

Careers in Mining

Level: 3-5
Facilitator Guide

LESSON DETAILS

Objective: Students will explore careers involved in each step of the mining process and will learn how their personal interests align with specific roles within those careers.

Standards

NVACSS and NGSS

- **4-ESS2-2:** Analyze and interpret data from maps to describe patterns of Earth's features.
- **5-ESS3-1:** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
- **3-5-ETS1-1:** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- **DCI:** Human Impacts on Earth Systems
- **SEP:** Obtaining, Evaluating, and Communicating Information
- **CCC:** Interdependence of Science, Engineering, and Technology

Career Readiness

- **1.1.3:** Demonstrate teamwork skills by contributing to the success of the team, assisting others, and requesting help when needed.
- **1.2.3:** Demonstrate critical-thinking and problem-solving skills by analyzing and resolving problems that arise in completing assigned tasks.

Materials

- mini pom-poms or other small objects
- tools or bowls for **Engage** activity (optional)
- glue sticks
- copies of "The Mining Process" handout
- copies of "Career Skills and Roles" handout
- copies of "Investment and Profit Icons" handout (cut apart)
- copies of "Mining Careers" handouts

Lesson Summary

Students will work in teams to locate items in a designated "mine" in the classroom, then discuss the skills needed to address and solve problems. Students then match career-related skills with steps of the mining process to show how different jobs and roles work together to run a successful mine. A discussion of the steps of the mining process will help students refine how they matched career-related skills to each step. Students then consider their own skill sets and interests to relate to mining careers they could pursue. Finally, students revisit the initial activity to apply what they learned about mining careers to more efficiently "mine" for items.



Preparation

Before **Explore** and **Explain**, review the **stages of mining** and determine the level of detail you want to address with your students.

For **Engage**, clear a space in the classroom where you can scatter mini pom-poms or other small objects that will represent a mineral resource. Randomly spread the objects throughout the area to mimic how mineral resources are not evenly distributed in the environment. Consider if you want to have tools (e.g., scoops, tongs) and/or containers for students to use in collecting the pom-poms.

Engage

1. Tell students that their groups have the opportunity to compete for the development of a mining site.
2. Allow students to make observations of the site, then work in groups to make a plan for how they can collect as many pom-poms as possible. Tell students:
 - a. They have only 20 seconds to collect the resources and transport them to a designated area (e.g., a bowl or a specific desk).
 - b. They need to follow safety rules, such as not running.
 - c. You are the investor who will choose which plans will be used for collecting the resources. Share some key factors that you will consider in your selection, such as:
 - **Teamwork:** teams in which students specify how they will work together to collect the pom-poms.
 - **Roles:** teams in which students will assume different responsibilities to collect the pom-poms.
 - **Tools:** teams that use available resources in the classroom to improve efficiency.
 - **Innovations:** teams that have the most unique approach.
3. Have each group share their plan and decide which groups will execute their plans. You might have all groups to carry out their plans, or select specific groups depending on time.
4. Discuss how successful each group was and why some plans were more successful than others.

Explore

1. Give each student group a copy of “The Mining Process” handout and facilitate a class discussion.
2. Ask students to identify which steps they took part in during **Engage** (such as planning, production, and distribution), and to explain their choices with evidence from the activity.



3. Discuss the rest of the terms to review their meanings, as needed, and to relate them to the process of mining.
4. Provide each group a copy of the “Career Skills and Roles” handout.
5. In groups, have students discuss the list on the “Career Skills and Roles” handout to decide which steps of the mining process each skill or role applies to. They should write the roles next to each step on “The Mining Process” handout where they apply. You may want to do one or two as an example, especially noting that each skill or role may apply to more than one step of the mining process.
6. As groups finish, discuss some of their choices and why different skills and roles are needed at each step of the process.
7. Have each group then consider other potential steps related to financial careers, namely “Investment” and “Profit.”
8. First discuss the skills and roles that could be used to describe financial careers in addition to the list that is provided, such as: math skills (calculating costs, profits, budgets, and forecasts), negotiating (prices and contracts), and the specific knowledge they might need (tax and financial laws and rules).
 - a. Discuss with students where they would place “Investment” and “Profit” icons.
 - b. Provide each group with 6 Investment and 1 Profit icons to add where financial careers are most involved to “The Mining Process” handout (see Figure 1).
9. Ask students:
 - *Are there any roles that relate to mining that could be added to the diagram? What are they and where would you add them?*
 - *Do you think there are any steps or details that are missing from “The Mining Process” diagram? What are they? What other roles or skills might they require?*

