Mine Your Future

Background

Today's world faces complex problems, and we all need to work together to manage the Earth's natural resources wisely. The mining industry is an exciting area of growth for scientists, engineers and others who want to help solve problems and find solutions to locate, extract, mine, and distribute the world's mineral products in a safe, economic, and environmentally-responsible way.

Many students are not familiar with careers in mining, and some adults are not aware of the innovative shifts mining technologies have taken over the past few years or the dynamic work environments they provide. Mining offers a wide range of rewarding careers that feature top salaries, travel, and the chance to work with advanced technologies.

Mining is one of the few industries where long-term, well-paying jobs are currently being added. As overall job growth in many industries hits a standstill, mining continues to add jobs at an impressive rate.

If your child is interested in making a difference in the world, mining provides many career opportunities in exploration, development, operations, and site reclamation in the US and all over the world. This resource can help your child consider his or her personal interests when researching job opportunities in the mining industry.

Start

The mining industry affects all of our lives. Those in the mining industry are busy working to extract the resources we use to make practically every product on Earth. We all rely on the extraction of minerals for the cars we drive, the cell phones we use, and the generation and transmission of electricity that lights your home. Ask your child if he or she has learned about mining or extraction of natural resources in school. Does he or she wonder where the materials that make up everyday objects come from? Or what types of careers might be involved in extracting natural resources from the Earth?

Discuss

Discuss together the quote, "If it can't be grown, it has to be mined." Through this discussion, point out that items such as fruits and vegetables are grown and naturally occurring. Everything else — such as clothing, school supplies and electronics — include components that have been mined and manufactured. Jewelry, electronics, automobiles, and spacecraft all are possible because of materials mined from Earth.

Those in the mining industry work together and use modern technologies to solve complex problems every day. Think about how these questions might be answered: Where will minerals be most abundant? What is the safest way to extract them? What methods and technologies will be the least impactful to the environment and local ecosystems? What is the most economic method to distribute them?

Organize

Encourage your child to use the table below to identify and rank his or her interest areas. Each interest area can be ranked by "very interested," "somewhat interested," or "not at all interested."

Interest Areas	Very Interested	Somewhat Interested	Not at all Interested
Technical Likes to problem-solve in a systematic way Likes to tinker when solving problems Enjoys having specialized knowledge			
Exploring Likes to discover new things Likes to improve things Seeks knowledge			
Hands-On Likes to learn by doing Likes to take things apart and put them back together Likes to improve processes			
Scientific Likes to use science to solve problems Curious and eager to figure things out			
Planning Likes to improve processes Likes to plan, manage, deliver, and communicate			

Then, match his or her interest areas to the related mining careers in the second column.

Technical	Mining Engineer, Metallurgical Engineer, Mechanic, Electrician, Automation Technician
Exploring	Geologist, Geoscientist, Environmental Engineer
Hands-On	Welder, Technician, Electrician, Automation Technician
Scientific	Environmental engineer, Chemist, Mining Engineer, Metallurgical Engineer, Geologist
Planning	Operations Manager, Global Supply Chain- Logistics, Health and Safety

Next Steps

Once your child has identified two or three jobs that are most appealing, suggest that he or she engages in additional research. Each career in the chart above links to additional information. Encourage your child to speak to someone in the profession to help him or her network by reaching out to a local business. Then, consider working with your school counselor to learn more about the right courses to help your child best prepare.

Mining Industry Careers

Environmental Engineer
Electrician
Welder
Mechanic
Geoscientist
Mining Engineer
Metallurgical Engineer
Operations Manager
Occupational Health and Safety
Logistician
Automation Technician
Industrial Engineer
Chemical Engineer

Environmental Engineer

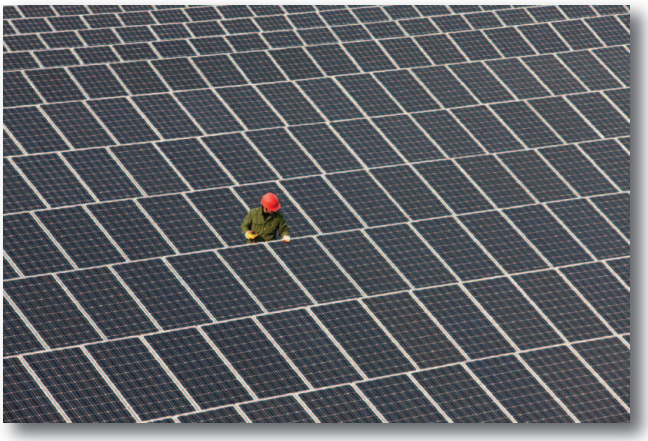
What is an Environmental Engineer?

