

# ROCK IS COOL: MISSOURI MINING

## LESSON PLAN & ACTIVITIES FOR THE CLASSROOM

### LESSON DETAILS:

**Estimated time:** 45 minutes

**Grade level:** Upper Elementary

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

### CONNECTIONS TO STANDARDS:

NGSS 4-ESS1-1

NGSS 4-ESS2-2

NGSS 5-PS1-3

NGSS 5-ESS3-1

### 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.

### FORMATIVE ASSESSMENT DESCRIPTION:

1. Mining is STEM Activity Page
2. Careers in Mining Career Cards

### SUMMATIVE ASSESSMENT DESCRIPTION:

Complete the steps from rock formation, mining and end products.



### MATERIALS

#### HANDOUTS

(1 per student)

- Missouri Mining Activity page and or book
- Careers in Mining Match Game Card Printable

#### MATERIALS

- Rock samples
- Pencils
- Computer with projector (optional)

### CONTEXT

#### WHERE ARE THE LEARNERS BEGINNING (PRIOR CLASSES/ KNOWLEDGE)?

We are assuming the learners have little to no knowledge of the mining process and how it impacts their life, and the importance of careers related to rocks, minerals and mining.

#### 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.

## INTRODUCTION - 5 MINUTES

(Preparation/Interest Approach/Learning Context)

### INTRODUCTION

What is rock?

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

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 touchpoint and related jobs around mining.

### "THIS LESSON WILL ASK YOU 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.

## LESSON - 35 MINUTES

(Presentation, methods and application)

### OBJECTIVE 1

**OBJECTIVE 1:** Describe Missouri's mining industry and its role in the rock life cycle.

**Missouri Mine Map Resource:**  
[dnrservices.mo.gov/geology/geosrv/geores/mine-maps](http://dnrservices.mo.gov/geology/geosrv/geores/mine-maps)

### CONTENT:

Overview of the Missouri mining industry and its role in the rock life cycle:

**Introduction:** 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 the 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.

## The Rock Life Cycle

The rock life cycle is a long and slow process and takes place over millions of years.

Rocks can go up to the surface and back below the surface again.

The cycle of a rock is impacted by:

### Weather

Magma (hot, liquid rock), coming to Earth's surface as a volcano.

Rain, wind, frost, heat, living things all break rocks down.

**Settling:** sand, mud, pebbles get carried into the sea by rivers and settle.

**Rivers and streams** carry rocks away and break them down further.

**Erosion:** movement or carrying away of rock pieces.

**Compacting:** rock particles at the bottom of seas, or lakes get squashed together and become hard.

## How and why are rocks 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.

Share the "Mining is STEM" activity page and refer to the rock life cycle as explained to the left. Ask students to share how they think rock forms and change over time before reviewing the process. .

## OBJECTIVE 2

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

**EXTENDED LEARNING:** share a group of items (some can be taken from home or classroom) to include rock and mineral byproducts to see if students can identify which products are made in part by rocks 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:** 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.

## Common Byproducts

Airiation parts

Paint

Plastics

Fertilizer

Highways, bridges and roads

Flooring

Batteries

### **Rock and mineral byproduct by rock and mineral type:**

**Graphite** – Pencils.

**Lepidolite** – Medicine

**Quartz** – Prisms, lenses, gauges, glass, paints and abrasives.

**Calcite** – Microscopes, fertilizers & chemicals

**Fluorite** – Enamels, cooking utensils, telescopes, camera lenses.

**Gypsum** – Paints, tile, drywall, blackboard chalk, fertilizer, plaster of paris.

**Granite** – Road bed construction material, counter top, wall tile.

**Scoria** – Flower beds.

**Pumice**- Foot smoothing stones, soap.

**Coal** – Fuel source – gives off the most heat of any coal during the burning process.

**Sandstone, Limestone and Coquina** – Building materials, coasters, statues and garden furniture.

**Gneiss and Marble** – Common building materials.

**Slate** – Flooring and roofing material, blackboards.

## OBJECTIVE 3

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

**METHOD:** Presentation

**EXTENDED LEARNING:** Careers in Mining Match Game

### **CONTENT:**

#### ***Careers in Mining: Rock is cool!***

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 are many touchpoints 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 skillsets and the types of things you may do as part of that career.

**1. Scientists-** Geologists, Minerologists and more are involved in exploring rock and identifying minerals for use.

**2. Engineers** - 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.

**3. 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 MATCHING GAME

*(Print one set per group, cut cards out and share set with each group of students).*

Allow students to break into groups of 2-3 and match career cards with their correct description. Ask students to note the rock and mineral use fact on each card and read aloud in group. At the end of 5 minutes, ask groups to share one type of career track and the type of skills needed in this career path. If time allows, ask students what they think they must study or know well to do this type of job.

## KEY to Career Cards:

- 1. Blasting Engineer:** uses technology and equipment to extract rocks and minerals from the Earth.
- 2. Safety Manager:** enforces safety and health standards onsite and inspects sites to ensure safety.
- 3. Geologist:** studies rocks and surveys maps underground.
- 4. Welder:** repairs and creates structures onsite, repairs equipment
- 5. Heavy Equipment Operator:** drives heavy equipment and hauls rocks and minerals
- 6. Environmental Scientist:** works with others to make sure the environment is protected when extracting rocks and minerals.
- 7. Mechanic:** assembles, installs and repairs equipment needed in the mining industry.
- 8. Mineralogist:** studies the formation and properties of minerals.

## CONCLUSION - 5 MINUTES

### CONCLUSION

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

### CONCLUDE WITH...

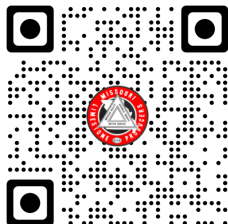
Allow students to share something they learned in each objective area. How is rock formed? Why does rock change over time? What products do we get from rocks and minerals? What types of jobs are found in the rock and mineral industry?

### Additional resources:

Rock activities: <https://www.funkidslive.com/learn/geology-rocks/>

Careers: [https://mineralseducationcoalition.org/wp-content/uploads/mec\\_careers\\_flyer-2.pdf](https://mineralseducationcoalition.org/wp-content/uploads/mec_careers_flyer-2.pdf)

## ABOUT THE MISSOURI LIMESTONE PRODUCERS ASSOCIATION



The Missouri Limestone Producers Association (MLPA) was organized in 1944 to promote crushed stone operators in Missouri. The Association is involved in legislative issues; regulatory matters and marketing and education of crushed stone products. Learn more at [molimestone.com](http://molimestone.com)