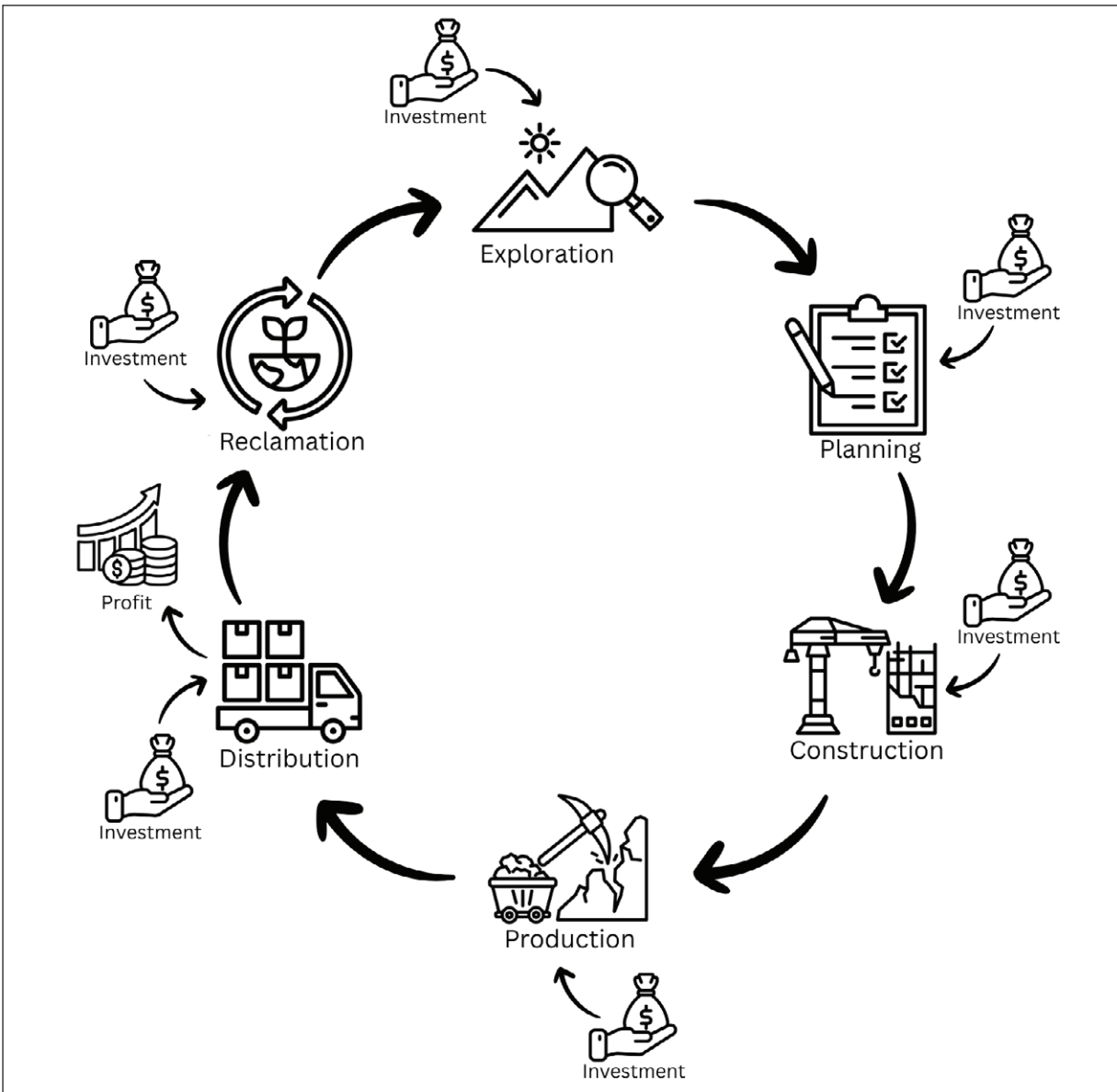


FIGURE 1. SAMPLE MINING PROCESS DIAGRAM WITH INVESTMENT AND PROFIT ICONS ADDED

Credit: Created using icons from The Noun Project, CC BY 3.0,

Explain

1. Have students watch a [video about the mining process in Nevada](#).
2. Pause the video to discuss the steps of the mining process and to allow students to review the skills and roles they related to each step. Sections of the video include:
 - a. Introduction to mining and the Nevada Mining Association (0:00–2:54)
 - b. Skills and roles related to the mining industry (2:54–4:12 and 7:47–8:54)



