



The Three Types of Rocks

6

✓ **Lesson Objectives**

Core Content Objectives

Students will:

- ✓ Explain that much of our knowledge of the earth and its history is the result of the work of many scientists
- ✓ Identify the three types of rocks: igneous, sedimentary, and metamorphic
- ✓ Describe how heat, pressure, and time cause the formation of igneous, sedimentary, and metamorphic rocks

Language Arts Objectives

The following language arts objectives are addressed in this lesson. Objectives aligning with the Common Core State Standards are noted with the corresponding standard in parentheses. Refer to the Alignment Chart for additional standards addressed in all lessons in this domain.

Students will:

- ✓ Compare and contrast the three types of rocks (RI.1.9)
- ✓ With assistance, categorize and organize rocks into the following categories: igneous, sedimentary, and metamorphic (W.1.8)
- ✓ Clarify information about “The Three Types of Rocks,” by asking questions that begin with *what* (SL.1.2)
- ✓ Orally retell important facts and information from “The Three Types of Rocks” (SL.1.4)

Core Vocabulary

artifacts, *n.* Items from long ago made by people

Example: There were many artifacts at the museum, including jars and bowls.

Variation(s): artifact

igneous, *adj.* A type of rock that forms when molten rock cools, hardens, and turns solid

Example: Obsidian and granite are two types of igneous rocks.

Variation(s): none

metamorphic, *adj.* A type of rock that has formed from another rock as a result of heat and/or pressure

Example: Marble is a metamorphic rock formed from limestone, a sedimentary rock.

Variation(s): none

sedimentary, *adj.* A type of rock that has formed as the result of layers of sediment pressed together


Example: Coal is a type of sedimentary rock used as an energy source.

Variation(s): none

sediments, *n.* Small, solid pieces of material often carried and moved around by the wind and weather

Example: Sediments settled at the bottom of the swimming pool.

Variation(s): sediment

At a Glance	Exercise	Materials	Minutes
Introducing the Read-Aloud	What Have We Already Learned?	Image Cards 1–3	10
	Interactive Read-Aloud		
	Purpose for Listening		
Presenting the Read-Aloud	The Three Types of Rocks	dirt; small rocks; glass of water; U.S. Map	15
Discussing the Read-Aloud	Comprehension Questions		10
	Word Work: Sediments	sediment; water in plastic container	5
 Complete Remainder of the Lesson Later in the Day			
Extensions	Three-Column Chart: Types of Rocks	Instructional Master 6B-1 (optional); chart paper, chalkboard or whiteboard; Image Cards 7–9	20
	Forming Three Types of Rocks	different colored chocolate chips; aluminum foil; plastic bags; clear jar, pan of hot water; hot plate [This exercise requires advance preparation.]	



The Three Types of Rocks

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Introducing the Read-Aloud

10 minutes

What Have We Already Learned?

Review with students the three words that Gerry the Geologist said they should always keep in mind when thinking about rocks: *heat*, *pressure*, and *time*. Use Image Cards 1–3 as clues. Ask students to share how heat, pressure, and time affect things on the earth, such as volcanoes, geysers, and the layers of the earth. Remember to repeat and expand upon each response using richer and more complex language, including, if possible, any read-aloud vocabulary.

Tell students that all rocks can be sorted into three categories because of how they were formed by heat, pressure, and time.

Interactive Read-Aloud

Tell students that you will need their help during the read-aloud. Preview actions that you would like students to do whenever you say certain words during the read-aloud:

- *Igneous*: Whenever students hear the word *igneous*, they should hold up their index finger like it is a candle and pretend to blow out the flame to demonstrate the heat of fire.
- *Sedimentary*: Whenever students hear the word *sedimentary*, they should continuously place one flattened hand on top of the other to demonstrate the formation of layers.
- *Metamorphic*: Whenever students hear the word *metamorphic*, they should hold out both hands and then clasp them tightly together to demonstrate pressure.

Purpose for Listening

Tell students to listen carefully to learn about the three types of rocks and how they were formed.



The Three Types of Rocks

◀ Show image 6A-1: Gerry pointing to a blackboard

- 1 What is the difference between solid rock and liquid rock?

The right amount of heat can turn a solid rock or metal into a liquid.¹ Pressure from the weight of the earth and movement of materials inside the earth can crush rocks. Over time, the effects of heat and pressure create the rock formations and other geologic phenomena that we find in the world.

- 2 [Say each word and have students repeat it.] What are the three types of rock?

Working together, heat, pressure, and time create the three types of rocks that exist in the world. Every rock in the world can be placed into one of three categories. The three types of rocks are **igneous**, **sedimentary**, and **metamorphic**. Try saying each of these rock types out loud: igneous . . . sedimentary . . . metamorphic.²



◀ Show image 6A-2: Granite surface

- 3 Whenever you hear the word *igneous*, hold up your finger like it is a candle and pretend to blow out the flame.