Environmental engineers use the principles of engineering, soil science, biology, and chemistry to develop solutions to environmental problems. They are involved in efforts to improve recycling, waste disposal, public health, and water and air pollution control. Environmental engineers manage all environmental issues, reports and permits as related to Air, Wastewater, Storm Water, Residual Waste, TRI, Tier II and Hazmat Reporting. This includes responsibility for the timely and accurate filing of necessary records to demonstrate compliance with applicable federal, state, and local programs.

How could you become an Environmental Engineer?

Environmental Engineer- Bachelors degree

Environmental engineers must have a bachelor's degree in environmental engineering or a related field, such as civil, chemical, or general engineering. Employers also value practical experience. Therefore, cooperative engineering programs, which provide college credit for structured job experience, are valuable as well. Getting a license improves the chances of employment.



It may be helpful to have the degrees, certificates and/or coursework listed below.

Environmental engineering (or related field such as civil, chemical, or general engineering)
Life sciences
Physical sciences
Algebra

Salary Range:

$49,150-$122,290

To learn more about *this career*, visit the Bureau of Labor Statistics.

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Employment Statistics*, July, 2014
www.bls.gov/oes

Electrician

What is an Electrician?

Electricians install, maintain, operate or repair all electrical equipment. They are familiar with industrial motors and controls; wire and troubleshoot.

How could you become an Electrician?

High School Graduate
GED
Technical/Vocational School
Two-year associate's degree

Although most electricians learn through an apprenticeship, some start out by attending a technical school. Most states require electricians to be licensed.

It may be helpful to have the degrees, certificates and/or coursework listed below.

Circuitry
Basic Electrics
Electrical engineering
Physics

Salary Range:

$30,420-$82,930

To learn more about *this career*, visit the Bureau of Labor Statistics.

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Employment Statistics*, July, 2014
www.bls.gov/oes

Welder

What is a Welder?

Welders weld various thicknesses of round, square, rectangular tubing and support structures. They use wire welding machines, band saw and iron working tools. Welders lay out sheet metal and read blue prints and schematics.

How could you become a Welder?

High School Graduate
GED
Technical/Vocational School
Two-year associate's degree

Training for welding, cutting, soldering, and brazing workers varies. Training ranges from a few weeks of technical school or on-the-job training to several years of combined technical school and on-the job training.

It may be helpful to have the degrees, certificates and/or coursework listed below.

Welding, soldering, or brazing certification
Mechanical drawing
Physics
Chemistry
Shop mathematics
Basic computer classes

Salary Range:

$24,720-$56,130

To learn more about *this career*, visit the Bureau of Labor Statistics.

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Employment Statistics*, July, 2014
www.bls.gov/oes

Mechanic

What is a Mechanic?

Mechanics analyze malfunctions and repair, rebuild, and maintain equipment. They operate and inspect machines and equipment to diagnose defects. Mechanics dismantle and reassemble equipment using hoists, as well as hand and power tools. They examine parts for damage or excessive wear, using micrometers and gauges. They replace defective engines and subassemblies, such as transmissions, electric motors, drums, seals, hydraulic pumps, valves, pistons, rods, gears, crankshafts, and cylinder blocks. Machinists test overhauled equipment to ensure operating efficiency and must be able to operate all equipment.

How could you become a Mechanic?

High School Graduate
GED
Technical/Vocational School
Two-year associate's degree

A high school diploma or the equivalent is typically the minimum requirement to work as an automotive service technician or mechanic. Because automotive technology is becoming increasingly sophisticated, some employers prefer automotive service technicians and mechanics that have completed a formal training program in a postsecondary institution. Industry certification usually is required once the person is employed.

It may be helpful to have the degrees, certificates and/or coursework listed below.

Operation of diesel equipment
Electronics
Computers
Automotive
General English Courses
Basic Mathematical Courses

Salary Range:

$20,810-$60,070

To learn more about *this career*, visit the Bureau of Labor Statistics.

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Employment Statistics*, July, 2014
www.bls.gov/oes

Geoscientist

What is a Geoscientist?

Geoscientists study the physical aspects of the Earth, such as its composition, structure, and processes, to learn about its past, present, and future. Geoscientists write reports and research papers. They must be able to present their findings clearly to clients or professionals who do not have a background in geosciences. Geoscientists work on complex projects filled with challenges. Geoscientists need to use and analyze complex sources of data. Evaluating statistical data and other forms of information to make judgments and inform the actions of other workers requires a special ability to perceive and address problems.

