

Ore Digging – Sample

Purpose

Mining is a process used to extract valuable materials from the earth. Often relatively small amounts of the desired materials are collected from large masses of rock. Due to the quantity of raw materials processed to remove the ore, mining often damages the environment.

Without proper mining of natural minerals, many of the products and services available during the 21st century would not be possible. Some critical uses of minerals include the following.

- Coal and petroleum for electricity
- Sodium salts for industrial chemicals
- Calcium and potassium phosphates for fertilizer
- Sand and gravel for roads and other construction projects
- Copper, gold, nickel, platinum, lithium, and lanthanum for batteries and electronics

You may wonder how mining affects the environment and how the expense of mining returns a profit?

Materials

Per pair of students:

- Simulated mine
- Paper towel or plate
- (2) pairs tweezers
- Device with internet access

Per student:

- Pencil
- *NRE Notebook*

Procedure

With your partner, extract ore from a simulated mine containing multiple valuable ores.

Part One – Mining

1. Collect a mine, paper towel, and tweezers from your teacher.
2. During the time allotted by your teacher, neatly extract any items which you think might be valuable ore, piece by piece using the tweezers, from your mine, placing it on a paper towel. Work quickly and efficiently, setting each ore in a separate pile.
3. Environmental damage in the form of sloppy, inefficient mining may result in the teacher levying a fine. The penalty will be the loss of mined ore, with the teacher deciding the fine.
4. When instructed to do so, stop mining, and tally each item extracted from your mine.
5. Record your results in Table 1.

Table 1. Ore Mined

Simulated Ore	Ore Represented	Quantity Extracted	Units per Item	Value per Unit	Total Value
Gold beads				\$	\$
Silver beads					
Blue beads					
Sunflower seeds					
Birdseed					
White beads					
Overall Total Value:					\$

Part Two – Valuing Products

1. Your teacher will provide the key to what each product is and the units per item extracted. Record the key in Table 1.
2. Research prices for the ores you extracted using the internet. These minerals are known as commodities, so using phrases like “silver commodity price” in your search should return helpful results. Ensure that the units of measurement are correct. Record the value of each ore in Table 1.
3. Determine the value of each ore mined and answer analysis questions.
 - q1 In what ways do you believe that the ore extracted in this mining situation is unrealistic?
 - q2 What other tools would be useful in this mining simulation? How are these tools similar to actual mining equipment and techniques?

SAMPLE


Sample Teacher Notes

Students will extract products from a simulated mine in this activity.

Teacher Preparation

Before class, prepare “mines” with the following components mixed in pans or large plates.

- One lb. wild birdseed
- Two small gold beads
- Four small silver beads
- Eight small blue beads
- Four medium white beads

Additional Suggestions	Resources
 <p>Virtual Facilitation Provide one or more digital explorations from Dig into Mining by Discovery Education and Freeport-McMoRan. Several explorations may be appropriate throughout the lesson.</p>	<ul style="list-style-type: none"> • Virtual mining simulations or games

Student Performance

Part One

Have each pair of students gather a single “mine,” a paper towel, and two tweezers. Each pair extracts ore from their mine for five minutes. Check student progress and assess fines for environmental damage at mine sites. Damage includes messy sites, or students are not keeping their types of ore neatly separated. You may determine the fine or decide on other types of damage. A simple fine would consist of taking some number of beads, depending on the infraction. Do not remove the white beads as a fine.

Part Two

When the allotted time has passed, provide the students the following key for the ore mined (see Table 1). Tell the students to record the types of ore they have unearthed in their student data sheet's appropriate columns.

Table 1. Key for Ore Mined

Simulated Ore	Ore Represented	Units per item
Gold beads	Gold	10 oz.
Silver beads	Silver	10 oz.
Blue beads	Coal	1 ton
Sunflower seeds	Copper	100 lbs.
Birdseed	Soil and rock debris	--
White beads	Reclamation efforts	Costs mine \$2,000/beat

Next, provide students time to research each ore's current prices and calculate the amount of ore they extracted. The minerals in the simulation are commodities, so having the students search ‘coal commodity price’ is an effective way to find the data. The two internet sites below may be helpful.

- [Minerals Information](http://minerals.usgs.gov/minerals/) (<http://minerals.usgs.gov/minerals/>) by the U. S. Geological Survey
- [Markets](https://www.mining.com/markets/) (<https://www.mining.com/markets/>) from mining.com

Results and Evaluation

Review student data and analysis questions to ensure students grasp the concept.

Table 2. Analysis Questions and Potential Responses

Q1	In what ways do you believe that the ore extracted in this mining situation is unrealistic?	<i>Students may recognize that the beads, representing ore, are extracted with tweezers and are already “pure” with no extra soil or other residues that require purification or refining.</i>
Q2	What other tools would be useful in this mining simulation? How are these tools similar to actual mining equipment and techniques?	<i>Students may identify sieves, magnets, or even floating the birdseed off the beads using water as potential tools or processes to increase yields.</i>