APES- Cookie Mining Lab Activity

Questions/Analysis:

1: Were the minerals evenly distributed throughout the cookie mines? *Explain how this relates to real mining.*

2: Were you able to "reclaim" the land after mining? **Discuss issues.**

3: Do you think the animals and plants in the area are affected by strip mining? How?

4: Can you think of anything humans can do to minimize the destruction of the environment when extracting fossil fuels? Explain.

5: Explain how the time required for mining is affected by the advanced knowledge that the land must be restored.

6: Explain why legislation that requires land to be restored after mining makes mining more expensive.

7: *Look up and outline* the **Surface Mining Control and Reclamation Act**:

8: Identify when and *discuss why* the Surface Mining Control and Reclamation Act was written.

9: Speculate about the citizens and organizations most likely to **support and oppose** the Surface Mining Control and Reclamation Act.

10: What was the purpose of this activity? What was learned?

<u>**APES- Cookie Mining Activity**</u>

<u>**Background Information:**</u>

Fossil fuels *(natural gas, oil and coal)* are created by the decomposition of dead plants and animals over millions of years and with a little help from high temperatures and high pressures. The fuels contain stored potential energy that originally came from the Sun. Fossil fuel extraction *(harvesting of coal, oil and natural gas)* can be very damaging to ecosystems. Coal mining can strip the surface of the Earth, leaving desolate areas permanently damaged. Petroleum extraction or transportation can spill and kill wildlife or soak through the aquifer to contaminate our water supply. Our government creates laws to protect the environment and levies fines to companies that damage the environment due to accidents or damaging extraction methods. **Ninety percent** of the energy we use in the United States comes from fossil fuels. The U.S. uses more than *17 million barrels of oil every day account for over 40% of our country's energy.* Stored chemical energy in coal is converted into the thermal energy of steam when the coal is burned. This thermal energy, in turn, is converted to mechanical energy that spins turbines to create electricity. Coal is used to produce almost *60% of our nation's electrical power and accounts for 22% of our overall energy consumption.* The third form of fossil fuel, *natural gas, accounts for almost 23% of our usage.* Each American uses an average of 7 gallons of gasoline everyday. <u>**The United States only has 5% of the world's population but consumes 26% of the world's energy.**</u>

<u>**Purpose:**</u> *The purpose of this activity is to simulate a mining operation. In order to simulate a real mining operation:*

- *A land area will be purchased from the bank*
- *The land area will be surveyed and quantified*
- *Mining equipment will be purchased from the bank*

- *A mining operation will be undertaken, with the cost for each minute of the mining operation included in the total operating costs*
- *At the conclusion of mining operations, the reclamation of the land area is required, with a fine assessed for any part of the land that is not successfully reclaimed*
- *The ore that was mined will be sold back to the bank to offset the start-up costs of the mining operation*

Procedure:

1: Each miner must obtain a sheet of graph paper and purchase a land area (cookie), on credit, for the bank.

- **Mother's Cookie- $3.00**
- **Chips Ahoy- $5.00**
- **Chips Deluxe- $7.00**

2: Each miner may purchased any combination of the following mining equipment, on credit, from the bank *(at least two items MUST be purchased)*

- **Flat Toothpick- $50,000**
- **Round Toothpick- $75,000**
- **Plastic Fork/Pick- $100,000**
- **Paper Clip- $100,000**

3: Following the purchase of the land and mining equipment, place the land on the graph paper, trace the outline of the cookie, determine the area of the cookie by counting the number of squares that fall inside the line *(count partial squares as full squares)*, and record the area of the cookie *(size of deposit)*.

4: Once mining begins, the cookie is **ONLY TO BE TOUCHED BY MINING TOOLS.** The cookie **MAY NOT** be touched with fingers or hands. You MAY NOT blow crumbs off the paper at any time. Any part of the cookie that falls off the graph paper is considered "lost" and should be not be retrieved until the simulation is complete.

5: Attempt to dig out as many chocolate chips as possible. The chocolate chips represent ORE and will be sold to the bank to offset the start-up costs of the mining operation.

Whole, clean, intact chocolate chips ONLY will be purchased for full price. 1/2 chips will only receive 1/2 price. The rest will be considered to be "overburden" and need to be disposed of appropriately.

6: The cost of the mining operation is **$10,000 per minute** and the **processing fee per chocolate chip is $1,500.**

7: After the cookie has been mined, reclamation must be attempted. Try to place all that remains of the cookie back into the circled area on the graph paper using the mining tools (remember, NO FINGERS or HANDS allowed!) Draw additional circles around each crumb that is not placed back in the circle, and count the number of squares that fall inside all circles. The fine for **unsuccessful reclamation is $1,200 per square.**

8: When all mining and reclamation is complete and you are ready to sell your chocolate chips to the bank, arrange them in such a way that they may be easily counted, record the end time of the simulation and raise your hand.

9: Answer the questions and summary while you are waiting for the bank to count up your ORE.

Data Table (Resources)

	Cookie #1	**Cookie #2**
Cookie Area (#squares)		
Mass-Unmined (g)		
Mass of Ore (g)		
Mass Difference (g)		

Data Table (Mining Costs)

	Fees $ (Cookie #1)	Fees (Cookie #2)
Cookie Brand/Cost $		
Tool Rental Fees $ *(pick at least 2)*		
Mining Costs *($10,000 per minute)*		
Processing Fee *($1500 per chip)*		
Labor Costs/Insurance	$2500	$2500
Reclamation Costs *($1200 per square)*		
Overburden $1000	$1000	$1000
Total Mining Fees		

Data Table: Selling the Ore

	Cookie #1	Cookie #2
Whole Chips $10,000 each		
1/2 Chips $2500 each		
Total $ Made		

	Cookie #1	Cookie #2
Total Mining Fees		
Total $ Made		
Difference ($) (-/+)		