The first rock type, igneous, is the most common.³ Igneous rocks come in many forms. Some form entire mountains, and some appear as boulders jutting from the earth. This picture shows a close-up of one type of igneous rock. This plain, old, gray rock contains different types of minerals, and it hasn't always been a plain, old, gray rock.



◀ Show image 6A-3: Diagram of magma movement

- 4 The word *igneous* sounds similar to the word *ignite*, which means to light something on fire. Both come from *ignis*, the Latin word for fire. Making connections between word parts will help you to learn more words!
- 5 Over time, heat forms magma, and pressure moves the magma. When the magma cools, it forms what type of rock? (igneous)

The word *igneous* comes from the Latin word for *fire*, because igneous rocks begin deep down in the heat of the earth's mantle.⁴ As you have heard, the earth's mantle is full of a hot, gooey, oozing substance known as magma, or melted rock. The magma is constantly being forced toward the surface by pressure from within the earth. As it travels upward from the mantle through the crust, the magma begins to cool and harden. Sometimes, the magma will erupt from a volcano, but sometimes, the conditions aren't quite right for an eruption.⁵



← **Show image 6A-4: Half Dome, Yosemite National Park**

This formation is called Half Dome, and it is located in Yosemite National Park in California. When you look at Half Dome, you are looking at an old magma chamber. A magma chamber is a pocket, or place, in the earth's crust where magma collects. As more magma enters the chamber, it gets hotter and pressure builds, and the magma can force its way up to the surface in the form of a volcano.

Or, sometimes, as in the case of Half Dome, the magma just gathers in the chamber and stays there without erupting. For whatever geologic reason, the heat and pressure did not get great enough to force the magma through the crust and onto the surface in the form of lava. Instead, the magma cooled and hardened within the chamber. Over time, the rocks and soil around the chamber eroded away, leaving beautiful Half Dome alone sticking high up above the earth. Half Dome is certainly a big igneous rock!⁶

6 Did you hear the word *igneous*?
Blow out the fire!



← **Show image 6A-5: Sill**

Another type of igneous formation occurs when magma intrudes, or pushes itself, between two existing layers of rock. This means that not all the layers in this mountain were formed one on top of the other. Rather, some of the layers forced their way in between other rocks.



← **Show image 6A-6: Obsidian**

This is my favorite type of igneous rock: obsidian, better known as volcanic glass. Volcanic glass forms when certain types of lava cool and harden, becoming smooth, shiny, and glass-like.⁷ Only certain types of lava under certain conditions become volcanic glass.

7 Characteristics of volcanic glass are smooth, shiny, and glass-like.



← **Show image 6A-7: Obsidian spearhead**

Some Native Americans used volcanic glass to make arrowheads and spearheads. If you break a piece of volcanic glass, you will find that it is incredibly sharp and strong. Every now and then I find ancient **artifacts** like this when I'm out rock hunting.⁸

8 Artifacts are objects made by people long ago. Which type of rock have you heard about so far: igneous, sedimentary, or metamorphic? [Prompt students to repeat *igneous* in unison and pretend to blow out the flame.]



← **Show image 6A-8: Bryce Canyon**

9 Whenever you hear the word *sedimentary*, place one flattened hand over the other over and over again.

10 Of heat, pressure, and time, which two are most important in forming sedimentary rocks?

After igneous, the second major rock type is sedimentary.⁹ Sedimentary rocks are not formed like igneous rocks, which form from cooled magma. In fact, heat does not play much of a role at all in the formation of sedimentary rocks. Instead, pressure and time are the most important factors in the formation of sedimentary rocks.¹⁰



← **Show image 6A-9: Sediments**

11 Sediments are little tiny pieces of dirt and rock. Do you hear the word *sediment* in *sedimentary*? [Demonstrate for students how sediments sink to the bottom by dropping bits of dirt and rock into a glass of water. Have students watch how the dirt slowly sinks to the bottom of the glass.]

12 Here, the word *sink* means to go below the surface of water or mud. The word *sink* also has other meanings. The word *sink* also means a wide bowl in the kitchen or bathroom that has a faucet for water and a drain at the bottom.

13 How are sedimentary rocks formed? (Time and pressure turn layers of sediment into sedimentary rock.) [Prompt students to repeat the word *sedimentary* in unison and place their hands one over the other.]