Geologists study the history of Earth and its physical nature. They often work for energy companies, environmental consulting companies, government agencies, non-profit organizations, and universities. Many do field work at least part of the time. Geophysicists apply the principles of physics to studying the Earth's interior and investigating its magnetic, electric, and gravitational fields. They often work for companies that search for and extract hydrocarbon and mineral resources.

How could you become a Geoscientist?

Geoscientists may spend significant amounts of time outdoors. Familiarity with camping skills, general comfort being outside for long periods of time, and specific skills such as boat handling or even being able to pilot an aircraft could prove useful for geoscientists.

Geoscientists need at least a bachelor's degree for most entry-level positions. However, some workers begin their careers as geoscientists with a master's degree. A Ph.D. is necessary for most basic research and college teaching positions.

To learn more about *this career*, visit the Bureau of Labor Statistics.

It may be helpful to have the degrees, certificates and/or coursework listed below.

Geoscience degree (physics, chemistry, biology, mathematics, or computer science are also usually accepted)
Algebra
Mineralogy
Petrology
Structural Geology
Earth Science

Salary Range:

$48,270-$187,200

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Employment Statistics*, July, 2014
www.bls.gov/oes

Mining Engineer

What is a Mining Engineer?

Mining and geological engineers design mines for the safe and efficient removal of minerals such as coal and metals for manufacturing and utilities. Mining engineers work on mountains, deserts, and other locations around the world.

A mining engineer will be involved in a project through all phases of mining operations – from exploration and discovery of the mineral resource, through feasibility studies, mine design, development of plans and production, scheduling, operations, processing and even marketing. They are still involved at the mine closure stages including final land restoration and rehabilitation.

How could you become a Mining Engineer?

High School Graduate

A bachelor's degree from an accredited engineering program is required to become a mining or geological engineer. However, work as a credentialed professional engineer requires licensure. Requirements for licensure vary by state but generally require passing two exams.

It may be helpful to have the degrees, certificates and/or coursework listed below.

General math and science courses
Geology
Physics

Salary Range:

$49,680-$140,130

To learn more about *this career*, visit the Bureau of Labor Statistics.

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Employment Statistics*, July, 2014
www.bls.gov/oes

Metallurgical Engineer

What is a Metallurgical Engineer?

Metallurgical Engineering is the science and technology of processing materials to extract, refine and recycle metals. These processes include the development and use of metals and alloys that have specific physical properties. Metallurgical engineers study the physical and chemical behaviors of metallic elements. They work with these elements to develop technologies for the products of metals. These metals are then used to create new materials that meet certain mechanical, electrical, and chemical requirements. Metallurgists are constantly thinking of new ways to minimize waste, maximize energy efficiency, increase performance and facilitate recycling.

How could you become a Metallurgical Engineer?

High School Graduate
Practical field experience
Cooperate engineering programs

Materials engineers typically have a bachelor's degree in materials science or engineering, or a related field. Employers also value practical experience.

It may be helpful to have the degrees, certificates and/or coursework listed below.

General math courses
Algebra
Calculus
Biology
Chemistry
Physics

Salary Range:

$52,900-$130,020

To learn more about *this career*, visit the Bureau of Labor Statistics.

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Employment Statistics*, July, 2014
www.bls.gov/oes

Operations Manager

What is an Operations Manager?

Operations managers oversee the daily operations of mining and related plants. They oversee, design, and control the process of production and redesigning business operations in the extraction of natural resources. Duties and responsibilities include formulating policies, managing daily operations, and planning the use of materials and human resources. They develop operating plans in accordance with company policies, goals and objectives and ensure operation plans achieve targeted cost and efficiency results that maximize value for the business unit.

How can you achieve a position as an Operations Manager?

Bachelor's degree plus 10 years manufacturing leadership

A bachelor's degree is required for most advertising, promotions, and marketing management positions. These managers typically have work experience in advertising, marketing, promotions, or sales.

It may be helpful to have the degrees, certificates and/or coursework listed below.

Industrial engineering
Master of Business Administration
Business administration

Salary Range:

$54,250-$150,020

To learn more about *this career*, visit the Bureau of Labor Statistics.

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Employment Statistics*, July, 2014
www.bls.gov/oes

Occupational Health and Safety

What is an Occupational Health and Safety Specialist?

Occupational health and safety specialists analyze many types of work environments and work procedures. Specialists inspect workplaces for adherence to regulations on safety, health, and the environment. They also design programs to prevent disease or injury to workers and damage to the environment.

As an occupational health and safety specialist, your job will be to make sure that working conditions are as safe as possible. The job may also require studying, redesigning, and updating working environments. If an accident occurs, occupational health and safety specialists help investigate possible causes and recommend corrective action.