- c. Why mining careers are important (4:12–6:20)
 - d. How people's interests can relate to mining careers (6:20–7:47)
 - e. Ways to learn more about mining careers and related skills (8:54–9:43)
3. Discuss each group's diagram, addressing questions they might have about which steps of the mining process align with different skills or roles. Discuss that there is not one correct answer, but they should be able to justify the placement of skills within the steps.

Elaborate

1. Have students choose 2–5 interests and/or skills from the “Career Skills and Roles” handout that they identify with or that describe what they like to do.
2. Then, have students try to identify which step of the mining process their interests and skills best align with.
 - a. Give students the “Mining Careers” handout that matches the step of the mining process they identified. Tell students that the careers described on these handouts represent only a few jobs within each step of the mining process.
 - b. Have students read the career descriptions on these cards to identify which career is of most interest to them. If students do not find a career that interests them, provide access to the other handouts so they can find a career that suits their interests.
 - c. Optionally, group students by their career choices to discuss what interests them about their choice.
 - d. Have some students share about their career choice and how it matches their interests.
 - e. Reinforce that the mining process relies on a wide range of skills, from science and engineering to communication and finance.

Evaluate

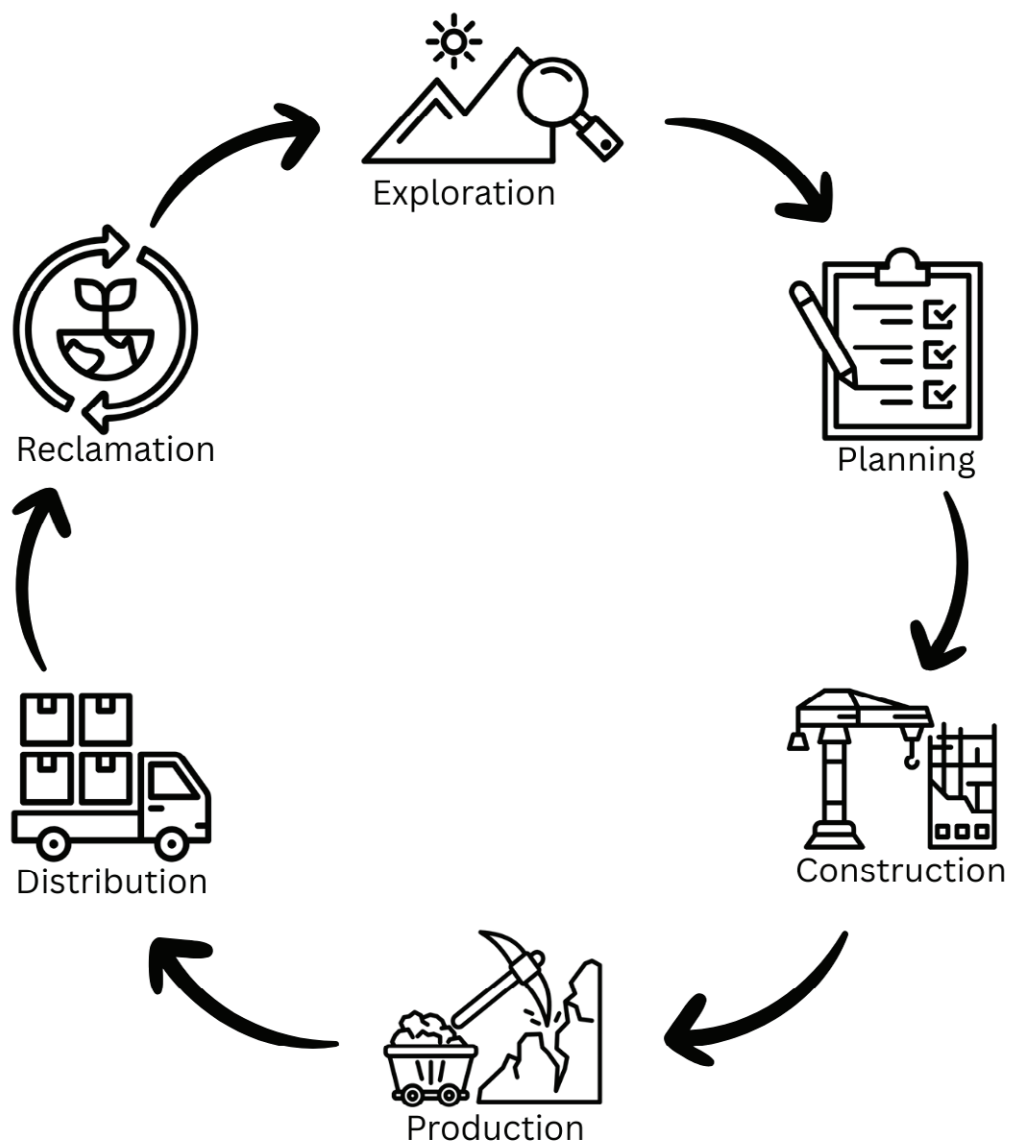
1. Revisit the activity from **Engage**. Have students return to their initial groups.
2. Groups should discuss what they have learned about the mining process and how they would change the activity or their approach to collecting the resource.
3. Discuss students' suggested changes and why they would make them.



