



Educator Explainer

What is Dig into Mining?

Dig into Mining is an interactive educational program for students in grades 6–12 that uncovers the use of metals, such as copper, in our everyday life and provides students a deeper understanding of today's mining industry. The free resources provided with this program are designed to give students a front row seat to nature's geological wonders and inspire further exploration of the world around them.

Why does mining matter? ^{1 2}

Simply put, the world as we know it could not exist without mining! Every year, the average American uses about 40,000 pounds of newly-mined materials. Around the world, mined metals and minerals are also used in various applications to help maintain and improve quality of life. They are a crucial source of raw materials used for construction and chemical industries, as well as an important part of the production of consumer products and electronics. Almost every manufactured product contains at least one mineral component. Mined materials are used to construct roads, create cars and buildings, make technology such as satellites, cell phones, and computers, generate electricity, and more.

In addition to helping maintain our quality of life today, mining has a critical role to play in the advancement of technologies for a sustainable future.. Renewable energy, electric cars, advanced healthcare technology, space travel, and sustainable power all rely on mined minerals. Solar panels, for example, are built using silicon and aluminum. Wind turbines are constructed with steel, aluminum, and fiberglass. And, as our horizons broaden, some scientists are even looking toward mining in outer space.

What skills can Dig into Mining teach my students?

With Dig into Mining's resources, students will explore a range of subjects ranging from elements, minerals, properties of matter and chemical reactions, to natural resources, sustainability, biodiversity, and environmental impacts. Through the lens of these subjects, students will practice and be exposed to a wide range of STEM and analytical skills that are critical to success in today's global economy. Experts say almost all of the 30 fastest growing occupations in the next decade will require math and science proficiency and at least some higher education—trade and technical certifications or professional degrees—in STEM. It's therefore important for students to have consistent opportunities to apply STEM skills as they tackle diverse, real-world problems like the ones provided in this program.

1 <https://www.energy.gov/eere/amo/mining-industry-profile>

2 <https://nma.org/facts-stats-and-data/>

Can Dig into Mining help my students explore future careers?

There are hundreds of different careers available in the mining industry. Having an understanding of the range of STEM careers available in this field will help broaden students' perspectives as they look toward their own careers and consider what may be of interest to them.

For instance, different careers within the mining industry include:

- **Engineering**—Contribute to the design, optimization and maintenance of large-scale mining and process facilities
- **Mining and Geology**—Work that spans the entire life of our mines, from exploration to mine planning to reclamation
- **Business**—Support for operations, capital projects and company objectives
- **Construction**—Support hands-on work throughout the extraction and excavation process
- **Metallurgy**—Find creative solutions to challenges with complex raw / geographical materials and convert them into usable and useful formats

These are just a few of the opportunities available! Even if students aren't interested in a career *in* mining, research shows that exposure to science topics, various STEM careers, and hands-on learning opportunities is needed in order to promote and build overall student interest in STEM.

Where to Start?

The Dig Into Mining resources are divided into middle school and high school resources. Each set includes NGSS-aligned classroom extension activities as well as engaging digital explorations. Other free resources include career profiles, a digital library of virtual field trips, and family resources. See the resources overview below for more details about each and a recommended pathway for using these with your students.

Resources Overview

The following summarizes this program's main resources. For a comprehensive chart, complete with hyperlinks and topic summaries for each resource, visit the final two pages of this document.

Classroom Extensions: Designed to take between one and two class periods, these teacher-led resources are available in both English and Spanish. Each one spotlights real-world mining challenges designed to help reinforce core math and science concepts. All activities may be used to teach or reinforce specific NGSS standards, and several address Common Core State Standards in Mathematics as well.

Digital Explorations: Created to give students an independent and practical application of how STEM and analytical skills are used to solve real-world problems, these engaging online resources include virtual labs, a mining simulation, a career exploration and more. They can be used in the classroom as independent work or can be accessed at home.

Career Profiles: These video profiles, accompanied by downloadable fact sheets about each career, feature diverse professionals with careers in the mining industry. Each one provides insight into the STEM and analytical skills used in the career as well as why the individual is passionate about their work. The videos can be viewed at home or in the classroom and could even be accompanied by an in-person or virtual visit from a community member who works in the mining industry.

Virtual Field Trip Archive: These videos allow you to embark on a field trip without leaving your classroom as students get an inside look at the technology, equipment, and chemistry behind mining. While the virtual field

trips range from about 15 to 45 minutes in length, each one is also divided into four-to-five-minute chapters that can be used to capture students’ attention at the beginning of class, easily integrated into the class session, or assigned as homework.

