher can write the terms "category," "attribute," "variable," and "correlation" on the board, without defining them. At the end of the lesson students should be able to define them without help.

Turn to the cemetery and have students observe maps and, if feasible, cemetery photos or even a 3D cemetery (see instructions at the end of this lesson) in small groups. They will slowly begin to make inferences, testing as they go by looking ever more closely. In the end students should be able to identify the gender, age, and status of the people in each of the burials.

Categorizing and correlating candy

This exercise is especially fun with common candies (avoiding nuts as needed), but the teacher can find other simple ways to illustrate the same lesson with objects in the classroom.

Examples of candy attributes and variables

- Shape (round, oval, spherical)
- Height top to bottom (tall, short)
- Size (large, small)
- Color
- Nuts (presence or absence, kind of nut, whole or chopped)
- Taste (dark or light chocolate, sweet or sour)
- Shell integrity (cracked or not)
- Melting (presence or absence)

As a test of correlation (association, connection), students might correlate "taste" with the "color" of plain chocolate M&Ms—and everyone will realize that this is not a meaningful correlation, since all colors taste the same. But correlating "taste" with "nuts" (presence or absence, type of nuts), is a meaningful correlation, as is correlating the color and taste of other candies of different colors, such as Skittles.

The Cemetery challenge

The burials are represented on a downloadable colored map with a key, while a black and white map is useful if the teacher would like students to color-code their own key. Students can work in small groups, each with their own map, to discuss their observations and inferences, and individual students can take their maps home.

- A second map (based on the same key) represents the cemetery after more burials have been excavated. Students can check their inferences at the end of the project.

Most teachers will use maps alone, or maps and cemetery photos, to challenge students, but instructions for creating a 3D cemetery are included at the end of this lesson.

Ask students to observe closely, but not to feel secure about inferences unless there is hard evidence. Their objective is to:

- identify the artifacts and attributes belonging to different types of people.
- infer the gender, age, and status of each skeleton based on the artifacts in its burial, its location, its orientation, and other factors.
- explain why each of the three burials in the odd northern area do not fit the logic of the main part of the cemetery.

They first gain an overall impression, start to identify artifacts and their attributes, and notice variables (for coffins: present/absent, wide/narrow, long/short, green/purple/white). Skeleton size is a good indicator of age (small = baby, medium = child or adolescent, large = adult), so age is a given. As they look closely someone will ideally find the hard evidence in burial #10 for status and gender (sometimes this takes a while).

Students should think aloud and talk to others about patterns. Since there is very little hard evidence for them to use, they are of course making inferences as they go, and their job is to base them on logical groupings.

How to record and report

The teacher may ask for individual or group reports and should decide, based on students' abilities, how much guidance to provide. Some students cannot step back and easily see the big picture. At the least, they should be able to identify each person in the main cemetery by gender, status, and age. For the northern walled-off group, students should be able to say in as much detail as possible what is odd about the burials' artifacts.

Students will often leap to conclusions and start to tell stories about the burials, especially the northern ones. Ideally they will realize that these stories are fun but may not be true (because there is no evidence to back them up).

For easy grading the teacher can require a list of numbered burials explaining each person based on their expected artifacts and attributes (see the master key to the site). Alternately a good map that is labeled might work for some students. This is a sample assessment rubric:

Mystery Cemetery: _____/100 points
Identified artifacts and attributes accurately (15 points) _____
Established logical categories and made convincing correlations (20 points) _____
Interpreted the tombs in the whole main area of the cemetery reasonably (30 points) _____
Gender (10 points) _____ Status (10 points) _____ Age (10 points) _____
Clearly explained what was unusual about the walled-off tombs (15 points) _____
#13 (5 points) _____ #14 (5 points) _____ #15 (5 points) _____
Work was thorough, careful, and accurate (10 points) _____
Summary was concise and clear (10 points) _____

Summing up

A final wrap-up allows students to suggest what they expect to find if they dig further. They can express their hypotheses as "if..., then... " statements, and then look at the expanded map # 2 to see if they are correct. "If wealthy people buried on the west side have colorful coffins, then I will find more colored coffins on that side of the expanded dig."

The teacher can also satisfy students' curiosity by telling a story about the cemetery, especially the walled off area. It is one of the frustrations and realities of archaeology that the story behind the finds we excavate is not always known. Or . . . give students free reign to have fun and invent stories IF they will describe what kind of new evidence could support them.

Resources

Additional observation/inference exercises for younger ages

The Society for American Archaeology (SAA) K-12 resources online include an *Analyzing and Interpreting* section with an observation/inference lesson called "What do you see?" https://www.saa.org/education-outreach/teaching-archaeology/k-12-activities-resources

SciGen Teacher Dashboard on *Science Thinking*: "Going from Observations to Inferences" exercise: https://serpmedia.org/scigen/t1.2.html

How to Create a 3-D cemetery

Many learners benefit from seeing the cemetery in three dimensions. The teacher can create a miniature cemetery on a 6-foot rectangular table using components available around the time of Halloween and the Day of the Dead. Students enjoy walking around the table and examining, even touching (without disturbing) the burials. The cemetery can be created with items found in Halloween stores and hardware, craft, and gardening supply shops.

The artifacts on the cemetery maps are visible in the photographs of the burials, which can be used as a replacement for a 3D cemetery.

- 15 small skeletons of three sizes
- Nails and screws for spears and daggers
- Silverware baskets of varying widths and colors for coffins
- Small "gemstones," found at craft and bead stores
- Silver and gold washers for ornaments
- Metal and ceramic "headstones" (pulls from the hardware store, small ceramic stands to hold the bottoms of pots off the ground)
- Popcorn kernels
- Small beads or ornaments, decorative flat marbles and glass or gaming pieces
- Small beads with letters on them (glyphs)
- Black rocks (some painted white on top)

*Note that when students are given a colored plan with a key at the beginning of the project, they need encouragement to look carefully at the 3-D site or photos.