

## LESSON DETAILS:

**Estimated time:** 1 hour  
40 minute instruction, 20  
minute activities

**Grade level:** Upper  
Elementary/Middle School

**Unit Topic:** Mining and use  
of rocks and minerals

## CONNECTIONS TO STANDARDS:

1. MS-ESS2 Earth's Systems
2. NGSS MS-ESS-2-1: Earth  
and Human Activity

## OBJECTIVES:

1. Identify the **life cycle of rock** and how rocks like sedimentary rock is formed.
2. Identify the **mining process** and ways rocks are used in our everyday life
3. Identify **careers** and types of jobs and steps involved in mining.

# ROCK IS COOL: MINING IN MISSOURI

## LESSON PLAN AND ACTIVITIES FOR THE CLASSROOM

### MATERIALS

#### HANDOUTS

(1 per student)

- Mining is STEM activity page and or book
- Careers in Mining Match Cards

#### MATERIALS

- Rock samples
- Pencils
- Computer with projector
- Make your own sedimentary rock activity supplies (optional), found on page four and on Mining is STEM activity page.



### GOALS AND OUTCOMES:

Students have a basic understanding of the mining industry, and how crushed stone products are used in everyday life.

#### Content Outline:

- Highlight Missouri's Mining industry and how it impacts everyday life.
- Identify the characteristics of **rocks and minerals mined**; for example, limestone, as a sedimentary rock and how it is formed and then applied.
- Highlight **career paths within the mining industry** and their importance.

## BACKGROUND

Mining activity in Missouri began as early as the 1740s. Early settlers mined lead, iron and Industrial commodities such as limestone, sand, and gravel.

Today's technology allows mining sites to efficiently extract rocks and minerals, while caring for the environment, local wildlife, soil, water and worker safety.

The U.S. Department of the Interior's Office of Surface Mining (OSM) reports there are more than 1100 mine maps on record in Missouri. Missouri is also home to 500 rock quarries, 150 of those are recorded as limestone quarries. The mining industry positively impacts the local, state and global economy, while providing careers in engineering, technology, science, trades, and more.

Missouri's most abundant commercial mineral, **limestone**, has many uses, and is known for its unique physical and chemical properties. Hundreds of historic, beautiful structures in Missouri were built with **limestone**, including **Daniel Boone's home**, the **Old St. Louis Cathedral near the Arch**, and even the **State Capitol Building**!

In the **Missouri Mining lesson plan**, students will explore the rock life cycle, while engaging in practical ways the mining industry positively impacts our lives and world.

# INTRODUCTION

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*What is rock?*

*Allow students to answer and describe rocks based on experience and personal observance.*

*What do we use rocks and minerals for? Why are they important?*

## START HERE...

If there's a quarry or mining industry in your community, it is a great way to share a local touch point and related jobs around mining.

- Ask students to describe the role of rocks and minerals in our everyday life.
- Pass out rock samples if applicable and allow students to share their observations.

## OBJECTIVE 1: THE MINING INDUSTRY AND ROCK LIFE CYCLE

### OBJECTIVE 1:

Describe Missouri's mining industry and its role in the rock life cycle.

#### Missouri Mine Map

**Resource:** [dnr.services.mo.gov/geology/geosrv/geores/mine-maps](https://dnr.services.mo.gov/geology/geosrv/geores/mine-maps)

**Overview:** For many years, we have used **rocks and minerals**. The process of mining, extracting (taking) rock from the Earth's surface is a process that has been used since early civilization.

- Early settlers used state's lead, iron, limestone, sand and gravel as early as the 1740s.
- The Missouri Department of Natural Resources reports over 1,100 mines in Missouri (students can explore their communities and nearby mines through interactive map).
- Missouri's mining industry has been an important part of the economy for 275 years.
- **Beyond Missouri:** Mining has taken place for hundreds of thousands of years, as early as the Stone Age, where rocks were used for tools. The Ancient Greeks mined marble for buildings.

#### How and why is rock and minerals mined:

The Earth's crust contains many minerals and materials useful to people and everyday life. To get these valuable natural resources, people dig into the ground.

There's many steps involved in mining rock and minerals.

**1. Formation of rock** - Before we can mine for rocks, they have to form! Rocks are constantly changing and it takes millions of years for rocks to change and form.

#### 2. Types of rock:

- **Metamorphic:** formed from other rocks that are changed by heat and pressure
- **Igneous:** formed from melted rock deep inside the Earth
- **Sedimentary:** formed from layers of sand, dead plants, and other fossils

**3. Making mines** - Miners can dig underground to create tunnels (some are miles long), or remove top layers of soil and rock to form a pit, similar to a canyon. Sometimes miners use explosives to break the materials or create tunnels and paths.

