

Note: Here are the teacher instructions for the Cookie Mining activity from the American Coal Foundation. In italics, I've commented on some of the instructions that I found unnecessary. I have not changed or deleted any of the text from the original American Coal Foundation instructions. — *Bill Bigelow*]

Grade Level 3-8 [*As indicated in my article, "Got Coal? Teaching about the Most Dangerous Rock in America," in Rethinking Schools magazine, I have played this game with high school students. I've also played it in teacher education classes and professional development workshops, examining the politics of curriculum.*]

Cookie Mining

Overview:

Students participate in a simulation of the mining process using chocolate chip cookies and toothpicks. The simulation helps to illustrate the costs associated with the mining of [coal](#).

Objectives:

Students will:

1. participate in a simulated "mining" of chocolate chips from cookies, using play money to purchase the necessary property, tools, and labor; [*I didn't use play money, which needlessly complicates the game. Students can simply keep track of their profits on their worksheets.*]
2. understand the various costs associated with mining coal, including environmental remediation, as demonstrated in the simulation; and
3. calculate costs and profits from cookie mining and relate them to the mining industry.

National Standards:

[National Council for the Social Studies \(NCSS\) Standards](#)

1. Production, Distribution, and Consumption
2. Science, Technology, and Society

[National Council of Teachers of Mathematics \(NCTM\) Standards](#)

3. Numbers and Operations, 3-5

Time Needed:

One to two class periods [*Obviously, the duration of the game depends on the length of class periods. One could likely "play" it in a 50-minute period, but this would not offer sufficient time to debrief—nor would it offer time to do the pre-*

game writing about coal, if you've been able to locate some coal.]

Materials:

1. Play Money [*Again, no need for this.*]
2. Three different types of commercially packaged chocolate chip cookies [*This sounds easier than it is. I tried to find cookies that were clearly different sizes and with different amount of chips. As I mention in my article, I had to distribute standard sized chips at the end because the chips in chocolate chip cookies vary greatly in size.*]
3. Grid paper
4. Pencils
5. Flat toothpicks
6. Round toothpicks
7. Paper clips
8. [Cookie Mining Worksheet](#) [See Cookie Mining pdf.]

Discussion Questions:

What do you think are some of the costs associated with mining coal?

Do you know what the term [land reclamation](#) means?

If not, what do you think it might mean with regard to coal mining?

Procedure:

1. Review the costs associated with coal mining: land acquisition, labor, equipment, and reclamation. Coal companies are required by federal law to return the land they mine to its original, or an improved, condition. This process, known as reclamation, is a significant expense for the industry.
2. Explain that the mining industry, like any other business, faces challenges to make itself profitable. To understand some of these challenges, students will attempt to conduct a profitable mining business in an experiment that requires them to mine the “coal” chips from chocolate chip cookies.
3. Give each student \$19 in play money [*Again, this is unnecessary; students can simply record this on their Cookie Mining Worksheet.*], a sheet of grid paper, and a [Cookie Mining Worksheet](#). Allow each student to purchase one “mining property” (a cookie) from three separate brands available. Montana costs \$3, Pennsylvania costs \$5, and Kentucky costs \$7. Students may want to examine the cookies before deciding which one to purchase. [*I showed the cookies to students, but didn't allow them to “examine them,” as this can be time-consuming and is not essential for the game.*]

4. Once all the students have purchased their property, have them measure it by placing it on the grid paper and tracing it. Then have them count the number of squares that fall inside the circle (partial squares count as full squares). Tell students to record this number on the [Cookie Mining Worksheet](#) under *D. Reclamation*.
5. Have each student purchase “mining equipment” (flat and round toothpicks and paper clips). More than one piece of equipment may be purchased, but no tools may be shared among students. Sell a flat toothpick for \$2, a round toothpick for \$4, and a paper clip for \$6. Sell replacement tools when necessary.
6. Explain that each minute of mining (labor) costs \$1 and that each chocolate chip mined from their property will result in a \$2 profit. Broken chips may be combined to form a whole chip. Consumed chips will eat into profits!
7. Do not allow students to spend more than five minutes mining. If they spend less time, their labor cost will be lower. Have them record their mining time and labor cost under *C. Mining/excavation costs* on the [Cookie Mining Worksheet](#).
8. After everyone is finished mining, have students restore their property to its original condition, within the drawn circle on the grid paper. This “reclamation” should also be timed, (no more than three minutes) and students may only use their tools, not fingers. After time is up, collect additional reclamation costs (\$1) for each square covered outside the original outline. Disburse profits for chips mined. Have students use the [Cookie Mining Worksheet](#) to calculate their profit or loss.

Assessment:

Allow students to share their experiences with the class. Was making a profit easier or harder than they expected? How accurate is this simulation in illustrating the challenges of making money in the mining industry? What costs or possibilities for profits were not included in this exercise?

Extension:

Encourage students to design another profit/loss simulation for a different industry. Remind them to think of all the costs related to the industry and to try to create an exercise that can be done in a short period of time by the rest of the class. Have them prepare a worksheet for other students to complete after participating in the simulation, on which to calculate their profit or loss.

Differentiation:

Working in tandem to complete the profit/loss worksheet might be helpful for those with math-related learning disabilities.