4. Optionally, have students repeat the activity with some of their changes incorporated. Discuss how the activity has changed and how it is more like the actual mining process.

HANDOUT

The Mining Process





HANDOUT

Career Skills and Roles

Operating large equipment

Following safety rules

Working outdoors

Testing mineral samples

Works with computers

Collecting and analyzing data

Using or making maps

Testing water or air quality

Focusing on details

Doing physical tasks and/or using tools

Organized

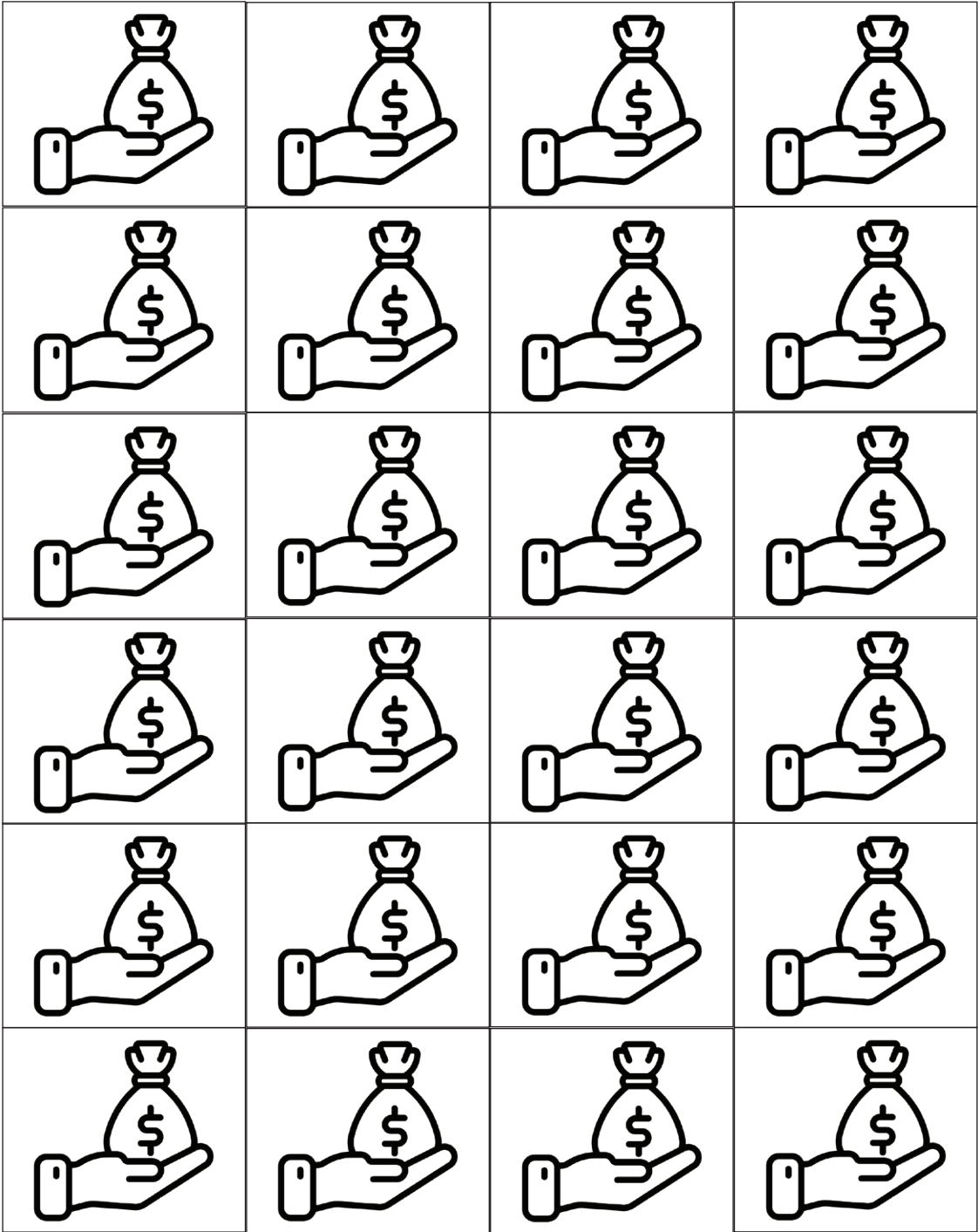
Problem-solving

Making decisions

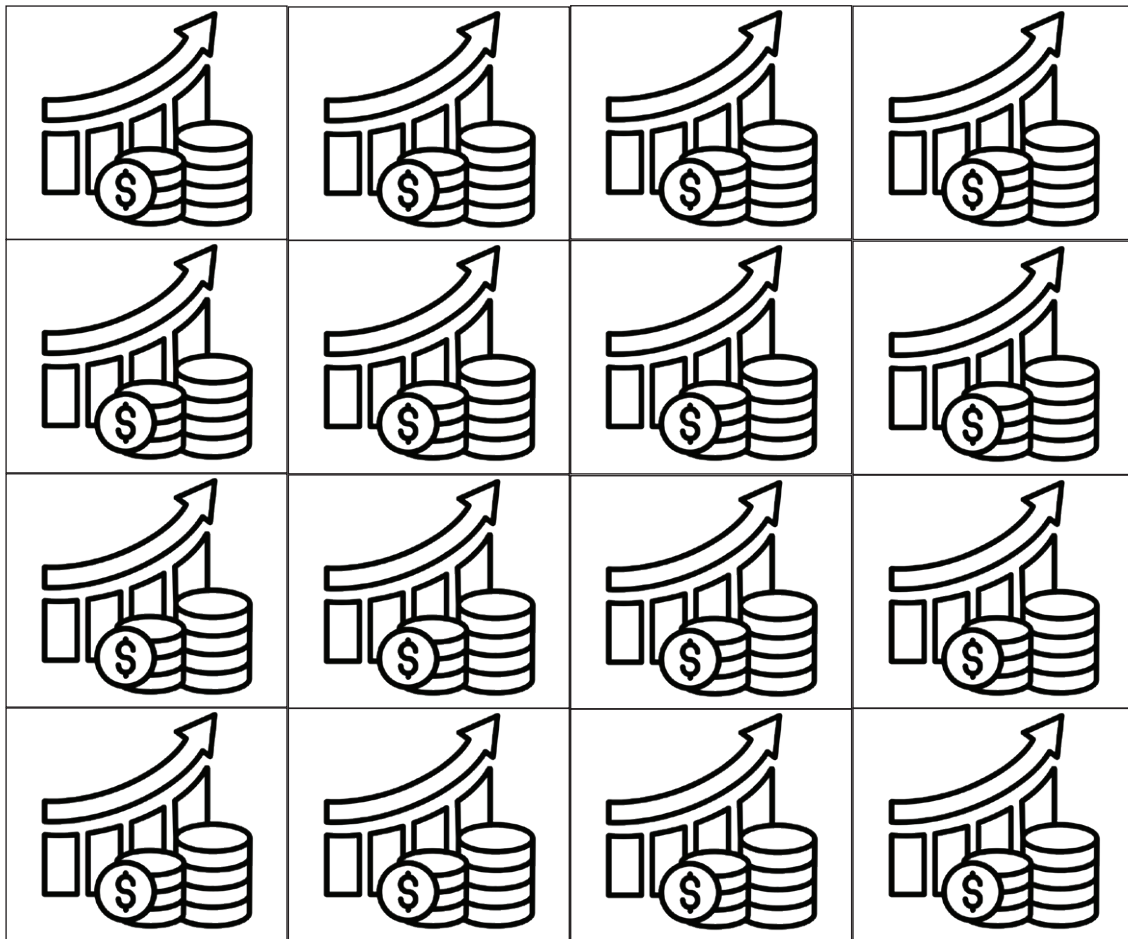
Working in a team

Writing reports

Investment Icons



Profit Icons





HANDOUT

Mining Careers: Exploration

Exploration: Mine Surveyor

Do you like being outside? Would you like to learn how to make maps? Do you enjoy solving math problems? If so, you might like to be a Mine Surveyor. As a Mine Surveyor, you tell people at a mine where buildings should be built. You will measure how high things are and make maps of the mining site. Sometimes, you might watch over other people at work. To be a Mine Surveyor, you need to finish two years of college and have worked on a mine for a few years.

Exploration: Exploration (Mine) Geologist

Do you love exploring Earth and digging to find new things? Do you want to know where minerals are located? If so, you might enjoy being an Exploration Geologist. As an Exploration Geologist, you use maps and knowledge about how minerals form to find where they might be. You might also go outside to study rocks and use tools to learn about what is underground. You will help decide if and where a mine should be built. To be an Exploration Geologist, you need to go to college and study Earth Science.

