Environmental Science Unit 3: Mining Natural Resources

Unit #:	APSDO-00018793	Duration:	4.0 Week(s)	Date(s):	

Team:
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Grades:
9
Subjects:
Science

Unit Focus

In this unit, students will learn how scientists locate, extract, and process mineral resources in the environment. Students will construct their understanding by participating in simulations which investigate factors like economic conditions, extraction techniques, and the chemical and physical properties of specific resources. In addition, students will explore the advantages (e.g., common uses) and disadvantages (e.g., environmental impacts) of using certain mineral resources. Summative assessments may include application problems, laboratory practices, data analyses where students must calculate if a given mineral deposit is actually an ore, and position statements where students must weigh the pros and cons of mining a resource locally. Primary instructional materials may include supplemental print and online resources, teacher-generated inquiry tasks and related equipment and materials.

Stage 1: Desired Results - Key Understandings

Established Goals

Next Generation Science Standards (DCI)
Science: 9

- All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. *ESS3.9.A2*
- Resource availability has guided the development of human society. *ESS3.9.A1*

Transfer

T1 (T1) Integrate knowledge from a variety of disciplines and apply it to new situations to make sense of information, formulate insightful questions, and/or solve problems.
T2 (T3) Collect, analyze, and evaluate the quality of evidence in relation to a question.
T3 (T4) Develop a valid scientific conclusion, assess its validity and limitations, and determine future course of actions to inspire further questions.
T4 (T5) Communicate scientific information clearly, thoroughly, and accurately.
T5 (T6) Use mathematics to represent physical variables and their relationships, to make quantitative predictions, and to solve problems.

Meaning

Understandings	Essential Questions

• Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. *ESS3.9.C2*	**U1** (U165) Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and prevent ecosystem degradation. **U2** (U161) Human activity impacts many of Earth`s systems. **U3** (U162) Human sustainability is dependent upon the responsible management of natural resources. **U4** (U166) All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks, as well benefits. New technologies and social regulations can change the balance of these factors. **U5** (U402) Physical Sciences: Structures & Properties of Matter: Atoms combine in predictable ways to form molecules which have characteristic physical and chemical properties. **U6** (U400) Each pure substance has characteristic physical and chemical properties that can be used to identify it.	**Q1** What does it take to get the resources we use? **Q2** (Q161) How do people`s actions affect the world around them? **Q3** (Q162) How do humans and Earth systems affect each other? **Q4** (Q164) What does it mean to live sustainably? **Q5** (Q403) What is it about how atoms and molecules are arranged, connected, and/or moving that explains the properties and/or states of the matter that we see and feel? **Q6** (Q403) What is it about how atoms and molecules are arranged, connected, and/or moving that explains the properties and/or states of the matter that we see and feel? **Q7** (Q401) How can properties be used to identify and classify substances?
	Acquisition of Knowledge and Skill	
	Knowledge	**Skills**
	K1 Metal resources are typically found bonded to other substances in nature. Various techniques can be applied to process and purify metal resources so they can be utilized **K2** Mining of natural resources typically produces a significant amount of waste and potential pollutants (e.g., acid rain, toxic metals). The impacts of these wastes and pollutants can be reduced by implementing mitigating technologies	**S1** Applying logical reasoning to follow a concentration gradient in order to locate the motherlode of a resource **S2** Calculating the amount of a resource and level of profit that can be made if given information such as mine volume, density, resource concentration and costs **S3**

	K3 Extraction of different resources have various environmental impacts and societal/economic benefits **K4** As resources become scarce there are typically changes in market value, consumer behavior and related technologies	Interpreting graphs that illustrate important unit concepts (e.g., rates of resource extraction over time)