



The Dirt on Ancestral Puebloan Plaster and Paint

In-the-Classroom

OBJECTIVES

Students will be able to:

- Describe how soil is used to make pigment plaster and paint
- Differentiate between sand, silt and clay
- Describe the main components of Puebloan plaster
- Create their own plaster design
- Explain why archaeologists study plaster
- Conduct and evaluate a scientific exploration of plaster
- Describe the steps of the scientific method

CO ACADEMIC STANDARDS

- Science
3.S.ESS.1, 6.S.LS.1, 6.S.ESS.3
- Visual Arts
3.VA.COMP.2, 4.VA.TRAN.2, 5.VA.COMP.2,
5.VA.CRE.3, 6.VA.CRE.2, 7.VA.COMP.2,
8.VA.REF.1

MATERIALS

- Cobblestones/pestle and bowl for grinding
- Paper cups or bowls (4 oz. size)
- Pencils
- Paint brushes (Puebloans would have used yucca brushes and their hands)
- Sponges, rags, or paper towels
- Sandpaper and masking tape
- Small clipboards or stiff boards
- Soil -- various colors and textures, without a lot of rock or organic material.
- Clay, Sand, and Silt samples
- Tubs and/or buckets for cleanup

INTENDED GRADE/RANGE

3rd - 8th grades

TIME INVOLVED

About 60 minutes, depending on how in-depth you want to make the project.

LOCATION

Classroom

CREDIT

By Nate Thompson, Mesa Verde 2009 Teacher-Ranger-Teacher. (Parts adapted from a U.S. Department of Agriculture Natural Resources Conservation Service lesson plan, "[Painting with Soil](#).")

OVERVIEW

Plaster and paint are integral parts of archeological research at Mesa Verde and Ancestral Puebloan life.

In this lesson, students will use soil to create their own plaster artwork. They also act as archeologists and use the scientific method to explain how Mesa Verde's ancient inhabitants used soil to make plaster and paint.

For this activity, the scientific method includes five basic steps:

1. Making observations
2. Asking informed questions,
3. Forming a hypothesis (probable answer to a question)
4. Testing hypotheses
5. Revising a hypothesis or forming a conclusion that can be communicated to other scientists for collaboration.

The estimated time for the activity is about 30 to 60 minutes, depending on how in-depth you want to make the project. This lesson can be used for a number of interdisciplinary lessons, to include geology, art, history, writing and other subjects.

PREPARATION

Review both the "Background Information" and "Instructions," and prepare materials for plaster art project.

BACKGROUND INFORMATION

"Painted plaster surfaces have been amazingly preserved at many of Mesa Verde National Park's signature cliff dwelling sites, much more so than at many other Ancestral Puebloan sites in the Southwestern United States."

Julie Bell
Mesa Verde Archeologist

Many of us overlook the connection between soil and plaster because, like much of the earth's topsoil, plaster at Mesa Verde National Park has been lost to erosion. Despite that destruction, plaster remains an important part of the history, beauty and mystique of Mesa Verde's cliff dwellings, pueblos and kivas.

Dictionaries define plaster as "a pasty composition ... that hardens on drying and is used for coating walls, ceilings, and partitions." The verb plaster can also mean the process of covering. Once applied, plaster can be painted with murals and other symbols that are important to various cultures. Plaster was used in European frescos, for example (see "Fresco Plaster" sidebar below).

At Mesa Verde, plaster is important to the park because the "plastered surfaces record a sequence of symbolic and stylistic changes [in Puebloan life] that cannot be assessed through any other means," according to Julie Bell, a park archeologist.

For park visitors, plastered surfaces are hard to see (or imagine) because some plaster colors used by Ancestral Puebloan people blend in with the walls in alcove and mesa top sites. And for the most part, plastered surfaces continue to erode from most exterior and interior surfaces left exposed to wind, snow, people, animals and rain. Some colors in plaster are vegetable based, but most plasters and paint colors at Mesa Verde are derived from various soil and mineral sources.



Image from Mesa Verde National Park

So what is soil? And what makes it such a versatile resource for all cultures? For starters, it is more than just dirt. Soil is a mixture of sand, silt, clay, air, water, organic material (living and dead life) and minerals. The texture of sand is gritty. Silt is finer than sand and can have the consistency of flour, but it is still a little gritty and doesn't stick together like clay. Clay is slippery or slick when wet and sticks together when it dries.

