

# Coal: More Than Meets the Eye!

<http://www.coaleducation.org/lessons/twe/coal2.htm>

## Focus on Inquiry

The student will collect and analyze data while simulating searching for coal deposits on the Earth's surface and under the ground.

## Lesson Overview

Coal is a natural resource mined from Earth. Energy resources are unevenly distributed. Students will participate in a hands-on simulation to help them understand that coal resources are deposited unevenly between the earth's surface and under the ground.

<b>Duration</b> 45 minutes	<b>Setting</b> Classroom	<b>Grouping</b> Individual students	<b>PTI Inquiry Subskills</b> <b>3.1, 3.6, 4.2, 5.2, 5.3, 5.5, 5.9</b>
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Lesson Components	Estimated Time	Inquiry Subskills Used	Technology Used	Level of Student Engagement	Brief Description
<b>Engage</b>	5 min		None	2	Students are engaged in a discussion of coal mining.
<b>Explore</b>	20 min	3.1, 3.6	None	3	Students "mine" for coal by counting the number of chocolate chips on the surface of their cookie and estimate the total number of chips before mining the buried deposits with a paperclip.
<b>Explain</b>	10 min	4.2, 5.2,	None	2	Students summarize their 'mining' data and relate their simulation data. They discuss the energy required to obtain new energy sources.
<b>Expand</b>	10 min	5.3, 5.5, 5.9	Internet maps & resources	2	Students examine maps of coal deposits and mines in the US and relate the simulated distribution to the actual distribution in the US.
<b>Evaluate</b>	varies			n/a	Teacher developed rubric for data collection and discussion.

### Level of Student Engagement

1	Low	Listen to lecture, observe the teacher, individual reading, teacher demonstration, teacher-centered instruction
2	Moderate	Raise questions, lecture with discussion, record data, make predictions, technology interaction with assistance
3	High	Hands-on activity or inquiry; critique others, draw conclusions, make connections, problem-solve, student-centered

### National Science Education Standards – Inquiry

Use appropriate tools and techniques to gather, analyze, and interpret data.



### National Science Education Standards – Earth Science

Living organisms have played many roles in the earth system, including affecting the composition of the atmosphere, producing some types of rocks, and contributing to the weathering of rocks. Some changes in the solid earth can be described as the "rock cycle." Old rocks at the earth's surface weather, forming sediments that are buried, then compacted, heated, and often recrystallized into new rock. Eventually, those new rocks may be brought to the surface by the forces that drive plate motions, and the rock cycle continues.

### Louisiana Grade Level Expectations – Inquiry

- Gr. 8, Inquiry GLE#6 - Select and use appropriate equipment, technology, tools, and metric system units of measurement to make observations (SI-M-A3)
- Gr. 8, Inquiry GLE#11 – Construct, use, and interpret appropriate graphical representations to collect, record, and report data (e.g., tables, charts, circle graphs, bar and line graphs, diagrams, scatter plots, symbols) (SI-M-A4)
- Gr. 8, Inquiry GLE#12 - Use data and information gathered to develop an explanation of experimental results (SI-M-A4)
- Gr. 8, Inquiry GLE#15 – Identify and explain the limitations of models used to represent the natural world (SI-M-A5)
- Gr. 8, Inquiry GLE#16 – Use evidence to make inferences and predict trends (SI-M-A5)



Gr. 8, Inquiry GLE#22 - Use evidence and observations to explain and communicate the results of investigations (SI-M-A7)

**Louisiana Grade Level Expectations Earth Science**

Gr. 8, GLE#16 –identifying the characteristics and uses of minerals and rocks and recognizing that rocks are mixtures of minerals (ESS-M-A5)

**Materials List**

- Chocolate chip cookie for each student
- Napkin for each student
- Paper clip for each student
- Reference book containing map of U.S. coal deposits

**Advance Preparation**

1. Obtain materials listed in the materials list.

**Other Information**

**Prior Knowledge Needed by the Students**

- none

**Procedure**

***Engage***

1. Tell students that today they will pretend to be coal miners. Engage students in a class discussion about the job of a coal miner. Students can share what they know. The discussion should include the benefits and dangers of coal mining.

***Explore***

1. Students will simulate searching for coal deposits using chocolate chip cookies. The procedures for this activity can be found at <http://www.coaleducation.org/lessons/twe/coal2.htm>

***Explain***

Students can use what they learned from the simulation to discuss the answers to the following questions.

1. What can you say about the distribution of energy sources?
2. Do you think that all areas of the United States contain coal? Why or why not?
3. True or false, it takes energy to obtain energy?
4. Can we use energy sources without affecting the environment?

***Expand***

1. Students can examine maps from the National Mining Association showing the distribution of coal deposits in the United States (for example, see [http://www.nma.org/pdf/c\\_bearing\\_areas.pdf](http://www.nma.org/pdf/c_bearing_areas.pdf)) and coal mines in the United States (for example, see [http://www.nma.org/pdf/c\\_locations.pdf](http://www.nma.org/pdf/c_locations.pdf)). How does the students' simulated cookie mining experience relate to the distribution of actual coal mines in the US? How does the coal mine location relate to the distribution of coal deposits in the United States?
2. The map of coal deposits (see above) indicates the type of coal that is in the deposit (anthracite, bituminous, subbituminous, and lignite). Students can research each of these types of coal to find out their distinguishing characteristics and the products that are manufactured from each type. (optional)

***Evaluate***

1. Teacher can use class discussion of the answers to the questions in the explain section as an informal assessment of student knowledge.

**Blackline Master**



none

### **Supplementary Resources**

#### **Kentucky Geological Survey: Coal Information**

[http://www.uky.edu/KGS/coal/coal\\_information.htm](http://www.uky.edu/KGS/coal/coal_information.htm)

This website can be used to obtain general coal information, such as what it coal, forming conditions, identification of coal components, classification and rank of coal, methods of mining, uses of coal, beneficiation of coal (cleaning coal), and coal and the environment.

#### **Salt the Sandbox: Neighborhood Rocks - Coal**

<http://www.saltthesandbox.org/rocks/coal.htm>

This website can be used to learn how to recognize coal, where coal came from, how it was formed, other names for coal, and links to other websites about coal.