Exploration: Geophysical Technician

Are you curious about what is underground? Do you like using tools and machines? If so, you could be a Geophysical Technician. As a Geophysical Technician, you use special machines to find where minerals are buried. You collect data that helps other mine workers decide where to dig. To be a Geophysical Technician, you need to learn about Earth and machines in school or training.



HANDOUT

Mining Careers: Planning

Planning: Administrative Assistant

Do you like helping others? Are you organized? Do you enjoy working with computers? You might like being an Administrative Assistant. As an Administrative Assistant at a mine, you help different teams with their schedules and keep papers in order. You also answer phone calls, help visitors, and use computers to do your work. To be an Administrative Assistant, you need to finish high school and learn how to use office machines, like copiers and printers.

Planning: Environmental Manager

Do you care about nature? Do you like solving problems? Do you like talking to people and learning new things? Then you might like being an Environmental Manager. As an Environmental Manager at a mine, you would work outdoors. Your main role would be to make sure water, dirt, and air around the mine are safe. You also teach people about the environment and check if everything is okay before, during, and after mining. To be an Environmental Manager, you need to go to college and learn about Earth's systems.

Planning: Systems Manager

Do you like using computers to do complex jobs? Do you enjoy finding patterns in numbers? Do you like helping others do their jobs better? Then you might like being a Systems Manager. As a Systems Manager at a mine, you run computers that help plan and track the work of others so the mine runs smoothly. You would fix problems with the computers and teach others how to use computer programs. To be a Systems Manager, you need to go to college and learn about computers.



HANDOUT

Mining Careers: Construction

Construction: Electrician

Do you like fixing things and using tools? Do you want to work with electricity? Are you good at following safety rules? You might enjoy being an Electrician. As an Electrician at a mine, you fix and build things that use electricity. You would learn about wires and machines. You also read building plans and use tools to install new wires or equipment. To be an Electrician, you need to finish high school, then learn about electricity in a training program.

Construction: Safety Technician

Do you like teaching and helping others learn new rules? Do you want to keep people safe? Then you could be a Safety Technician. As a Safety Technician at a mine, you teach everyone how to be safe while they do their jobs in and around the mine. You keep records and report on any safety problems. You would also work with inspectors to make sure the mine is following safety rules. To be a Safety Technician, you need to finish high school and learn about safety.

Construction: Mine Engineer

Do you like making plans? Do you like working with numbers? Do you want to help people work together? You might be a good Mine Engineer. As a Mine Engineer, you would help design a mine so that everyone working in it can do their jobs easily. You would know about the rocks and minerals around the mine and the machines needed to dig up minerals. You would write plans and reports on how mining is going. To be a Mine Engineer, you need to go to college and learn about rocks, minerals, and mining equipment.