Family and Volunteer Resources: Specially designed for community volunteers and families, these supplementary resources are available to engage those outside your classroom in community learning around mining.

Suggested Pathways

There is no right or wrong way to use these resources, and they may be introduced to your students in any order. However, the following tips may be useful if you are looking for guidance on how to integrate Dig Into Mining’s content into your classroom.

Middle School	High School
Engage	
Kick off with the Metals in Your Everyday Life Digital Exploration , which will guide students in exploring Earth’s natural resources as they begin to understand how they interact with metals every day.	Kick off with the Innovation in Mining classroom extension activity, which will engage students in investigating how the mining industry works, as well as innovations that enhance safety and productivity.
Connect	
<p>#1—Next, guide students through the Pattern of Natural Resources classroom extension activity, where students will continue exploring the everyday items that come from mined materials. They will also begin to explain the relationship between natural resources and geological processes, which they will build upon throughout the program.</p> <p>#2—Then lead students through the Minimalist Mining classroom extension activity as they investigate mining methods that minimize environmental impact. Awareness of these methods will help students as they continue to explore different facets of the industry.</p>	<p>#1—Next, introduce students to a diverse group of professionals that work within the mining industry. Show the Career Profile Videos and share the accompanying career guides to give students an inside perspective on careers in the mining field before they dive fully into the instructional resources.</p> <p>#2—Then help students connect to the content by introducing the Dig into Mining Careers Digital Exploration. In this self-guided exploration, students will answer a series of questions that will match their interests and skills with some of mining’s most in-demand careers.</p>
Grab, Go & Learn	
<p>Now move on to mix and match the classroom extension activities, career profiles, digital explorations, and virtual field trip segments to create a dynamic and engaging learning experience for your students. There is no one order in which the content should be taught—each piece will only help students better understand the others. You may present a bulk of the content over one period of time, or you may pick and choose resources throughout the year as they support your classroom curriculum. No matter what, be conscious of trying to vary the materials you select so students get a variety of career insight, hands-on experience, and virtual exploration as they strengthen their STEM skills and problem-solving abilities.</p>	

Comprehensive Resource Overview

For a quick look at all of Dig Into Mining’s resources in one place, check out the chart on the following two pages—complete with hyperlinks and a topic overview.

	Resource Topics					
	Metals & Minerals	Mining Process	Chemical Reactions	Mixtures	Environment & Natural Resources	Careers
Middle School Classroom Extensions						
Microbe Probe (Also available in Spanish)	x	x				
Minimalist Mining (Also available in Spanish)	x	x			x	
Investigating Electrolysis (Also available in Spanish)	x	x	x	x		
Mineral Mixtures and Mining (Also available in Spanish)	x	x		x		
Economic Feasibility Study (Also available in Spanish)	x	x				
Patterns of Natural Resources (Also available in Spanish)	x	x			x	
Middle School Digital Explorations						
Aim to Reclaim Virtual Lab		x			x	x
Exploring Copper in Cars	x				x	
From Ore to More Virtual Lab	x	x				
Operations Exploration	x	x				x
Dig a Little Deeper Virtual Lab	x	x				x
Metals in Your Everyday Life	x					
High School Classroom Extensions						
Innovation in Mining (Also available in Spanish)		x			x	
Microbial Mining (Also available in Spanish)		x	x		x	
Satellite Studies with Mining Geomages (Also available in Spanish)		x			x	
High School Digital Explorations						
Dig into Mining Careers Exploration		x				x
Career Profile Videos & Career Guides	x	x				x

	Resource Topics					
	Metals & Minerals	Mining Process	Chemical Reactions	Mixtures	Environment & Natural Resources	Careers
Middle School & High School Virtual Field Trips						
Dig into Mining Virtual Field Trip	x	x				
Explore Metals in Your Everyday Life	x	x				
Middle School & High School Career Profiles						
Career Profile Videos & Career Guides	x	x				x
Family Activities						
Copper in the Home (Also available in Spanish)	x					
The Hunt for Copper (Also available in Spanish)	x					
Mine Your Future (Also available in Spanish)		x				x
Volunteer Resources						
Grade 6–12 Activity: Copper Wars	x					
Grades 6–12 Activity: Homopolar Motor Motion	x					
Mining Overview Video	x	x				