

Overview

The students will be introduced to the economics of mining. Students will buy a “property”, purchase “mining equipment”, and pay for the “reclamation” of the property post “mining”. In return the student receives “money” for the “ore” mined.

Source: Saskatchewan Mining Association
Teacher's Resource Unit (2001).

Duration: One class

Materials:

Each group

- Three varieties of chocolate chip cookies (with different amount of chips)
- “cookie mining money” (use play money or coloured paper to represent values of one, two or five dollars to a total of nineteen dollars)
- Cookie mining worksheets
- Cookie mining grid sheets
- Flat toothpicks
- Round toothpicks
- Paper clips
- stopwatch

Instructional Methods: Small group work, Hand-on activity

Notes to the Teacher

Do this activity after the “Resources in Saskatchewan” Activity.



Sue uranium open pit mine.

Learning Outcomes and Indicators

Grade 4 Rocks, Minerals and Erosion
RM4.2 Assess personal, societal, and environmental impacts of human uses of rocks and minerals.

j. Suggest methods of reclaiming resource extraction sites (e.g., quarry, strip mine, open pit mine and hard rock mine) to reduce impacts on communities and the environment.

Grade 7: Earth's Crust and Resources:
EC7.2 Identify locations and processes used to extract Earth's geological resources and examine the impacts of those locations and processes on society and the environment.

i. Suggest solutions to economic and environmental issues related to the extraction of geological resources in Saskatchewan (e.g., managing mine tailings and pollutants; reclaiming open pit mining sites; ecological impact of pipelines; resource depletion; maintaining water quality; and increasing urbanization).

Source: [Saskatchewan Evergreen Curriculum](#)

Big Picture Questions

1. How are mineral resources extracted from the earth?
2. What can be done to reclaim mining sites?

Background Information

Mining is the province's third largest industry and a

significant contributor to the provincial economy spending over \$3 billion annually on wages, goods and services, and generating over \$2 billion annually to the provincial government revenue through royalties and taxes.

Saskatchewan has over 25 operating mines. Our mines produce potash, uranium, coal, gold, salt, meta-kaolin, silica sand, sodium sulphate, clay and bentonite.

Saskatchewan also has a wealth of developing mineral resources including diamonds, platinum & palladium, rare earth elements, copper, zinc, and nickel.

Vocabulary

ore	mineral deposit
reclamation	waste rock

THE ACTIVITY

Introduction: (10 minutes)

1. Review the minerals mined in Saskatchewan.
2. Introduce the vocabulary terms. In this simulation pre = chocolate chips, mineral deposit = whole cookie, waste rock = cookie without the chocolate chip,
3. Explain that the students will be mining and rehabilitating a mine site.

The Activity:

1. Hand out a cookie mining worksheet on which the student will record the mining information; a cookie mining grid sheet.
2. Each player must buy his/her own "mining property" which is a cookie. Only one "property" per player. Cookie prices are as follows: brand 1 - \$3.00, brand 2 - \$5.00, and brand 3 - \$7.00.
** See options.*
3. After the cookie is purchased, the player places the cookie on the grid paper and traces the

outline of the cookie with a pencil. The player then counts the number of squares inside the circle.

Partial squares count as a full square.

4. Have the student replace the cookie inside the drawn outline. **From now on, the only things that can touch the "mining property" are the UNROKEN mining tools and the paper the cookie is sitting on.**
No player can use his/her fingers to hold the cookie.
5. Each player must by his/her own "mining equipment". More than one piece of equipment may be purchased and the tools can be different for each person.
Mining equipment MAY NOT be shared between players. If the "tool" breaks, it must be replaced by buying a new tool – broken tools may not be used.

Mining Equipment for Sale:

Flat toothpick - \$2.00

Round toothpick - \$4.00

Paper clip - \$6.00 (the paper clip may be bent)

6. Once all the students have their equipment they may all start mining. Allow up to 5 minutes for mining.

Mining Costs: \$1.00 per minute

Students who finish mining before the five minutes are used up should only be charged for the time spent mining.