The word **sediments** refers to tiny little particles, such as dirt or rock, which are carried along in water, ice, wind, or landslides.¹¹ If you dump a spoonful of sand into a glass of water, for instance, you will see the sand gradually sink down and settle on the bottom of the glass, much in the same way that sediments settle on the bottoms of lakes and oceans.¹² Sediments are always floating around in lakes, oceans, and rivers. Over time, sediments in lake water settle and form a thick sludge on the bottom of a lake. As more and more sediments settle on the bottom, more and more weight presses down on the sludge. Over time, the pressure from the weight of the upper sediments can cause the sludge to harden into rock. Through time and pressure, layers of sediments are turned into sedimentary rock.¹³



← **Show image 6A-10: Coal**

14 Remember that decayed means that the plants have died and their remains have gone back into the soil.

Coal is a type of sedimentary rock that comes from decayed plants that have been under pressure for many years.¹⁴ Coal is an important energy source. People burn coal in order to create electricity for homes and to make energy to power machines in

factories. People get coal and other important rocks, minerals, and metals by mining them from the earth. One way to mine coal is by digging a mineshaft, or tunnel, deep down into the earth.



← **Show image 6A-11: Iron ore**

Another sedimentary rock is called iron **ore**. An ore is a rock that contains valuable minerals or metals. There are many different types of ores in the world, but iron ore is one of the most important. Iron ore is the source of iron, a strong metal which is used to make steel. Steel, in turn, is used to build bridges, cars, buildings, tools, and other things you see and use every day.



← **Show image 6A-12: Bryce Canyon**

Sandstone is one common type of sedimentary rock.¹⁵ Wherever you find sandstone, there is a good chance that you are walking in a place that used to be completely underwater. At one time or another, every place on earth has been completely submerged in water. Thus, sandstone is quite common throughout the world. This photo was taken in Bryce Canyon, in the state of Utah, which is known for its unique sandstone formations.¹⁶

15 Did you hear the word *sedimentary*? Make layers of sediments with your hands!

16 [Locate Utah on a map for students.]



← **Show image 6A-13: Antelope Canyon**

Here is another sandstone canyon I thought you would like to see. Antelope Canyon, in Arizona, is a very special place.¹⁷ It is known as a slot canyon, which is formed over many, many years as water from rain and floods rushes through the sandstone, causing it to erode.

17 [Locate Arizona on a map for students.]



← **Show image 6A-14: Limestone cliffs**

These cliffs are made of limestone, another type of sedimentary rock. Limestone is interesting because it is composed mainly of minerals left over from ancient sea creatures like clams, oysters, and other shellfish. When these creatures died, their shells sank down to the ocean floor and settled with the other sediments. Over time, the churning oceans ground the shells into a fine white powder. The powder settled and more shells and sediments put pressure on it. It took many, many years, but eventually all the powdery shell leftovers were compressed into limestone.¹⁸

18 Did you hear the words *pressure* and *time*? With pressure and a long, long period of time, the shells of sea creatures turned into sedimentary rock. Which two types of rocks have you learned about so far? Hint: One is formed by cooled magma and the other is made of sediments.



← **Show image 6A-15: Limestone to marble**

If limestone is subjected to intense pressure for an even longer period of time, it can turn into another kind of rock called marble.

Marble is very hard, and it often has a beautiful, pure white color. People have used marble for thousands of years to make fine buildings and sculptures.

Marble is known as a metamorphic rock, which is the third and least common type of rock.¹⁹ *Metamorphic* comes from the Greek word for transformation, or change. Metamorphic rocks are formed when other types of rocks undergo intense heat and pressure and change, or metamorphose, into new kinds of rocks.²⁰

19 Whenever you hear the word *metamorphic*, hold out both hands and then clasp them tightly together.

20 What's the third type of rock, formed when heat and pressure change igneous and sedimentary rocks into new kinds of rocks?



← **Show image 6A-16: Three types of rock**

Congratulations! You are becoming a geologist! Now you know about the three rock types: igneous, sedimentary, and metamorphic. Won't everyone be impressed when you tell them about the new words you learned?

Discussing the Read-Aloud

15 minutes

Comprehension Questions

10 minutes

1. *Literal* What are the three types of rocks? (The three types of rocks are metamorphic, sedimentary, and igneous.)
2. *Inferential* How are igneous rocks formed? Remember: *igneous* means "fire." (Igneous rocks are formed from hot magma or lava that cools and hardens.)
3. *Inferential* How are sedimentary rocks formed? (Sediments settle and form a thick sludge on the bottom of a lake that thickens over time. The pressure from the weight of the sediments makes it harden into sedimentary rocks.)
4. *Inferential* How are metamorphic rocks formed? (Metamorphic rocks are formed when heat and pressure change igneous and sedimentary rocks into new rocks.)

5. *Evaluative* How are the three types of rocks similar? How are they different? (The three types of rocks are similar because they are all found in the earth and are formed over time. The three types of rocks are formed differently. Igneous rocks are formed when heat forms magma and pressure moves the magma towards the surface of the earth. Sedimentary rocks are formed when layers of sediments are pressed together over time. Metamorphic rocks are formed when other types of rocks undergo intense heat and pressure.)

