



Topic **Resources (Restoration)**

- Objectives
- Show the cost-benefit determination of a mining operation.
 - Analyze environmental impact of prolonged mining on profitability.
 - Justify decision to continue old methods or to develop new options.

Duration 35-45 minutes depending on depth of discussion

Assessment Type Formative

Students tend to believe that mining always produces a profit. They may not know about the regulations governing mining and requirements for land management or how to weigh the yield.

Materials

- Large box (1m x 50cm)
- Styrofoam packing materials to fill the box
- 20 household sponges cut into 2cm cubes



Set-up

Materials taken from the earth are only designated as 'ore' if the mining operation is profitable. The environment is not destroyed by modern and responsible mining practices. The land is simply altered for another use. In fact, the future use of the land is designed and planned prior to mining; the government requires contractors to establish an Environmental Protection and Enhancement Program before mining begins in order to protect the environment. In this activity:

- the box filled with Styrofoam represents the earth;
- the sponges represent nuggets of the target ore;
- 10 seconds represents 1 year;
- it takes 10 nuggets of ore per year to make a profit; and
- miners who are careless about ecology (as indicated by the mess on the floor) will be assessed a damage tax of 20% of their total production for that year.

Instructions

1. Each miner has 10 seconds to get as much ore as possible using his/her non-dominant hand.
2. In the first year there is one miner. Be sure to record the number of nuggets mined on your graph. ***Do not return the nuggets to the earth.***
3. The second year, there are two miners. Graph their ***total*** production.
4. The third year, there are four miners. Graph ***total*** production for each year.
5. The fourth year, there are 8 miners.
6. Continue doubling the number of miners until the total production rate drops to about what it was the first year. For example, the fifth year, there would be 16 miners.

Notes

Depending on the size of the miners 16 or even 8 miners may not be able to reach around a box. You may want to assign a 'scribe' to each miner to collect and count the ore. You can also designate students to play the part of the EPA official to make sure that the amount of destruction is accurately noted.

You may choose to have one graph per miner. You can then combine the individual graphs so that students can see all the data.

Discussion Questions

- Explore the components:
 - What type of resource were the nuggets, renewable or non-renewable? *How do you know?*
 - If each year the nuggets had been replaced in the earth, what type of resource would they be? *How do you know?*
 - If oil is like the nuggets, what will happen if we all use as much as we want?
- Examine the data:
 - What was the largest number of nuggets per person mined?
 - What was the smallest number of nuggets per person mined?
 - What is the relationship between number of miners and available resources?
- Should you keep mining in that way at the locale?
 - List the costs.
 - List the benefits.
 - Adjust for any fines.
- If there had been no environmental damage tax, what would have happened to the environment?

Reality Check! Evaluation

- Did students correctly determine the cost-benefit of their individual mining operations (boxes)?
- Did students reasonably analyze the environmental impact of prolonged mining on profitability?
- For each of the scenarios, could students justify their decisions
 - to continue old methods?
 - to develop new options?
 - to shut down the operation?

