

Title: Rocks Rock for Building Stuff Estimated Time: 1-2 periods

Core Ideas (GSE Standard and elements):

SKE2. Obtain, evaluate, and communicate information to describe the physical attributes of earth materials (soil, rocks, water, and air).

a. Ask questions to identify and describe earth materials—soil, rocks, water, and air.

b. Construct an argument supported by evidence for how rocks can be grouped by physical attributes (size, weight, texture, color).

S3E1. Obtain, evaluate, and communicate information about the physical attributes of rocks and soils.

a. Ask questions and analyze data to classify rocks by their physical attributes (color, texture, luster, and hardness) using simple tests.

S6E5. Obtain, evaluate, and communicate information to show how Earth's surface is formed.

b. Plan and carry out an investigation of the characteristics of minerals and how minerals contribute to rock composition.

c. Construct an explanation of how to classify rocks by their formation and how rocks change through geologic processes in the rock cycle.

Literacy Connections: Books	Literacy Connections: Close Reads
Sylvester & the Magic Pebble, William Steig	Rocks Rock for Building Stuff Close Read ES
Scribble Stones, Diane Albers	Rocks Rock for Building Stuff Close Read MS
Science and Engineering Practices:	Crosscutting Concepts:
Asking Questions and Defining Problems:	Structure and Function:
Define a simple problem that can be solved	The way an object is structured/designed
through the development of a new or	determines many of its properties and functions.
improved object or tool.	
	Stability and Change:
Constructing Explanations and Designing	For designed systems, conditions that affect stability
Solutions:	and factors that control rates of change are critical
Use tools and/or materials to design and/or	to consider and understand.
build a device that solves a specific problem or	
solution to a specific problem.	

STEM Challenge Overview:

Rocks are often used to build things like walls, floors, chimneys, walk-ways, and fences. In this STEM Challenge, the student's task is to build and design a useful structure using rocks and cement.

Ask	Beyond for throwing or skipping across the water, have you ever thought
	about what rocks are useful for? Think about the attributes (features) of
	rocks that are often used to describe them. Discuss which of these features
	you think could make rocks useful and/or valuable.
Imagine/Brainstorm	Students brainstorm ideas for how they could design and construct a structure
	out of rocks that could be useful or helpful. The structure should have some
	sort of useful purpose. After brainstorming, they should consider the
	strengths and weaknesses of each idea.
Plan/Design	In order to learn more about topic, have them read the Rocks Rock for
	Building Stuff article and discuss how rocks are frequently used to build things.
	After learning about rocks, students plan and design a simple model structure
	using rocks as the main materials and Playdoh as the "cement" that holds the
	rocks together. Depending on the level of your students and the time you
	have for this challenge, you can make this open-ended or more of a guided
	inquiry for your students. If you take a more open-ended approach, provide a
	greater variety of materials that can be used to construct the structure and
	encourage more out of the box designs.
Create/Test	Students follow their plan, and create their rock structure. Once it is created,
	students test it in a measureable way to evaluate the effectiveness of their
	solution. Their results should be recorded, organized, and analyzed.
Improve	After discussing and evaluating their results, students improve their solution
	and re-test if possible.

Teacher Notes:

Rocks are natural objects that are composed of solid crystals. Rocks are made of a mixture of **minerals**. Rocks have different attributes (features) that are used to describe them including their color texture, luster, and hardness.

The **color**, or tint, of a rock depends on the minerals that are found in the rock. The colors can be bright and lively or dull and cloudy. Brightly colored rocks that are cut and polished are often called gems.

The **texture** of a rock refers to how the rock feels on the surface. Some rocks feel smooth when you touch them while others feel rough. While the texture of a rock determines how it feels, you can also see with your eyes how textures like smooth and rough are different. The **luster** of a rock refers to the sparkle and shine of a rock. Rocks that reflect lots of light usually have lots of luster. The **hardness** of a rock describes the stiffness of a rock. Hard rocks resist scratching, denting, and bending. The hardness of rocks and minerals can be measured using the Mohs scale.

For middle school students, a discussion of the main types of rocks is also appropriate. The way in which a rock forms determines what type of rock it will be. The three main types of rocks are sedimentary, metamorphic, and igneous.

Sedimentary rocks are formed when small particles in the water called sediment settle on the bottom of a lake, river, or ocean. Over time, the particles of sediment stick together and form layers of rock. Sandstone, limestone, and shale are examples of sedimentary rock.

Metamorphic rocks are formed when old rocks are transformed by heat and pressure. The heat and pressure causes physical or chemical changes to occur and new types of rocks are formed. Most metamorphic rocks are very hard and dense and some are made of many layers. Marble and slate are examples of metamorphic rock.

Igneous rocks are formed when hot molten (liquid) rock cools down and solidifies from a liquid to a solid. Hot molten rock below the surface of the earth is called **magma** and hot molten rock on the surface of the earth is called **lava**. Obsidian and granite are types of igneous rocks.

Rocks are often used to build things like walls, floors, chimneys, walkways, and fences. In addition, rocks are often crushed into sand or powder and then used as materials in mixtures like cement or plaster. Finally, precious rocks (or gems) are often used to make different types of jewelry including rings, necklaces, and earrings.

In this STEM Challenge, students are asked to design something useful using a sample of small rocks and sample of Playdoh that serves as the connecting cement. We give each group a cup of river pebbles (Dollar Tree) or a cup of the small clear glass gemstones (Dollar Tree). We also give them a ball of Playdoh to use as a binder to stick to the other rocks and help hold them together. While Playdoh isn't usually a binder used by builders since it doesn't set and harden very well, it is both cheap and reusable. We make sure to mention lots of things that are actually used as binders including mud, cement, glue and caulk. We steer students away from jewelry designs as we want them to focus on some basic building applications.

Suggested materials for students to use:





Rocks Rock for Building Stuff STEM Challenge:

Can you design, build, and test structure made from rocks that has a useful purpose?



Designing and constructing your structure:

- 1. After learning about rocks, **plan** and **design** a simple structure made from rocks that has a useful purpose.
- Using the materials provided and your plan, construct your structure. Your structure should include rocks, and a binder (Playdoh) to hold the rocks together.
- 3. Once your structure is constructed, carefully **test** it by trying it out to see if it works. Observe and record how it responds.

Evaluating and Improving:

- As a group, discuss how you were able to construct your structure and explain how the rocks were used to build your structure and how the binder was used to stick things together.
- As a group, evaluate the effectiveness of your structure and discuss how you would change your design moving forward to improve it. If time permits, make these improvements and re-test.





Vocabulary Cards:

rock

natural objects made of a mixture of minerals



color

the tint of an object



luster

the shine or sparkle of an object



mineral

a solid substance formed naturally in the earth



texture

the feel of a surface



hardness

the stiffness or rigidity of an object