[Please continue to model the *Question? Pair Share* process for students, as necessary, and scaffold students in their use of the process.]

6. *Evaluative What? Pair Share:* Asking questions after a read-aloud is one way to see how much everyone has learned. Think of a question you can ask your neighbor about the read-aloud that starts with the word *what*. For example, you could ask, “What did you learn about in today’s read-aloud?” Turn to your neighbor and ask your *what* question. Listen to your neighbor’s response. Then your neighbor will ask a new *what* question, and you will get a chance to respond. I will call on several of you to share your questions with the class.
7. After hearing today’s read-aloud and questions and answers, do you have any remaining questions? [If time permits, you may wish to allow for individual, group, or class research of the text and/or other resources to answer these questions.]

Word Work: Sediments

5 minutes

1. The read-aloud said, “*Sediments* are always floating around in lakes, oceans, and rivers.”
2. Say the word *sediments* with me.
3. Sediments are tiny particles of dirt or rock that are moved by wind or water. [You may want to put some sediment in a plastic container of water for students to observe.]
4. When you go swimming in a lake, your feet kick up sediments that are on the bottom of the lake.
5. What are some other places that you might see sediments? Try to use the word *sediments* when you tell about it. [Ask two or three students. If necessary, guide and/or rephrase the students’ responses: “I saw sediments in . . .”]
6. What’s the word we’ve been talking about?

Use a *Making Choices* activity for follow-up. Directions: I will describe some objects. If I describe sediments, you will say, “Those are sediments.” If I do not describe sediments, you will say, “Those are not sediments.”

1. I noticed tiny specks of dirt in my glass of water. (Those are sediments.)
2. The ants crawled through the blades of grass. (Those are not sediments.)
3. The wind blew small bits of dust all over the car. (Those are sediments.)
4. Dad cleaned the small grains of sand out of the bathtub. (Those are sediments.)
5. The museum has many large gemstones. (Those are not sediments.)



Complete Remainder of the Lesson Later in the Day



The Three Types of Rocks



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Extensions

20 minutes

Three-Column Chart: Types of Rocks (Instructional Master 6B-1, optional)

On a large piece of chart paper, a chalkboard, or a whiteboard, create a chart similar to the one below, using Image Cards 7, 8, and 9 (Igneous), (Sedimentary), and (Metamorphic) to label each column.

		
Image Card 7 (Igneous)	Image Card 8 (Sedimentary)	Image Card 9 (Metamorphic)

Ask students to think about what they learned from the read-aloud about the three types of rocks. Have students share what they learned about igneous rocks. Record students' responses on the chart paper, chalkboard, or whiteboard. Tell students that you are going to write down what they say, but that they are not expected to be able to read what you write because they are still learning all the rules for decoding. Emphasize that you are writing what they say so that you don't forget. Tell them that you will read the words to them.

Follow the same procedures for filling in the other types of rocks.

Once the chart has been completed, read it to the class.

✈ Above and Beyond: Instructional Master 6B-1 has been included if you have students who are ready to fill in the chart on their own, using the sound/spelling correspondences taught thus far.

Forming Three Types of Rocks

Note: This activity requires adult supervision and you may desire the assistance of parents or a teacher's aide. In the interest of time, you may wish to complete this activity during the Domain Review or Culminating Activities section at the end of the domain. This activity can be completed with crayon shavings instead of chocolate chips.

Note: Be sure to follow your school's policy regarding food distribution and allergies.

Review with students the three types of rocks and how each is formed. Tell students that you are going to use different-colored chips (white chocolate chips, semi-sweet chocolate chips, peanut butter chips, etc.) to demonstrate how each type of rock is formed, using heat, pressure, and time.

To create igneous rocks, melt one color of chocolate chips. This can be done using a stove or hot plate, if available, or by placing the chips on aluminum foil in a pan of very hot water. Please exercise caution when completing this activity with your class. Allow the melted chips to cool. Tell students that igneous rocks are formed from magma (melted rock) that has been heated and then cooled, similar to how these chocolate chips have been melted and then cooled.

To create sedimentary rocks, place each color of chocolate chips into separate plastic bags. Students can crush these chips using their feet or hands. Next, layer each color of crushed chips into a clear jar. Have students help you press down on these layers using their hands or feet to simulate the formation of sedimentary rocks.

To create metamorphic rocks, remind students that metamorphic rocks are rocks that undergo extreme amounts of heat and pressure. First, layer each color of crushed chocolate chips onto a piece of aluminum foil. Next, have students apply pressure to the layers using hands or feet. Place the pressed layers on aluminum foil in a pan of very hot water to melt the layers. Allow the melted layers to cool. Tell students that metamorphic rocks have undergone intense heat and pressure, similar to how these chips have been layered, pressed together, melted, and then cooled.

Lead students in a discussion of how each type of "rock" was formed, using heat, pressure, and/or time.