**4. Quarry** - When a mine provides stone for building, it is called a quarry.

## OBJECTIVE TWO: USES OF ROCKS AND MINERALS

**OBJECTIVE 2:** Describe products made from rocks and minerals.

**Extended learning:** Share some items that are created in part by rocks and minerals and see if students can identify which products are a byproduct:

- aviation parts
- toothpaste
- batteries
- plastic
- glass
- paint
- fertilizer

### CONTENT:

#### Uses of rock and minerals:

*Why are rocks and minerals important?*

The **mining and minerals industry** supports our way of life. How did you get to school today? By road? Did you cross a bridge? (Allow students to answer). Do you have a concrete sidewalk? Or glass windows? All of these are examples of things we use in our life made from rocks and minerals.

Farmers also use limestone (a sedimentary rock) in a form for fertilizer on plants, which supports crops, feed, and therefore, livestock. Rocks and minerals are the foundation of many supply chains. What is a supply chain? Allow students to share their thoughts.

**TRANSITION TO OBJECTIVE THREE:** In order to have roads, highways, and more, we rely on people in the mining and mineral industry. Let's learn about some of the jobs required in this field.

## OBJECTIVE THREE: CAREERS IN MINING

**OBJECTIVE 3:** Identify the careers involved in exploring, studying and mining rocks and minerals.

### ACTIVITY: Careers in Mining Match Game



Tip: print on cardstock for best experience.

### CONTENT:

#### Careers in Mining:

The process to extract rocks from Earth's crust continues to evolve. We know that people have been using rocks and minerals for a long time. (rocks are cool!) Today, technology plays a large role in extracting rocks and minerals in a safe way. There's many touch points and careers related to rocks and minerals. Let's explore some of those career paths involved in the process of exploring and using rocks. As we discuss career paths, think about skill-sets and the types of things you may do as part of that career.

- **Scientists- Geologists, Mineralogists** and more are involved in exploring rock and identifying minerals for use.
- **Engineers** are involved in exploration, evaluating water and ground sites, exploring rocks and soil; and develop plans for mines. They work all over the world.
- **Equipment Operators** - A variety of equipment operators are needed at the mine site, and as rocks and minerals are moved and hauled off the site and processed. Other tradespeople in the mining industry include welders, electricians, salespeople and surveyors.

**Careers in Mining Match Game Instructions:** Allow students to break into groups of 2-3 and in a timed period, ask students to match career with the correct description. At the end of 5-10 minutes, ask groups to share one type of career track and the type of skills needed in this career path. Also ask students to share the Limestone fun fact on their career card with the class.

*If time allows, ask students to sketch or write about their favorite mining career track.*

## CONCLUSION

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Rock is COOL! Allow students to review what they know and discuss objectives on the Mining is STEM activity page.

#### Extended learning:

*Allow students to create their own rocks, and observe what they created.*

### CONCLUDE WITH...

Allow students to share something they learned in each objective area: How is rock formed? Why does rock change over time? What products do we get from rocks and minerals? What types of jobs are found in the rock and mineral industry?

### Make Your Own Rock Activity

#### Supplies:

- School glue (water-soluble glue) or Elmer's Glue
- Assorted sediments—clean sand (can be aquarium, craft, any type of sand)
- Gravel (less than 1/2 inch in size)
- "Fossils" (twigs, leaves, seashells, plastic dinosaurs, etc.)
- Wax paper
- Small paper plates or bowls
- Plastic spoons
- Sedimentary rocks, such as sandstones, limestone
- Magnifying glass
- Ruler

*Students can also layer their rock ingredients in a small 5 ounce cup, add glue, and stir.*

#### Directions:

1. Place a small piece of wax paper at each student's workspace.
2. Allow students to place a few spoonfuls of each sediment and fossil samples on the wax paper.
3. Pour glue over sediments and stir with plastic spoon.
4. Place on a mold or on a paper plate and allow to set.
5. Observe sedimentary rocks and features of the rock created.
6. Discuss how your "rock" and the sedimentary rock are alike or different. Measure rock features.
7. If there is a "fossil" in your rock? How does wind, water, sand impact the rock formation overtime?



### The Missouri Limestone Producers Association (MPLA)

was organized in 1944 to promote the crushed stone operators in Missouri. Now known as **INFRA**, the organization represents the interests of all crushed stone and sand producers, vital segments of the construction aggregates industry. **Learn more at [infra.com](http://infra.com).**