

## COOKIE MINING . . . REBAKED

### STANDARDS

See summary of National Science Education Standards.

Original: <http://books.nap.edu/readingroom/books/nse/>

Standard Concept	General Standard	Specific Standard	General Standard	Specific Standard	General Standard	Specific Standard
Grade level		K-4		5-8		9-12
Science as Inquiry (A)	Abilities to do ... inquiry	A.1.4.1	Abilities to do ... inquiry	A.1.8.3		
		A.1.4.2		A.1.8.4		
		A.1.4.3		A.1.8.7		
		A.1.4.5		A.1.8.8		
	Understandings about Science Inquiry	A.2.4.2	Understandings about Science Inquiry	A.2.8.1	Understandings about Science Inquiry	A.2.12.4
		A.2.4.4		A.2.8.3		
Physical Science (B)	Properties of ... materials	B.1.4.1	Properties ... in matter	B.1.8.1		
		B.1.4.2				
Earth and Space Science (D)	Properties of Earth Materials	D.1.4.1				
Science and Technology (E)	Understanding about ... Technology	E.2.4.2				
		E.2.4.3				
Science in Social Perspective (F)	Types of resources	F.3.4.1	Personal Health	F.1.8.7	Natural Resources	F.3.12.1



		F.3.4.2				F.3.12.2
		F.3.4.3				F.3.12.3
	Changes in Environment	F.4.4.1	Science and Technology in Society	F.5.8.3	Environmental Quality	F.4.12.3
		F.4.4.2				
		F.4.4.3				
	Science ... in local challenges	F.5.4.2				



## COOKIE MINING . . . *REBAKED*

### INTRODUCTION

Mining involves removing a metal from the ore, a volume of rock that is already elevated in the concentration of that metal compared to other rocks. In order for that rock to be classified as ore, it must be possible to extract the metal and make a profit. That means the classification of a rock as ore depends on a lot of factors such as the expenses involved in the method of extracting the metal, the concentration of the metal in the rock, the expense involved with separating the metal from the ore, and so on.

This activity models the varying concentrations of the metal (chocolate chips) and methods of extraction (choice of student) plus charges for environmental disturbances.

### OBJECTIVE

Using a variety of chocolate chip cookies to represent the ore, and toothpicks to represent the mining technique, students will model the mining process including environmental considerations and economics.

### THE ACTIVITY

#### MATERIALS REQUIRED:

- 3 types of chocolate chip cookies
  - *Mothers*, or another low-priced store brand (few chips).
  - *Chips Ahoy* (more chips), and
  - *Chips Deluxe* (most chips)
- Flat toothpicks
- Round toothpicks
- Paper clips
- Chocolate frosting
- Shredded coconut
- Green food coloring
- Colored flower cake/cookie sprinkles
- Chocolate cake/cookie sprinkles
- *Cookie Mining* Sheet
- *Cookie Mining* Grid
- *Cookie Mining* Money

- Frost the top of each cookie with chocolate frosting to represent topsoil.
- Sprinkle each cookie with shredded coconut dyed green to represent vegetation, chocolate sprinkles to represent rocks and boulders and colored flower sprinkles to represent wildflowers.
- *Be sure to keep the cookies separated by brand.*

#### PROCEDURE

- 1) Explain the object of cookie mining to make a profit.
  - a) Each student buys property (a cookie), equipment (toothpicks or paper clips), pays for the mining operation and reclamation.
  - b) In return, the students receive money for the ore mined (chocolate chips).



- 2) Each player starts with \$19 worth of Cookie Mining Money, a Cookie Mining Sheet and a sheet of the grid paper.
- 3) Each student must buy his/her own "mining property" or cookie. Write the cookie prices on the board:
  - a) Store brand chocolate chip - \$3.00
  - b) Chips Ahoy - \$5.00
  - c) Chips Deluxe - \$7.00
- 4) After the cookies are bought, have the student give their "mine" a name and record it, along with the price of their cookie, on the sheet.
- 5) Have them place their cookie on the grid paper and trace the outline of the cookie. They should then count each square that fall inside the circle, counting partial squares as a full square, and record that number on the sheet.
- 6) Students must now buy mining equipment. They can purchase more than one piece or type of equipment. If a mining tool breaks, it is no longer usable and a new tool must be purchased. Write the equipment prices on the board:
  - a) Flat toothpick - \$2.00 each
  - b) Round toothpick - \$4.00 each
  - c) Paper clip - \$6.00 each
- 7) Have them record the price of mining equipment on their sheets.
- 8) Students can now prepare their mining property by removing the top soil, rocks and vegetation from the cookie using their mining tools. This material should be stockpiled on a corner of the graph paper for use in reclamation.
- 9) Now they can mine the chips out of the cookies. No student can use his fingers to hold a cookie. The only things that can touch the cookie are the mining tools and the paper the cookie is sitting on. The maximum mining time is 5 minutes, at a cost of \$1.00 per minute. Students can finish mining before the 5 minutes are up and record the time spent mining on the sheet.
- 10) Students receive \$2.00 for each chocolate chip mined. Broken chips can be combined to form one whole chip.
- 11) Students must now reclaim their cookie mine by placing the remaining cookie parts back into the original circle drawn on the graph paper. Any squares within the original circle that are no longer covered are assessed a \$1.00 fee each. Each student must also purchase additional topsoil, rocks and vegetation at a cost of \$1.00
- 12) The player with the most money at the end of the game wins, and everyone gets to eat the remainder of their cookie!

## EVALUATION

Did it matter which cookie the student bought? Which cookies were harder or easier to mine, and why? Which cookies were more expensive?

What about the mining equipment? Which tools, or combination of tools were most effective? Did certain tools break?



When the student tried to reclaim the cookie, what happened? Was it difficult to return this cookie back to

the same exact size that it was before mining the chips?



**COOKIE MINING . . . REBAKED  
 MINING ECONOMICS**

1. Name of Cookie Mine \_\_\_\_\_

2. Price of Cookie \$ \_\_\_\_\_  
 (Mother's \$3.00, Chips Ahoy \$5.00, Chips Deluxe \$7.00)

3. Size of Cookie \_\_\_\_\_ Squares Covered

4. Equipment:

Flat toothpick \_\_\_\_\_ x \$2.00 = \_\_\_\_\_

Round toothpick \_\_\_\_\_ x \$4.00 = \_\_\_\_\_

Paper clip \_\_\_\_\_ x \$6.00 = \_\_\_\_\_

**Total Equipment Cost** \$ \_\_\_\_\_

5. Mining: \_\_\_\_\_ minutes x \$1.00  
 Cost of removing chips \$ \_\_\_\_\_

6. Chip removal:  
 Number of chips \_\_\_\_\_ x \$2.00 = Value of chips \$ \_\_\_\_\_

7. Reclamation: \_\_\_\_\_ squares x \$1.00 = \_\_\_\_\_  
 Grass seed, flowers and rocks = \$1.00

**Total Reclamation Cost** \$ \_\_\_\_\_

**How much did I make?**

PROFIT		COST	
6. Chip Removal	\$ _____	2. Price of Cookie	\$ _____
		4. Equipment	\$ _____
		5. Mining	\$ _____
		7. Reclamation	\$ _____
<b>TOTAL SALES</b>	<b>\$ _____</b>	<b>TOTAL COSTS</b>	<b>\$ _____</b>

Value of chips (total sales) \$ \_\_\_\_\_

Total cost of mining (total costs) minus \$ \_\_\_\_\_

**Profit/Loss** \$ \_\_\_\_\_