Warn students not to eat their ore as it is to be "sold"

7. Sale of the chocolate chips brings \$2.00 per chip (broken chips can be combined to make 1 whole chip). **See Options.*
8. After the cookie has been mined, the player should "reclaim" the property by placing the cookie (and crumbs) back into the circled area on the grid paper. This can only be accomplished by using the mining tools, no fingers, hands or blowing allowed.
9. Reclamation costs are \$1.00 per square over the original square count. There could also be a "fine" if the "land" is piled too high. Allow 2 minutes for reclamation.

10. The player with the most money at the end of the game is the best miner.

Each student “wins” because he/she gets to eat the remained or the cookie.

11. Discussion:

- In this activity a limit of \$19.00 was used. Ask the students to think about this cost and ask if they think a more realistic cost to mine a deposit is in the , hundreds of dollars; thousands of dollars, millions of dollars, or billions of dollars. *Depending upon the size of the deposit and the method used to mine (aboveground or underground) the costs are more likely to be in the high millions to billions of dollars.*
- Discuss some of the costs of mining (cost of land, tools, removing the ore, reclamation) ask what are some other costs that were not involved (wages, buildings, energy, marketing, costs of finding the ore deposit, transportation).
- Discuss why the mines reclaim the mine property. *Explain that before a mining company starts to mine a deposit they must submit a plan that details how they are going to reclaim the mine site and they must pay up the money to the government before they start to mine.*
- Show the students a picture of an open pit deposit and discuss how they would reclaim the site.

Options

- For lower grades, only use one kind of cookie.
- The teacher could appoint a banker to collect money or assess fees or fines.
- The highest priced cookie need not be the one with the most chips.
- Because chips are different sizes, older students could weigh their chips to determine their “profit”
- Multi-coloured chips could be used so “miners” could sell their bi-products. For example, yellow chips could be gold; red could be copper.
- The “market price” could vary up or down during the mining process so the player would need to decide to either sell “now” at a higher price or keep mining and hope the price stays high.

Assessment Method and Evidence

- ✓ Hands on Activity
 - Students will learn that some of the costs of mining are: the cost of the land, cost of the mining tools, and cost of reclamation.
 - Students will learn that is there is sufficient ore then mining will be profitable however if there isn’t enough ore then the costs of the tools, mining and reclamation will mean no profit for the mine.
- ✓ Discussion
 - Through discussion the students will realize that it costs in the billions of dollars to develop a mine through to its closure and reclamation of the site.
 - Students will learn that there are more costs such as wages, building, energy, marketing, transportation costs that must be considered when thinking about developing a mine.
 - Students will think about ways to reclaim mine sites, to reduce impacts on communities and the environment.

Resources

Saskatchewan Mining Association Teacher’s Resource Unit (2001). Out of Print

Vocabulary

Ore: A source of minerals that can be mined at a profit. Ore refers to either metallic or nonmetallic deposits.

Mineral deposit: A mineral occurrence of sufficient size and grade that it might, under favourable circumstances, be considered to have economic potential.

Reclamation: On completion of mining, the law now requires that the land disturbed by mining be returned to near-original condition. Requires clean up of ponds, dumps, and roads. Land must be revegetated and land contoured to match

existing topographic slopes in the area.

Waste rock: Barren or sub marginal rock or ore that has been mined, but is not of sufficient value to warrant treatment and is therefore removed ahead of the milling processes.

COOKIE MINING BALANCE SHEET

1. Name of the Ore Body (cookie) _____

2. Price of the Ore Body (cookie) _____

3. Size of the Ore body (cookie) _____ (squares covered)

4. Equipment Costs

Equipment	How Many?		Price for Each		Total Price
Flat Toothpick			\$2.00	=	\$
Round Toothpick			\$4.00	=	\$
Paper Clip			\$6.00	=	\$
Total Equipment Cost				=	\$

5. Cost of Removing Ore (Chips)

Number of Minutes	Mining cost per Minute		
	\$1.00	=	\$

6. Reclamation

Number of Squares	Reclamation cost per Square		
	\$1.00	=	\$

7. TOTAL COST OF MINING

(A)	(B)	(C)	(D)	(E)
\$	+	\$	+	\$
				= \$

8. VALUE OF ORE (CHIPS)

Number of Chips	Sale Price of Chips		
\$	+	\$	= \$

9. HOW MUCH DID I MAKE?

Value of Ore (Chips)		\$
	-	
Total Cost of Mining		\$
PROFIT OR LOSS		\$

Student Sheet Activity: Cookie Mining