Fresco Plaster: Color

True fresco painting consists in the application of earth colors, or minerals, onto the surface of the wet plaster.

"In creating a palette for fresco [plaster] painting, the earth colors are the easiest to find. By earth colors I mean those taken from the soil – dirt! You have all seen plowed fields that look very red, or riverbanks and caves of golden yellow. The earth pigments range through reds, yellow, brown, to a green. We all know of them as the ochres, the siennas, the umbers, any number of reds, terra verte, and others. These are clays, which owe their color to compounds of iron or manganese and iron. These can be burned at different temperatures producing an even greater variety of colors. As would be expected these are the earliest colors known to the first painters and were universally used."

-www.muralist.org

The way the soil ingredients are mixed can vary from place to place and have significant impact on how the soil is used by plants, animals and people. Fertile soils are used for growing crops and mineral rich soils can be used in products such as plaster and paint. And when preserved, plaster and other design elements are used by archeologists and anthropologists to answer questions about the ancient use of plaster.



Image from Mesa Verde National Park

Mesa Verde National Park has some of the best preserved plaster examples created by the Ancestral Puebloan people between 1200 and 1300 A.D. The park's alcove sites contain well-preserved rooms like this one found at Cliff Palace.

Two common colors of plastered surfaces at Mesa Verde are a rusty red and a pale tan or white.

Mesa Verde has been set aside as a national park and World Heritage Site – an international recognition from UNESCO, the United Nations Educational, Scientific and Cultural Organization – to preserve cultural resources left by the Ancestral Puebloan people.

Archeologists continue to research and preserve plaster in the park today. That said, many of the questions about why people plastered surfaces remain unanswered. These questions include: When were surfaces plastered? Why were certain colors used? Where did the colors come from?

PROCEDURE

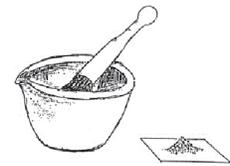
Instructions

Color Preparation: Observe, Question, Hypothesize

1. *Observations:* Plasters vary in color. Soils vary in color. Puebloan plaster is typically 90 percent (%) clay and is sticky when wet.
2. *Question:* What soils can be used to match pigments found in the plaster colors in a pueblo or kiva? Where would red or white soil come from? How thick was the plaster? And so on ...
3. *Hypothesis:* Use an "if ... then ... because" statement to explain which soil will match the desired color and try to explain why it matches. (Hint: science isn't just explaining that something works, you have to be able to say why it works. For more help on this see the "Extension" section of this activity).

Note: Steps 4 through 12 are all considered the “test” or experimentation step of the scientific method used in this activity.

4. Test hypothesis: Place one of the crushed soils into a mortar. Use a pestle to grind the soil into a fine powder. (See Figure, Step 4 at right)
5. Place the prepared soil powder into a disposable cup -- notice the colors and textures of the soil, is the soil mostly sand, silt or clay? Remember, sand is really gritty, silt is a little gritty, and clay is sticky or slick, depending on the moisture content).
6. Set prepared soil to the side for later use.



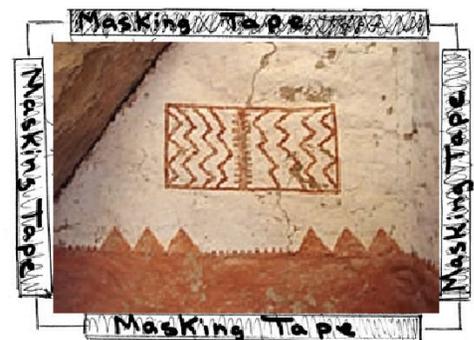
Step 4. Grinding Soil

Mixing Color

7. Get a cup with clay.
8. Add water to “thin” the mixture until it is like wet paint. Note: Clay particles enable plaster to have the ability to form very thin layers.
9. Mix in soil color and add water as needed, to maintain consistency created in step 8. (i.e. plaster should not be too wet, but not too dry).