HANDOUT

Mining Careers: Production

Production: Welder

Do you like using tools and working with your hands? Do you want to fix big machines? Then you might like being a Welder. As a Welder at a mine, you fix machines by welding metal. You find problems and talk about them. You also learn how to use machines safely. To be a Welder, you need to finish high school and learn how to weld.

Production: Blaster or Driller

Do you like working with big machines and explosives? Do you want to help break rocks? Then you might like being a Blaster or Driller. As a Blaster, you use explosives to break rocks safely. As a Driller, you make holes in rocks to find minerals. You learn about machines and rocks to do your job well. To be a Blaster or Driller, you need to finish high school and learn how to use machines.

Production: Assayer or Metallurgist

Are you curious about how things are made? Do you like doing science experiments? Then you might like being an Assayer or Metallurgist. As an Assayer, you test minerals to see what they are made of. As a Metallurgist, you study metals and how to get them from rocks. You use labs and write reports to help mining. To be an Assayer, you need to finish high school and learn how to test minerals.



HANDOUT

Mining Careers: Distribution

Distribution: Mechanic

Do you like fixing things and using tools? Do you want to work with big machines? Then you might like being a Mechanic. As a Mechanic at a mine, you check and fix big machines. You learn about tools and use them to fix machines safely. You also learn how to use machines to move things. To be a Mechanic, you need to finish high school and learn about machines.

Distribution: Equipment Operator

Do you want to drive big vehicles and keep things safe? Do you like working with big machines? Then you could be an Equipment Operator. As an Equipment Operator at a mine, you learn to drive big machines like trucks and bulldozers. You check machines and keep them safe. You also talk to others to do your job well. To be an Equipment Operator, you need to finish high school and learn how to drive large machines.

Distribution: Refiner

Do you like working with others? Are you good at following directions? Do you want to make things better? Then you might like being a Refiner. As a Refiner at a mine, you clean and make minerals better. You fix problems and write about your work. You learn to use machines and work safely with others. To be a Refiner, you need to finish high school and learn about minerals.



HANDOUT

Mining Careers: Reclamation

Reclamation: Hydrologist

Do you like helping with water and nature? Do you want to learn about how water helps the Earth? Then you could be a Hydrologist. As a Hydrologist at a mine, you watch water and learn how it moves. You check water to keep it clean. You also help plants and animals live near mines. To be a Hydrologist, you need to go to college and learn about water.

Reclamation: Community Relations Coordinator

Do you like talking to people and helping with projects? Do you want to make sure everyone understands about nature? Then you might like being a Community Relations Coordinator. As a Community Relations Coordinator at a mine, you talk with people about nature and how to keep it safe. You help with meetings and tell others about what's happening. To be a Community Relations Coordinator, you need to go to college and learn about talking to people.

Reclamation: Environmental Technician

Do you like being outside and helping with nature? Do you like learning about plants and animals? Then you could be an Environmental Technician. As an Environmental Technician at a mine, you check water and dirt to keep nature safe. You use tools and learn about nature. You also help plants and animals near mines. To be an Environmental Technician, you need to go to school and learn about nature.



HANDOUT

Mining Careers: Financial

Financial: Accountant

Do you like working with money and numbers? Do you want to keep track of spending and saving? Then you might like being an Accountant. As an Accountant at a mine, you check how much money comes in and goes out. You write about money and help others with spending. You learn about money and keep records. To be an Accountant, you need to go to college and learn about money.

Financial: Purchasing Agent

Do you like shopping and talking with people? Do you want to help with buying things? Then you could be a Purchasing Agent. As a Purchasing Agent at a mine, you find and buy things. You talk with people about what to buy and how much to pay. You learn about the mine and make sure everyone gets what they need. To be a Purchasing Agent, you need to finish high school and learn about buying.

Financial: Analyst

Do you like numbers and learning about money? Do you want to help with decisions? Then you might like being a Financial Analyst. As a Mining Financial Analyst, you check if mining can make money. You study numbers and tell others about money. You learn about mining and help with decisions. To be a Financial Analyst, you need to go to college and learn about money and numbers.