How can you achieve a position as an Occupational Health and Safety Specialist?

Bachelor's degree in occupational health, safety or related scientific or technical field, such as engineering, biology, or chemistry

For some positions, a master's degree in industrial hygiene or health physics is required.

It may be helpful to have the degrees, certificates and/or coursework listed below.

Bachelor's degree
English
Math
Chemistry
Biology
Physics

Salary Range:

$40,080-$97,380

To learn more about *this career*, visit the Bureau of Labor Statistics.

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Employment Statistics*, July, 2014
www.bls.gov/oes

Logistician

What is a Logistician?

Logisticians analyze and coordinate an organization's supply chain—the system that moves a product from supplier to consumer. They manage the entire life cycle of a product, which includes how a product is acquired, distributed, allocated, and delivered. Their work is typically behind-the-the scenes but they are integral for companies and governments to run smoothly. Logistician's identify areas for improvement and develop strategies to minimize costs and maximize efficiency.

How can you achieve a position as a Logistician?

High School Graduate
GED
Associate's degree
Bachelor's degree

Prospective logisticians can benefit from previous work experience in a field related to logistics or business

It may be helpful to have the degrees, certificates and/or coursework listed below.

Associate's degree
Bachelor's degree in business, industrial engineering, process engineering, or supply chain management
Computer science
Algebra
General science

Salary Range:

$45,190-$112,100

To learn more about *this career*, visit the Bureau of Labor Statistics.

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Employment Statistics*, July, 2014
www.bls.gov/oes

Automation Technician

What is an Automation Technician?

Automation technicians troubleshoot, service, and fix the computerized systems and robotic devices that are designed to reduce human interaction, such as robotic assembly devices and computer-controlled building air-conditioning systems. Automation is a technique for making a device run or a process occur with minimal direct human intervention. Many automation technicians have a background in mechanics, electronics, and computers.

How could you become an Automation Technician?

Associate's Degree
On the job training

Vocational-technical schools, unions, and industry trade associations also offer training.

It may be helpful to have the degrees, certificates and/or coursework listed below.

Fluid Mechanics
Alegbra
Basic science courses

Salary Range:

$33,490-$80,070

To learn more about *this career*, visit the Bureau of Labor Statistics.

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Employment Statistics*, July, 2014
www.bls.gov/oes

Industrial Engineer

What is an Industrial Engineer?

Industrial engineers find ways to eliminate wastefulness in production processes. This position acts as a primary resource for accomplishing IE tasks associated with problem solving, data analysis, statistical analysis, business strategy development, capacity planning, inventory/cost reduction, engineering econ analysis, and systems modeling. Industrial engineers serve as a plant-wide resource analyzing, modeling, understanding, and predicting gaps to achieving desired business results both across and within departments. This position develops effective plans, which bring clarity to potential solutions that close those gaps, and will lead the implementation of those solutions.

How could you become an Industrial Engineer?

Industrial Engineer-Bachelor's degree

Industrial engineers need a bachelor's degree, typically in industrial engineering. However, many industrial engineers have degrees in mechanical engineering, manufacturing engineering, industrial engineering technology, or general engineering.

It may be helpful to have the degrees, certificates and/or coursework listed below.

Mechanical engineering
Manufacturing engineering
General engineering
Algebra
Chemistry
Physics
Computer science

Salary Range:

$51, 180-$118,300

To learn more about *this career*, visit the Bureau of Labor Statistics.

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Employment Statistics*, July, 2014
www.bls.gov/oes

Chemical Engineer

What is a Chemical Engineer?

Chemists and materials scientists study substances at the atomic and molecular levels and the ways in which substances react with each other. They use their knowledge to develop new and improved products and to test the quality of manufactured goods. Chemists apply the principles of chemistry, biology, physics, and math to solve problems that involve the production or use of chemicals, fuel, drugs, food, and many other products.

How could you become a Chemical Engineer?

Bachelor's degree

In addition to a bachelor's degree, this position requires that chemists and materials scientists carry out scientific experiments and studies. They must be precise and accurate in their analyses, because errors could invalidate their research.

It may be helpful to have the degrees, certificates and/or coursework listed below.

Chemistry
Physics
Algebra
Statistics
Calculus

Laboratory experience, either at a college or university, or through internships, fellowships, or work-study programs in industry, is also useful.

Salary Range:

$41,080-$120,600

To learn more about *this career*, visit the Bureau of Labor Statistics.

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Employment Statistics*, July, 2014
www.bls.gov/oes