Plaster Artwork

10. With masking tape, carefully tape paper edges to clip board. This is done so that the art work will dry flat and be easier to paint. (See Figure, Step 7 at right)
11. Lightly draw on paper with a pencil, until satisfied with a plaster composition. What would the Ancestral Puebloans used to plan their designs?
12. Experiment with depth of color and mixing in different soils (you can borrow colors from neighbors or make a new color). Use different sizes and kinds of paint brushes, sponges, and rags.
13. When finished, review your hypothesis. Does it need revision? Can you form any conclusions based on your artwork experiment?



Step 7. Tape paper onto surface

Extensions

- Students can have fun by experimenting and using sticks to make etchings in the plaster.

- Have them think like an archeologist and ask:

- What could the Ancestral Puebloan people have used to apply plaster?
- What could they have done to make it last for centuries?
- Where did the different colors come from?
- What do they think the different designs mean?
- When were plasters applied?
- What is needed to repeat this experiment AND get the same results again?

- Layering Colors:

When the artwork is dry, students may apply another layer of soil plaster. Archeologists have found rooms with over 60 layers of plaster. The layers frequently have black (soot) between them. Why do you think that is?

- More About the “If...Then...Because” Hypothesis Format:

(Adapted from *Mr. Erickson's Science Website*)

Below are some examples of the “If...then...because” format for eighth grade science projects. Notice it contains three parts: 1) Your independent variable, 2) a prediction about what will happen to your dependent variable, and 3) a reason why you predicted this. With this sheet, writing your hypothesis is easy.

Format

If I _____ (Independent Variable) _____ then _____ (Prediction about your dependant variable) _____
because _____ (Why, based on your research, did you make this prediction?) _____.

Example

1. If I make the fins bigger, then the smaller fins will go the furthest because the smaller fins have less drag and less mass.
2. If I change the size of the sediment, then as the water flows over it, the larger rocks will move the least and the smaller gravel will move the most because it takes more energy to move larger particles.

HYPOTHESIS PARAGRAPH

Only one paragraph

- Write 1-2 sentences about what gave you the idea and/or what you found in your research.
- Write about what you are testing (your question!!!).
- Write 1-2 sentences about what you think the outcome of the experiment will be and give some evidence from your literature research to support this.

Example

As I was researching I found that This made me wonderTherefore I will test... If my hypothesis is correct then... _____ ...will happen because... _____.

ASSESSMENT

Student assessment can be based on completed artwork project and their answers to final questions (#13).

POTENTIAL VOCABULARY

Alcove	Conservation	Mortar and Pestle	Sand
Ancestral	Culture	National Park	Scientific Method
Ancestral Pueblo people (Anasazi)	Etch	Observation	Sediment
Anthropologist	Experiment (Test)	Organic Material	Silt
Applied	Fresco	Paint (verb vs. noun)	Soil
Archeologist	Heritage	Pigment	Symbol
Blend	Hypothesis (if, then ... because)	Plaster (verb vs. noun)	Test (experiment)
Clay	Iron Oxide	Pottery	UNESCO
Cobblestone	Mesa	Question	United Nations
Conclusion	Mineral	Resource	Yucca
		Revise	

COLORADO ACADEMIC STANDARDS

Science, Earth Systems Science, Life Science, Visual Arts - Comprehend, Reflect, Create, Transfer

- 3.S.ESS.1 Earth's materials can be broken down and/or combined into different materials such as rocks, minerals, rock cycle, formation of soil, and sand – some of which are usable resources for human activity
- 6.S.LS.1 Changes in environmental conditions can affect the survival of individual organisms, populations, and entire species (erosion of plaster)
- 6.S.ESS.3 Earth's natural resources provide the foundation for human society's physical needs. Many natural resources are nonrenewable on human timescales, while others can be renewed or recycled
- 3.VA.COMP.2 Art has intent and purpose
- 4.VA.TRAN.2 Historical time periods and cultural settings are interpreted in works of art
- 5.VA.COMP.2 Visual arts communicate the human experience
- 5.VA.CRE.3 Apply an understanding of art processes and creative thinking to plan and create art
- 6.VA.CRE.2 Explore various media, materials, and techniques used to create works of art
- 7.VA.COMP.2 Understanding works of art involves knowledge of historical and cultural styles, genre, and artists over time
- 8.VA.REF.1 Visual literacy skills help to establish personal meaning and artistic intent in works of art