



EDUCATOR'S GUIDE

Jesse Steam: Solving Mysteries through Science, Technology, Engineering, Art & Math

Title: The Clue in the Painted Pattern

Series Overview

Ten-year-old Jesse Steam's curiosity about how the world works leads her to one mystery after another as she pedals around town, often with Mr. Stubbs, her tabby cat, keeping her company in the bike basket. Using simple scientific tools and their powers of observation, Jesse and her friends analyze, test hypotheses, and conduct experiments. If the kids get stuck, they know they can count on Professor Peach, a retired college science educator, to step in with a clear explanation.

Each title in the Jesse Steam series focuses on one **STEAM** subject: Science, Technology, Engineering, Art, or Math.

About This Book

In *The Clue in the Painted Pattern*, Jesse discovers what looks like an unusual patterned rock while exploring near her summer camp. With Professor Peach's help, she discovers that what she's found is not a rock but a piece of very old pottery, painted in a Native American pattern. Jesse and her friends go back to the site and excavate for other pieces, which they reassemble for a museum display.

This title has a skill-focus on **art**.

Next Generation Science Standards Alignments and Activities

The activities and learning ideas in this guide have been correlated with the **Next Generation Science Standards (NGSS)**: <https://tinyurl.com/y649p73f>

These standards were developed by the National Research Council (NCR) of the National Academy of Sciences. The NCR's Framework for K-12 Science Education combines practices, crosscutting concepts, and disciplinary core ideas to address relevant science, technology, engineering and math (STEM) concepts that students should learn.

The Clue in the Painted Pattern aligns well with this standard:

<https://www.nextgenscience.org/pe/4-ess1-1-earths-place-universe>



Lexile: 730 GRL: R 4,406 words



Background and Key Concepts

The Clue in the Painted Pattern is an entertaining story, and it's also an opportunity to explore many subject areas—rocks, minerals, natural history, native cultures and art, archaeology. Here are some definitions and information you and your class may find helpful.

- **Rocks:** Solid mixtures of minerals, often with other organic materials mixed in
- **Minerals:** Chemical compounds found on, in, and below Earth's crust.
- **Rock cycle.** A never-ending process by which rocks change from one form to another over thousands and thousands of years.
- **Igneous** The most common type of rock. There are two kinds:
 - Intrusive:** Forms when magma cools beneath Earth's surface and is pushed up to the surface. Example: **Granite**
 - Extrusive:** Forms when the magma erupts as lava and cools on Earth's surface. Example: **Basalt**
- **Sedimentary** Forms when igneous rock is broken down into tiny pieces, called sediments, which are moved around by natural forces, pile up in water, and become compressed into layers. Example: **Limestone**
- **Metamorphic** Forms when igneous or sedimentary rocks are changed by pressure and heat into a new shape, color, and mineral structure. Example: **Marble**, which often comes from limestone

Class Discussion

Open the discussion by inviting students to suggest differences between rocks and minerals. Write down their ideas on the board. Offer them one easy way to remember the difference: Rocks are made of minerals, but minerals are not made of rocks. (Minerals are made of elements.) Share that there are more than 4000 known minerals on Earth, including precious **gems** such as diamonds and rubies.

Invite students to share their observations of rocks and minerals in your area and around your state. Does anyone have a collection?



TEACHER'S PET ROCKS: Classroom Activity

Students will be conducting this activity in small groups of 4 to 6, depending on your class size. Assemble these materials in advance:

Materials for Activity

- Pictures of different types of rocks and minerals. You can find some good ones here: <https://geology.com/rocks/>. If you have access to a color printer, print out one set per team. Or you can project them during the activity if you prefer.
- Data sheets, one per student
- Local rocks, one per team. These should be around 2 inches long—large enough for observation with the naked eye—and thoroughly washed. Perhaps a couple of students or classroom parents could help you collect them.
- Magnifying glasses, ideally one per team, but teams can share if necessary

Materials for Design Challenge

- Extra paper for sketching
- Colored pencils

Instructions

Invite students to divide into groups. Explain that although rocks can't talk, they have a lot to say—especially about the geography and history of a location. In fact, they've been collecting information for millions of years.

Tell students they're going to observe local rocks and try to identify which type they are.

Distribute the rocks, data sheets, and rock and mineral pictures.

Challenge students to observe their group's rock carefully, turning it over in their hands and examining it first with their eyes and a second time with a magnifying glass. They should note these features on their data sheets:

- Shape
- Color or colors
- Surface texture—Is it rough? Smooth? Porous? Pebbled or pocked?
- Grains, streaks, crystals

Then students should compare notes and try to come up with a group decision on whether their rock is igneous, sedimentary, or metamorphic.



PICTURE ME ROCKY: Design Challenge

Now that students know what identifying features to look for, have groups swap rocks.

Distribute sketch paper and art materials. Invite students to create detailed pictures, with labels of key features, of their new rock. What type do they think it is?

Then each group can present their observations, conclusions, and drawings to the entire class. Do different groups agree on the rock type? As a follow-up, students can do some research in the library or online about the natural history of your state. Do the landforms and features match their conclusions about the type of rock? Last, encourage students to look for rocks, minerals and fossils wherever they go, and make sketches to check out later.

(Note: After all the rock handling, you might also encourage students to wash their hands!)

OF QUARTZ WE CAN! Research Project

Quartz, like the crystal Jesse finds, is the most common mineral in the world. It's found in almost every type of rock and in every environment, very often in streams and on beaches. The clear quartz Jesse finds is called rock crystal, but quartz comes in an amazing array of gorgeous colors, as well as different forms.

In addition to being beautiful, quartz is *piezoelectric* (pea-AYZ-oh-electric). That means has the power to create mechanical energy into electricity. (See Videos, p. 4). Most clocks and watches work on quartz crystals. Combined with silicon, quartz is a key component in computers, TVs and phones. Last, some people think quartz has healing powers.

Invite students to do research on quartz and create a quartz trivia poster, with pictures of different kinds of quartz and fun facts.



Additional Online Resources

The US Geological Survey is a remarkably rich, free source of earth science materials for students and teachers. You can find grade-specific maps, downloadable worksheets, activities, multimedia, and class projects here:

Home page, grades 3-5

<https://www.usgs.gov/science-support/osqi/yes/resources-teachers/grade-3-5>

Geology.com is another excellent resource. It offers a wide range of content, most of which is written by a geologist. (Please note: This site is free to use, but it does contain advertising.)

<https://geology.com/>

Videos

From PBS Learning, downloadable videos and more from historians, artists, students, and scientists on Native American art, history, and culture.

<https://kcts9.pbslearningmedia.org/collection/nativeamericanheritage/>

Fascinating lesson on how piezoelectric materials such as quartz crystals turn mechanical stress—pressure, sound waves, and other vibrations—into electricity.

<https://www.youtube.com/watch?v=YEJ2qryXcIQ>

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Data Sheet

Teacher's Pet Rocks: Classroom Activity

Students Name _____

Date _____

Rock Observations without Magnifying Glass

Shape:

Color or Colors:

Surface texture:

Grains, streaks, crystals, patterns:

Rock Observations with Magnifying Glass

Shape:

Color or Colors:

Surface texture:

Grains, streaks, crystals, patterns:

Is the rock igneous, sedimentary, or metamorphic?

Group vote: