Kentucky Coal Museum and
Portal 31 Exhibition Coal Mine

Coal Education Curriculum

Linking Coal To Our Past, Present, and Our Future

Kentucky Coal Museum & Portal 31

Kentucky Community & Technical College System

Kentucky Coal Museum and Portal 31 Underground Exhibit

Linking Coal to our Past…Present…Future…

The materials included in this packet were developed for use in educating students throughout Kentucky about the history of coal mining and the need for coal mining in Kentucky. This project has been a partnership between the Energy and Environment Cabinet, the Kentucky Coal Museum and Southeast Kentucky Community and Technical College.

Although this project was developed primarily for Kentucky School teachers and students, much of the material is universal in nature and can be used without modification. On the other hand, you may wish to consider modifying some of the content to better represent your state or local situation. Feel free to do so.

Coal mining has played a vital role in the daily lives of the residents in Kentucky. We feel that it is important to help expand knowledge of coal mining, the technologies used in mining, and culture/heritage of the family life of coal miners so that future generations will better understand and appreciate the complex world in which we live.

If you would like additional information regarding this project please contact us at the Kentucky Coal Museum, (606) 848-1530 or e-mail us at kycoalmuseum@att.net . Thank you for your interest in coal mining. We hope the enclosed materials will benefit you.

Sincerely,

Phyllis Sizemore

Phyllis Sizemore
Museum Curator

ACKNOWLEDGEMENTS

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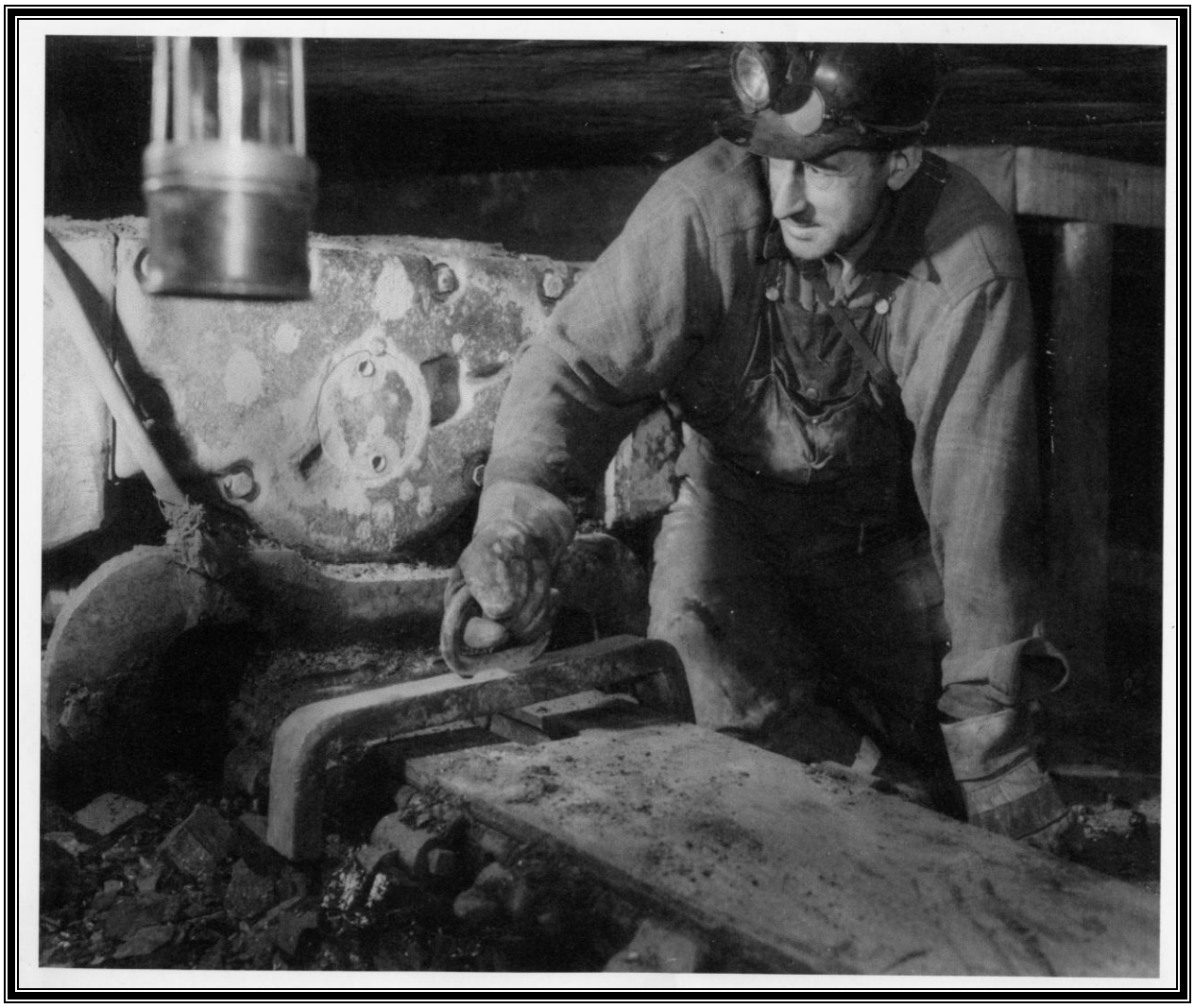
Appreciation is also extended to individuals and institutions that granted permission for the use of materials and images.

Kentucky Coal Museum Contact Information
Visit the Kentucky Coal Museum at 231 Main Street, Benham, Kentucky. Hours are: 10 a.m. to 5 p.m. Tuesday through Saturday. Contact the museum by mail at P.O. Box A, Benham, Kentucky 40807; by phone at 606.848.1530; by fax at 606.848.1546; or by email at kycoalmuseum@att.net.

Coal Town Curriculum:
Exploring the Underground



An Underground Coal Miner at Work

Coal Fields—Maps
Social Studies: Culture and Heritage Student Worksheet
Core Content:
SS-E- 4.1.1 Simple physical, political and thematic maps, globes, charts, photographs, aerial photography, and graphs can be used to find and explain locations and display information.
SS-E- 4.2.2 Regions are areas that have one or more physical or human characteristics in common (e.g., physical: geographical regions of Kentucky, south, Midwest, Western Hemisphere; human: Appalachia, the Cornbelt, Amish country).

Coal Energy
When you think of energy you should think of coal. One fourth of the world's coal is located in the United States and that is comparable to all of the world's known oil reserves. Coal deposits in 38 states amount to about 276 billion tons of coal that are still available to be mined in America. The coal industry employs approximately 81,000 miners and produces almost 1.1 billion tons of coal every year. That makes coal mining a $20 billion industry and according to government agencies the coal contributes about $161 billion to our economy each year.

Actually, coal is found on every continent, but only Europe, Asia, Australia, and North America are major commercial coal producers at present. Great Britain (the largest coal producer in the world until the early 1900s), France, Belgium and Germany have significant coal reserves. Significant coal deposits are also found in Poland, Czechoslovakia, and Hungary. China and Russia also have sizeable deposits of coal while Chinese coal fields are the largest in the world.

Mapping Coal
Look on the Internet for a map that shows coal reserves in America. One site to use for coal resources is http://www.coaleducation.org/. Look at your map of the Coal Fields in America. Remember that coal is ranked into four classes according to carbon content. The ranks are: anthracite coal, bituminous coal, sub-bituminous coal, and lignite coal. Keep in mind that the carbon content of coal increases with the heat and the amount of time that the fossil matter is under pressure from covering material. Therefore, Anthracite Coal, the coal that has the highest carbon content, comes from the oldest deposits. Anthracite Coal is used primarily for residential and commercial heating; anthracite is the highest rank of coal. It is hard, brittle, and has a shiny, black texture. Anthracite has low moisture content and low gas/petroleum content.

Bituminous Coal is black or dark brown coal that often has bands of bright and dull material. Its primary use is for production of electric power. It is also used for power and heat in manufacturing and to make coke. Bituminous Coal is the most abundant coal with deposits that make up over half of the worldwide coal reserves. Bituminous Coal is most often found east of the Mississippi River, with the greatest amounts in Illinois, Kentucky, and West Virginia. Benham Coal was placed in large coke ovens and changed into coke for use in northern steel mills before being shipped out of Kentucky.
Sub-bituminous Coal is dull, dark brown to black and soft and crumbly. It is used as fuel to make electric power. All sub-bituminous coal reserves are located west of the Mississippi, with most of it in Montana and Wyoming.
Lignite Coal has a brownish-black color and high moisture content. It is the lowest rank coal and low carbon content. Lignite Coal is often called brown coal and is used almost entirely as fuel for electric power generation. Approximately 10 percent of the coal reserves are made up of lignite coal and are located in Montana, Texas, and North Dakota.

Thinking About Coal

1. According to this information and your coal map, what states in the United States have the most bituminous coal deposits?

2. List the states that have anthracite coal deposits.

3. List the states that have lignite Coal deposits.

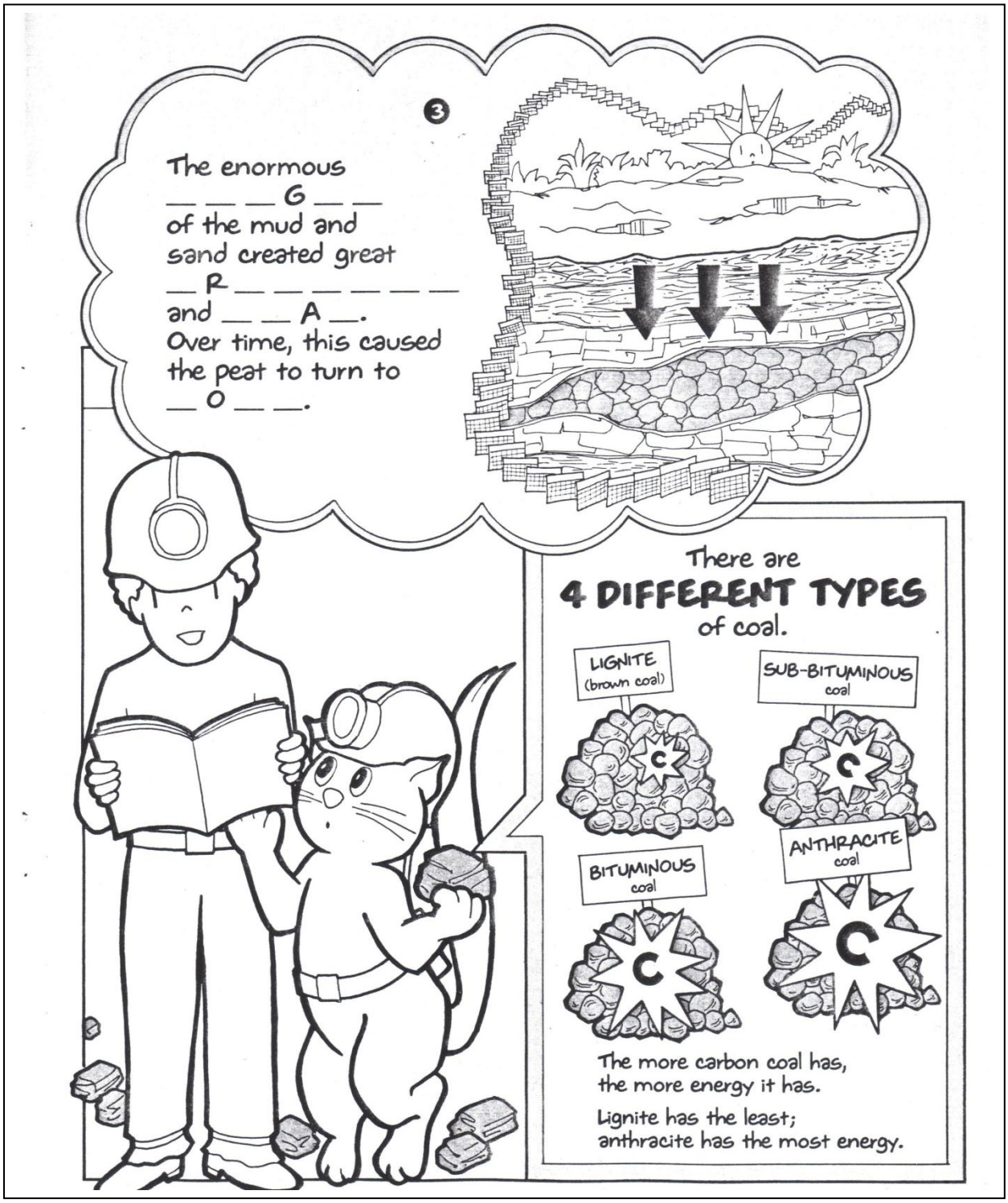
4. List four states that have no coal reserves. Research on the web or use an encyclopedia to find if there are other kinds of mining in these states.

6. How many mining states have a seaport? How do you think having a nearby seaport affects the mining industry in that state?

Kentucky Coal Map

1. Where are the two distinct coalfields in Kentucky located?

2. Research on the Internet or in an encyclopedia to find differences in land formations in the eastern and western portions of the state. Write a paragraph about the different mining techniques used in the two mining regions of Kentucky.



To find out how coal is made, fill in the blanks using the following words: Pressure, Coal, Weight, and Heat.

Coal Mining in America
Social Studies: Culture/Heritage
Core Content
SS-E-2.3.1 Various human needs are met through interaction in and among social groups (e.g., family, schools, teams, and clubs)
SS-E-2.1.2 Elements of culture (e.g., language, music, art, dress, food, stories, folktales) serve to define specific groups and may result in unique perspectives.
SS-E-5.1.2 History can be understood by using a variety of primary and secondary sources and tools (e.g. artifacts, diaries, timelines)
SS-E- 4.2.2 Regions are areas that have one or more physical or human characteristics in common (e.g., physical: geographical regions of Kentucky, south, Midwest, Western Hemisphere; human: Appalachia, the Cornbelt, Amish country).

Coal has always been important to Americans. We have used it to heat our homes and run our trains and factories. Most of the coal that is mined today is used to make electricity. There are still many uses today such as steel production that call for the mining of coal.

Coal has been used for many, many years. Thousands of years ago, Aristotle talked about charcoal-like rock and the Chinese used coal for many years before the Europeans learned of its importance. Some people believe that a mine in China may have burned coal to smelt copper as much as 3,000 years ago and that the Chinese made coins using coal.

Roman ruins contain cinders and this makes us believe that they used coal before AD 400. Records in England, Scotland and Europe don't mention coal mining until the 1200s.

Hopi Indians in the American southwest used coal to bake their pottery by AD1000 and by the 1300s the Hopi's were heating and cooking with coal. Coal was first discovered in this country by French explorers in the Illinois River area.

Virginia settlers found coal deposits in 1701 and the earliest recorded commercial mining in America was in Virginia in 1748. This coal was used to produce weapons during the American Revolution (1775-1783).

In 1750, Kentucky explorer Dr. Thomas Walker was the first recorded person to discover and use coal in Kentucky. It wasn't long until coal was found in Maryland, West Virginia, and Pennsylvania. It was the Lewis and Clark expedition that first reported discovering coal west of the Mississippi, along the banks of the Missouri and Yellowstone rivers. During the 1830's companies were mining coal in the Appalachian region and along the Ohio, Illinois, and Mississippi rivers.

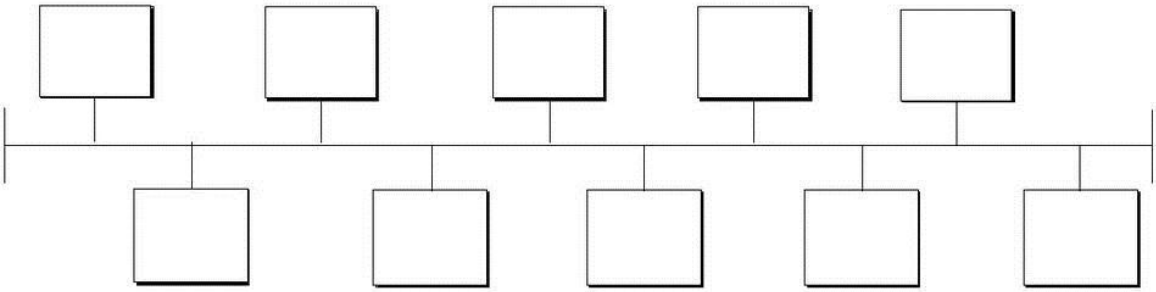
During the 1880s, there was little demand for coal in America because of the large amount of wood available in the abundant forests. The demand for coal increased when the construction of canals and railroads provided a way to move it to the market.

Today, coal is used to generate electricity, supplies more than half of the electricity produced in the United States and 95% of the electricity produced in Kentucky.

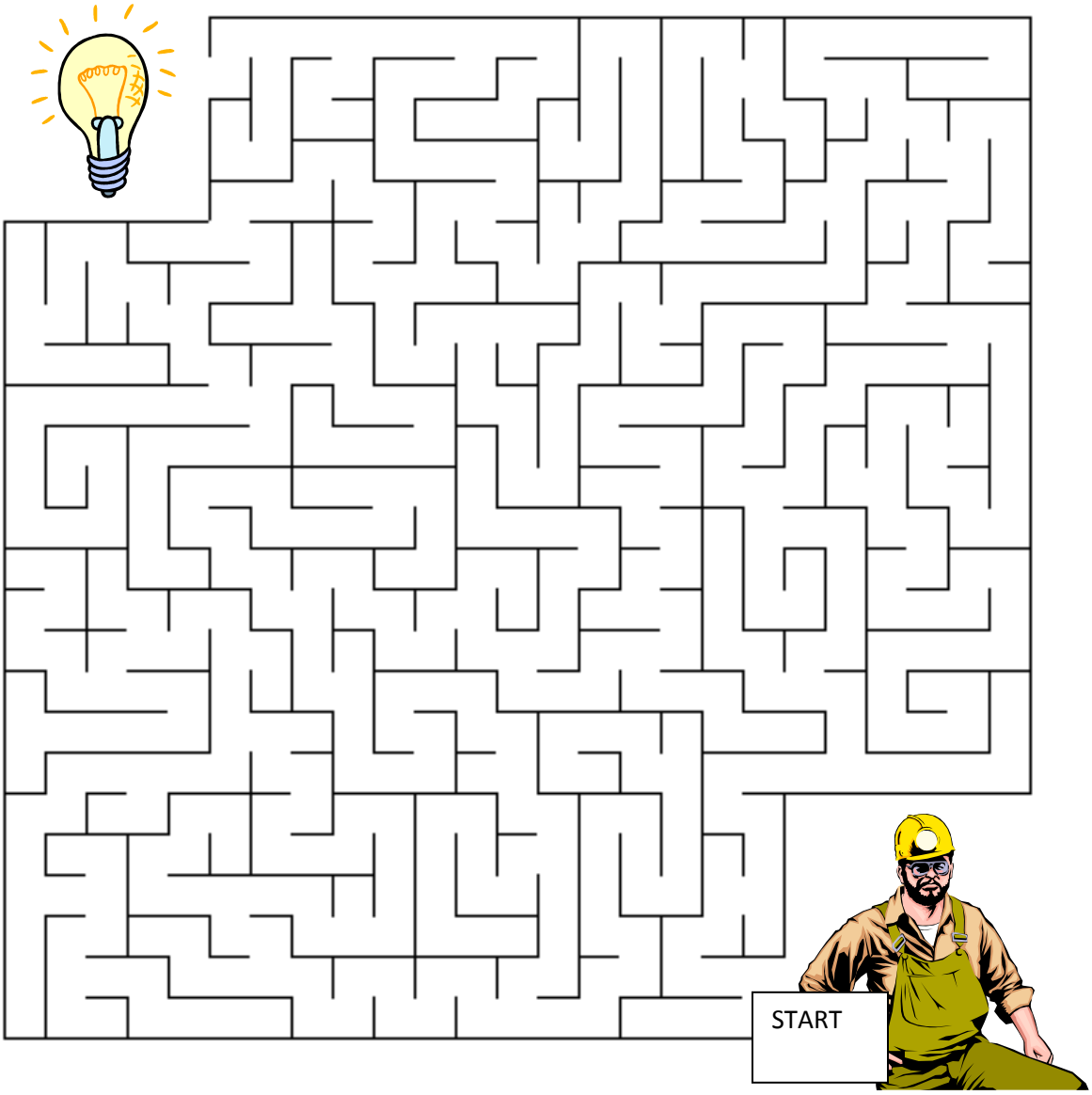
Activity:

Make a timeline using information above. Illustrate your timeline with your own art or copy images from coaleducation.org

Timeline



Social Studies: Cultural/Heritage
Activity Page
POWER MAZE



The process of removing coal from the ground, processing it for use in a power plant to generate electricity takes many man-hours. Can you start at the miner and take him through the maze to the electric light being used in a home?

Tommaso Travels to Kentucky
Social Studies: Heritage/Culture
Core Content:
SS-E-4.2.2 Regions are areas that have one or more physical or human characteristics in common (e.g., physical: geographical regions of Kentucky, South, Midwest, Western Hemisphere, Human: Appalachia, the Cornbelt, Amish country).
SS-E-5.1.2 History can be understood by using a variety of primary and secondary sources and tools (e.g., artifacts, diaries, time lines).

Student Reading
How exciting to leave a poor village in Italy for the land of wealth and success in America! Tommaso held to the ship's rail and watched the seaport near Milan, Italy slip away, but his mind was full of his uncle's stories of America and about a new coal-mining town called Lynch in the state of Kentucky. His uncle had been working in the coal mines there for almost a year and he had sent last month for his wife and children to catch the big boat and join him. Later, he had sent for Tommaso, his favorite nephew, to come and work in the same coal mine. A few days later, Tommaso stood at the same ship's rail and held his hat in is his hand as the ship sailed past the Statue of Liberty and approached Ellis Island. He was finally in America!

Through all the official procedures of entering a new country, Tommaso kept remembering his uncle's description of the tall hills, rich with coal, the friendly people, and the welcome of the boarding houses for new workers in Lynch. Thoughts of the new job and the new friends he would meet stayed in Tommaso's mind as he rode the ferry into New York City and met a representative from U.S. Coal and Coke Company. The company man gave Tommaso a train ticket and made arrangements for his journey to Kentucky.

Within days, Tommaso had boarded a passenger train and sat gazing through the window at the changing landscape as he traveled through New England toward Kentucky. He met many other men, immigrants like himself, each with the promise of a job at a coal mine, in a steel mill, or as builders of new communities that would house other new workers. Frequently, the train stopped at a depot where several men loaded with bundles and crates of their belongings left the train with waves and good wishes. After several days on the train, Tommaso was glad to hear the conductor call out, "Appalachiaaaaa, Virginnnniaaaa!" This was the as close as the train could take Tommaso to Lynch.

After leaving the train, Tommaso and several other men traveling to Lynch met a man who hauled groceries and dry goods across Black Mountain into Kentucky. He suggested that they get a room for the night and the come by to see him the next morning. "There will be room for you all and your belongings in the grocer's wagon," he told Tommaso. So it was that Tommaso and the other immigrants rode and hiked across the highest point in Kentucky the next afternoon and covered the last 15 miles to Lynch, Kentucky. The grocer left the men at the coal camp

boarding house and they were glad to find a kind welcome and a country meal of pinto beans, fried potatoes and cornbread for supper.

The next day sped by as Tommaso signed papers at the mining office, opened an account at the company store, and stopped at the post office to mail letters home to his girl friend and his mother. He visited his uncle's family and later met a man who came from a village not far from his own Italian birthplace. That night he went to sleep on the soft bed of the boarding house, almost too excited to sleep as he thought about his new job and bright future.

Tommaso woke to a dark room and the sounds of boots tramping by the doorway as other miners clumped downstairs to breakfast. Quickly, he stood up and began to dress in a thick one-piece set of cotton underwear and heavy cotton pants and shirt. He knew these warm garments would be needed because the temperature underground would be about 55 degrees and he might get wet from water that seeped into the mine. He added an old jacket and gathered his tools before leaving the room that he shared with another miner.

Tommaso, like other coal miners in 1915, had to take his own tools to work with him. He was glad he had thought ahead and brought some things with him from Italy so he didn't have to add tools to his credit account at the company store. Some of the miners would spend months paying for the pick, auger, and shovel that they bought on credit. He had to buy handles for many of his tools and that was much less expensive. Tommaso wasn't surprised when he was told that he had to bring his own tools to work. The miners knew they had to have tools to do their jobs.

"Like my carbide lamp," Tommaso thought. "How could I see when I'm underground if my hat wasn't designed to hold a carbide lamp? Of course, I have to buy the fuel for the light."

However, it did get expensive to buy the black powder and caps he used when he set an explosive charge to break the coal loose from the seam. He wished the company would provide that. He felt better after he heard one of the men say that on his last job, the miners were required to buy the timbers they used to support the roof! The Lynch miners didn't have to buy their own timbers.

Tommaso liked mining. He enjoyed the close friendships that developed between miners who worked together. They laughed and joked as they worked on a section of the coal seam—undercutting (using a pick to remove several inches of coal below the seam), drilling (using a breast-auger to make a four to six foot hole into the coal seam to pack black powder or dynamite in), loading (using a pick and shovel to put the coal into sleds or wagons for removal where it was weighed), and laying track (setting up the rails for train cars to move the coal out of the mine). He liked to gather with the other men in the dinner hole (area where the men ate meals) and open their dinner buckets and eat together. Tommaso even liked the excitement of setting a charge of black powder, using a tamping rod to fill the hole tight, stuffing the end of the hole with a dummy (clay-filled paper or sack to plug a charged hole), lighting the fuse and running away, holding his ears, and waiting until the dust settled. Some days, he helped set timbers, sawing poles, setting them upright along the sides of the mine wall, wedging rocks or wooden blocks at the top of each one to help support the roof.

In the evening as Tommaso walked back to the boarding house from a hard day's work in the coal mine, the cool mountain breeze stirred his hair and he lifted his eyes to a beautiful blue sky and he thought of the day he would have the money saved to bring his fiancé over from Italy and

they would marry in the stone church on the hill and have a camp house of their own, right in Lynch, Kentucky. He had traveled a long way but he felt that he was at home!

Tommaso Travels to Kentucky

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
12								10		14	2			26					19						

T	O			A		O		L			T			I				O	O				I	L	L
19	26	25	25	12	4	26		2	15	21	19		11	10	4		5	26	26	7		23	10	2	2

A			I		I	T	A	L				O			T			L	A			O			
12	13	1	10	13	10	19	12	2	3		21	26	7		19	11	15	2	12	13	1	26	21		

A														I			A				I		A	
12	13	1	4	9	6	6	15	4	4					10	13		12	25	15	7	10	6	12		

	O		I				T	O		L						K			T				K		!
25	26	23	10	13	20		19	26		2	3	13	6	11		14	15	13	19	9		6	14	3	

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Teacher's Page

Tommaso Travels to Kentucky (Answer)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
24	25	3	14	11	8	2	18	22	26	19	23	4	21	15	20	13	6	17	5	1	9	12	7	10	16

T	O	M	M	A	S	O		L	E	F	T		H	I	S		P	O	O	R		V	I	L	L	A	G	E
5	15	4	4	24	17	15		23	11	8	5		18	22	17		20	15	15	6		9	22	23	23	24	2	11

I	N		I	T	A	L	Y		F	O	R		T	H	E		L	A	N	D		O	F		W	E	A	L	T	H
22	21		22	5	24	23	10		8	15	6		5	18	11		23	24	21	14		15	8		12	11	24	23	5	18

A	N	D		S	U	C	C	E	S	S		I	N		A	M	E	R	I	C	A		B	Y
24	21	14		17	1	3	3	11	17	17		22	21		24	4	11	6	22	3	24		25	10

M	O	V	I	N	G		T	O		L	Y	N	C	H		K	E	N	T	U	C	K	Y	!
4	15	9	22	21	2		5	15		23	10	21	3	18		19	11	21	5	1	3	19	10	

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Art Page
Social Studies: Heritage/Culture (Teacher)
Core Content:
AH-E- 4.1.41 Create artwork using the elements of art and principles of design.
AH-E-4.1-35 Media – crayon, pencil, pint, fabric, yarn, clay, paper, papier-mâché (used to produce artworks)

Learning Activity
Draw a picture. Include the following things in your picture:
Sun, Cloud, Mountain, Valley, Hill, Waterfall, Forest, Lake, and River.

Finish your artwork with crayons, markers, or watercolors. Complete your project, by labeling each of these things with their Italian name.

Sun—il sole

Cloud—la nuvola

Mountain—la montagna

Valley—la valle

Hill—la collina

Waterfall—la cascata

Forest—la foresta

Lake—il lago

River—il fiume

These are the words Tommaso probably used to describe things he saw on his trip from Italy to Kentucky.

Tommaso's Mining Tools Glossary
Tools Used Between 1900 and 1940
Social Studies: Heritage/Culture
Core Content:
SS-E-5.2.3 The way we live has changed over time for both Kentuckians and Americans because of changes in many areas (e.g., communication, innovations/inventions, homes, transportation, recreation, traditions, education).

The **breast auger** was used by the coal miner to drill into the face of the coal. An auger is a long or short piece of steel (depending on the height of the seam of coal) that looks like a drill bit.

A **pick** has a wooden handle and sharp points on both ends of a metal piece. The pick is used to loosen the coal before loading it into a car.

The **coal shovel** has a wooden handle and the bottom looks like a large spoon. It is used to load the coal into cars.

Track wrenches were used in building the railroads inside and outside the mines. They are made of heavy steel.

A **detonator** was held-held box that had wiring that ran to the holes that had been drilled by the breast auger and stuffed with black powder. It made an electric spark that caused the black powder to explode and loosen the coal from the face.

Black powder was used to blow the coal into smaller bits to be loaded into the cars. The miners would call "Fire in the Hole" when they were ready to blast the coal.

The **rail gauge bar** was used to pull down the railroad track to gauge the space between the tracks. The rails had to be properly gauged or the train would derail.

A **sixteen-pound hammer** was used to break the coal into smaller pieces after a blast and was used to put the rails in place.

A **track hammer** was used to put in or pull out the spikes that held the rail in place.

The **tamping bar** was used to push the black powder into the holes drilled by the breast auger to make the blast loosen more coal. It is a long narrow steel rod.

A slate bar is used to check the top for loose rock or coal.

An **ax** has a number of different uses in the mines. One of those uses is to cut the timbers to fit the roof of the mine.

The **bucksaw** was used in and round the mines to cut the timbers and wedges.

A **carbide light** was the main source of light the miners used during this time period. The light fit onto the mining cap they were wearing.

An extra supply of carbide was kept in a **carbide can** and the miners carried this small metal container in their pocket.

Water was needed for the carbide light and the miners would carry a **water can** on their belt or in the pocket to keep their lights burning.

Dummies were clay-filled paper or pieces of brown shopping bags rolled tightly and stuffed into the drilled holes with a tamping rod to make the coal blast larger.

The miners carried their lunch in a round or square metal **lunch bucket.** Their drinking water was put in the bottom of the bucket and their sandwich or biscuit, fruit and cake or pie was carried in the top. The lid fit tightly to keep the mice and rats from eating their food.

Many men wore **kneepads** when they worked in low seams of coal. The kneepads were made of rubber and tied behind their knees.

The **flame safety light** was a very important tool the miners carried in and out of the mines with them. If the flame in this light became very bright the miners knew there was gas in the mine. If the flame began to dim they knew there was not enough oxygen and they needed of better ventilation.

Tools List Activity—Student Sheet
Tools Used Between 1900 and 1940
Social Studies: Heritage/Culture
Core Content:
SS-E-5.2.3 The way we live has changed over time for both Kentuckians and Americans because of changes in many areas (e.g., communication, innovations/inventions, homes, transportation, recreation, traditions, education).

In this activity, place an **R** beside the items used to work on railroad tracks; place on **E** beside the items used with the explosives; place an **M** beside **the** items used in the mines; and place an **X** for coal extraction terms.

Breast Auger	Slate Bar
Ax	Bucksaw
Shovel	Carbide Light
Carbide Can	Track Wrench
Detonator	Water Can
Black Powder	Dummies
Rail Gauge Bar	Lunch Bucket
Sixteen-Pound Hammer	Knee Pads
Track Hammer	Flame Safety Light
Tamping Bar	Pick

Teacher's Page
Tools List—Key
Tools Used Between 1900 and 1940

In this activity, place an **R** beside the items used to work on railroad tracks; place on **E** beside the items used with the explosives; place an **M** beside **the** items used in the mines; and place an **X** beside coal extraction terms.

Breast Auger (X)

Ax (X)

Shovel (X)

Carbide Can (M)

Detonator (E)

Black Powder (E)

Rail Gauge Bar (R)

Sixteen Pound Hammer (R)

Track Hammer (R)

Tamping Bar (E)

Slate Bar (X)

Bucksaw (M)

Carbide Light (M)

Track Wrench (R)

Water Can (M)

Dummies (M)

Lunch Bucket (M)

Knee Pads (M)

Flame Safety Light (M)

Pick (X)

Tommaso's Trip: an Immigrant Comes to Kentucky
Map Activity
Social Studies: Cultural/Heritage
SS-E- 4.2.2 Regions are areas that have one or more physical or human characteristics in common (e.g., physical: geographical regions of Kentucky, south, Midwest, Western Hemisphere; human: Appalachia, the Cornbelt, Amish country).

Look on-line or in an encyclopedia and find a map that shows Europe and North America. Print or copy the map.

1. Tommaso was born in Italy. Mark Italy with a small HEART.

2. The ship carried Tommaso from Italy across the Mediterranean Sea and the Atlantic Ocean. Mark the course of the ship across these bodies of water with a BOLD LINE.

3. Tommaso entered the United States at Ellis Island in New York. Mark that spot with a DIAMOND.

4. Tommaso traveled from New York, through New England, and into Virginia by train. Mark his route with a DOTTED LINE.

5. Tommaso and other immigrants crossed Black Mountain from Appalachia, Virginia to Lynch, Kentucky. Put a STAR at Lynch! (Check out Lynch and Portal # 31 on line at http://www.portal31.org)

Coal Quiz

Mark a T for true or an F for false beside each question. Use your student worksheets to make the best choice.

_____ 1. Antarctica is currently a major commercial coal producer.

_____ 2. China has the smallest coalfields in the world.

_____ 3. Anthracite Coal is the rank of coal having the highest carbon content.

_____ 4. Graphite is one of the four ranks or types of coal.

_____ 5. One half of the world's coal is located in the United States.

_____ 6. Lignite Coal is seldom used for power generation.

_____ 7. Bituminous Coal is called "hard coal".

_____ 8. The coal industry adds only about a billion dollars to the U.S. economy each year.

Use your maps to find the answers to the following questions.

1. Name a state with a bituminous coal deposit.

2. Name a state with an anthracite deposit.

3. Name two states with coal deposits and a seaport.

4. In what state is the most southern coal deposit in the U.S. located?

5. Write two or three sentences describing the two coal deposits in Kentucky.

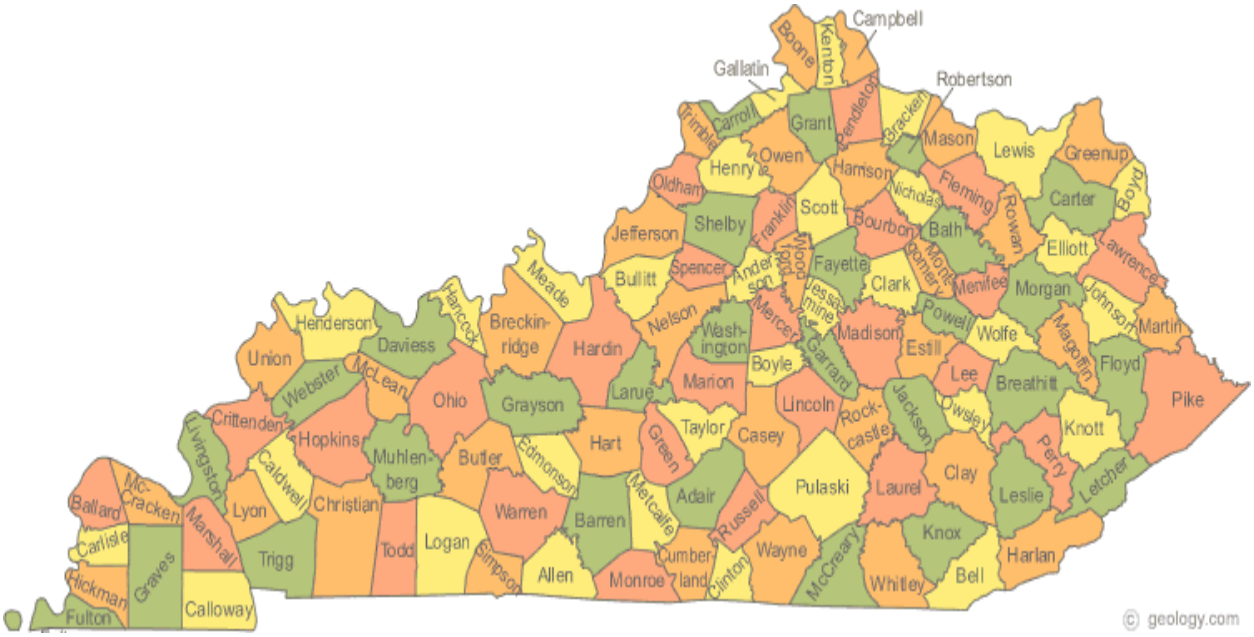
Write a letter that you think Tommaso would write to his parents following his trip to Kentucky from Italy. What would he tell them about the trip? Describe his journey from New York to Kentucky.

Kentucky Energy Use and Coal Reserves
Core Content:
SS-04-4.1.2: Students will use geographic tools to locate major landforms, bodies of water, places and objects in Kentucky by their absolute and relative locations.
RD-04-2.0.3: Students will locate key ideas or information in a passage
RD-04-2.0.4: Students will interpret the meaning of specialized vocabulary (words and terms specific to understanding the content). RD-04-3.0.4: Students will identify main ideas and details that support them.

Wyoming, West Virginia and Kentucky lead the nation in coal production. Kentucky's coal is bituminous and its sulfur content varies. More than 95% of Kentucky's coal is used for producing electricity. More than two-fifths of the state's households are heated with electricity.

Kentucky's coal deposits are located in the eastern Central Appalachian Basin and in the western Illinois River Basin. The coal deposits in those basins are accompanied by reserves of oil and gas. Kentucky has two petroleum refineries located in Catlettsburg and Somerset. The Catlettsburg refinery receives crude oil from the Gulf Coast and the smaller plant in Somerset refines crude from Kentucky and the regional area. Eastern Kentucky's Big Sandy field produces less than 1 percent of the total U.S. natural gas production. About two-fifths of the state's population heats their homes with natural gas.

In the Ohio River Basin the Cumberland and Tennessee Rivers offer the potential for hydroelectric power.



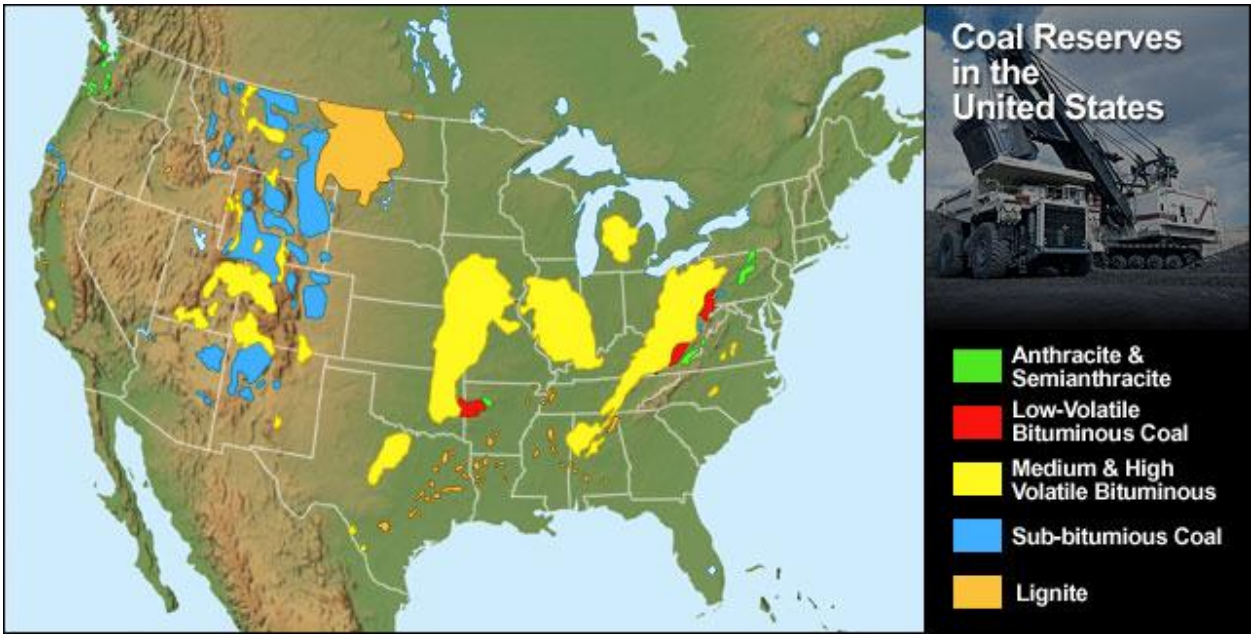
Geography of the coal regions-Map Activity

Locate each county on the state map and use a search engine to discover the county seat of each county.

WEST KENTUCKY COAL PRODUCING COUNTIES

Butler
Christian
Crittenden
Daviess
Henderson
Hopkins
McLean
Muhlenberg
Ohio
Union
Webster

EAST KENTUCKY COAL PRODUCING COUNTIES
Bell
Boyd
Breathitt
Carter
Clay
Elliott
Floyd
Greenup
Harlan
Jackson
Johnson
Knott
Knox
Laurel
Lawrence
Lee
Leslie
Letcher
Magoffin
Martin
McCreary
Menifee
Morgan
Owsley
Perry
Pike
Whitley



http://teachcoal.org/wp-content/uploads/2011/10/reserves-map.jpghttp://www.youtube.com/watch?v=nJ_rh9rVNAU&feature=related

Western Kentucky Coalfield Counties

X Z A S Q A N D G B E H B P Y R E W U M
M C Y S U O Z O L A U U W K Q U K N D C
P N N E C R N A S M L T Y Z A O I L B L
H N M I L Z I U K R N R L G A O B D T E
B P X V P F G O X Q E C C E N N M V H A
W Z D A H H P X M P M D Z J R V F Y G N
D R J D L G K E J W W F N K L F F M F I
Y J L X N V Z B C I Z U U E Q Z F U J A
M W E B S T E R R R K N E M H G N A S N
Z A X M V P B Y B F P H F L Y H M C V M
W N G P P G O L X Z T W W R B Y U X V P
K O L H W R V D M P Y C Y M Q K Y R R P
R W E G X D Z I C F U W S Z K Y M E F Y
N B P Y K E J O Y N U N C F I N Q R Z R
G R E B N E L H U M I O I H O V F H J P
W T B H K M W Y N K D I X Z W X R D E V
X V F Q V F A Q P T C R B X O N V Q P H
L M C P B B I O N Z Q D V C I Z T C K W
Y G X N R D H K B H Y D P X R G J K D N
Z N G B W K X L F I P Z S P V L A S I S

BUTLER
DAVIESS
HENDERSON
HOPKINS
MCLEAN
MUHLENBERG
OHIO
UNION
WEBSTER

Teacher's Page:

Western Kentucky Coalfield Counties

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x x x S x x N x x B x x x x x x x x U M
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x x x E x x x x S x x T x x x x I x x L
x x x I x x x x x R x x L x x O x x x E
x x x V x x x x x x E x x E N x x x x A
x x x A x x x x x x x D x x R x x x x N
x x x D x x x x x x x x N x x x x x x x
x x x x x x x x x x x x x E x x x x x x
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BUTLER
DAVIESS
HENDERSON
HOPKINS
MCLEAN
MUHLENBERG
OHIO
UNION
WEBSTER

Eastern Kentucky Coalfield Counties

L E F Q C I Y K O C N J H R R D M M U L
T T I H T A E R B A Q W B R E T K A A F
O G T G A D H O L N R E H C T E L R M H
L F M Q C V Y R K P A W C Y G P S T A M
U S P F K Q A O M W S G L N J G V I I C
M Z P K G H H M L J P P I E E Y S N B W
R T K R Y R B Y K F J X A V S R X O N K
N P S O R V E L E K D Q U B R L W L K D
R T M S A N Q E X L J U R O E I I A T C
B U I K E J M X N O T D F Y T J I E L N
Y E V O R U N G H U Y I U D R E T A I X
O Q L B C U T N Z R P N H E A E Y F J S
Y K K L C E S Q R T Q C O W C L F A A V
T G J U M O K E E F A H N C A O V J C T
C J C F N A P I L E X H M C G M S B K T
Y E L S W O H M P K E O O A B R R O S O
L A U R E L X R Z S R H M W O L F E O N
C H J X C C V D V G Z D M B T T H A N K
T E L L I O T T A K T P K P Z R C Z P U
G E H C P U X N I U O P K H B G Y I K H

BELL
BOYD
BREATHITT
CARTER
CLAY
ELLIOTT
FLOYD
GREENUP
HARLAN
JACKSON
JOHNSON
KNOTT
KNOX
LAUREL
LAWRENCE
LEE
LESLIE
LETCHER
MAGOFFIN
MARTIN
MCCREARY
MORGAN
OWSLEY
PIKE
WHITLEY
WOLFE

Teacher's Page:

Eastern Kentucky Coalfield Counties

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x x x x x x x x x x N x x x x x x M x x
T T I H T A E R B A x x x x x x x A x x
x x x x x D x x L x R E H C T E L R x x
x x x x x x Y R x x x x C x x x x T x x
x x x x x x A O x x x x L N x x x I x x
x x x x G H H x L x x x x E E x x N x x
x x x x Y R B Y x F x x x x S R X O N K
x x x x R x E x E x x x x B R L W x x x
x x x x A x x E x L J x x O E x I A x C
B x x x E x x x N O T x x Y T x x E L N
x E x x R x x x H U Y I x D R E x A I x
x x L x C x x N x R P x H x A E Y F J x
x x x L C E S x R x x x x W C L F x A x
x x x x M O K E x x x x x x x O x x C T
x x x x N x P I x x x x M x G x x x K T
Y E L S W O x M P K x O x A x x x x S O
L A U R E L x x x x R x M W O L F E O N
x x x x x x x x x G x x x x x x x x N K
x E L L I O T T A x x x x x x x x x x x
x x x x x x x N x x x x x x x x x x x x
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BELL
BOYD
BREATHITT
CARTER
CLAY
ELLIOTT
FLOYD
GREENUP
HARLAN
JACKSON
JOHNSON
KNOTT
KNOX
LAUREL
LAWRENCE
LEE
LESLIE
LETCHER
MAGOFFIN
MARTIN
MCCREARY
MORGAN
PERRY
PIKE
WHITLEY
WOLFE

LIGHTS IN THE COAL MINE

Core Content:

RD-04-2.0.3: Students will locate key ideas or information in a passage
RD-04-2.0.4: Students will interpret the meaning of specialized vocabulary (words and terms specific to understanding the content). RD-04-3.0.4: Students will identify main ideas and details that support them.
SC-04-1.1.1: Students will explain how matter, including water, can be changed from one state to another.
Materials can exist in different states--solid, liquid and gas. Some common materials, such as water, can be changed from one state to another by heating or cooling. Resulting cause and effect relationships should be explored, described and predicted.

A coal mine is a cold, dark, damp place. Miners must have a light, protective clothing and special equipment when they work underground. Miners in the early 1900s used torches to light their workplace. In the late 1890s carbide lamps were invented, but they were not available to all miners.

The carbide lamp produced a yellow light when the miner filled the top chamber with water and the bottom chamber with carbide. Allowing the water to slowly drip onto the carbide created a chemical reaction that released acetylene gas. The small wheel on the front of the reflector on the lamp was the starter for a flint sparker that ignited the gas. The miner could control the size of the flame by changing the flow of water that dripped onto the carbide. The reflector behind the flame magnified the illumination.

Large lamps were hung on nails on support timbers in the mine shafts, but the lamps were also made in the appropriate size to attach to the miners' hats.

Occasionally, a pocket of explosive gas was ignited by the open flame of the light. The results could be catastrophic, with a gas and coal dust explosion.

Early miners carried canaries into the mine and trusted the bird's sensitivity to hazardous gases to warn them of danger. During the 1800s the safety lamp was invented. It became more widely available to miners through the early years of the twentieth century. By watching the flame which flared in the presence of gas or died in low oxygen areas, the miner was more aware of changes in his workplace.

Not until 1913 did Thomas Edison invent a battery lamp that finally provided a safe light for coal miners.

To check out information about today's mining, watch a video at
http://videos.howstuffworks.com/science-channel/34261-how-do-they-do-it-coal-mining-video.htm

Lights in the Coal Mine
Quiz

1. When was the carbide lights invented? _____
2. _____ were used in the early mines to warn miners of hazardous gases.
3. Who invented the battery lamp to provide safe lighting for coal miners? _____

In Class Project Suggestion:
If possible, take a trip to the KY Coal Museum and have a volunteer guide demonstrate the different types of mine lights.

Teacher's Page:
Lights in the Coal Mine
Quiz (answers)

1. When was the carbide lights invented? 1890's
2. Canaries were used in the early mines to warn miners of hazardous gases.
3. Who invented the battery lamp to provide safe lighting for coal miners? Thomas Edison

The Miner's Daily Work
Core Content:
RD-04-2.0.3: Students will locate key ideas or information in a passage
RD-04-2.0.4: Students will interpret the meaning of specialized vocabulary (words and terms specific to understanding the content). RD-04-3.0.4: Students will identify main ideas and details that support them.
SC-04-4.6.4: Students will: analyze models/representations of light in order to generalize about the behavior of light; represent the path of light as it interacts with a variety of surfaces (reflecting, refracting, absorbing).Light can be observed as traveling in a straight line until it strikes an object. Light can be reflected by a shiny object (e.g., mirror, spoon), refracted by a lens (e.g., magnifying glass, eyeglasses), or absorbed by an object (e.g., dark surface).
PL-04-4.2.2: Students will describe team skills (e.g., cooperation, communication) and explain how these skills are used to complete tasks more efficiently at home, school and work.

The miner's daily job was one of hard labor and long work hours. His work space was often cold, wet and dangerous. It was also very dark. A miner working early in the 1900s may have used an oil lamp or a carbide lamp. The lamps were made in several sizes. Lamps were large enough to hang on a nail in a timber or small enough to clip onto the miner's soft cap. The lamps were fueled by oil or carbide.

Carbide, that is made by coked coal, is placed in the lower half of the carbide lamp and water from the top chamber of the lamp drips onto the carbide. This causes a chemical reaction that produces acetylene gas. The gas is ignited by a flint sparker and a bright, white flame results. The lamp's reflector increases the illumination forward to light the miner's workplace. (Find more about miners' lamps at: http://www.ramshornstudio.com/miners_lamps.htm).

Each morning a mining supervisor entered the mine shaft to check the walls and roofs of tunnels for fallen rocks or unstable areas. He looked carefully for other signs of danger. If the inspection went well, he signaled the work crew inside to begin work. If he spotted potential danger he could keep workers outside until support timbers were added or other precautions taken.

The men worked in crews but each man did many tasks throughout his day. Many miners entered their work area after a long walk or crawl underground through low tunnels. The miners carried tools underground with them, a pick, shovel, explosives, an augur (drill), or a tamping rod. Many other tools were used underground. You can learn about them here:
http://www.mcintyrepa.com/miners.htm

Reaching the face of the coal (where the coal was to be mined), the miner began to undercut the coal seam. He did this by digging several inches under the coal seam at ground level. Then he used an augur (drill) to make a deep hole into the coal seam (wall) and fill it with black powder (an explosive charge). When ignited the explosion blew the coal loose from the wall of the mine and when the dust settled, the miner could load the coal by hand and with a shovel into a wooden car that would be hauled by mule or pony to be weighed.

The miner was paid according to the weight of coal he dug. In order to keep records, the men were given brass coal checks (also called brass tags). The miner's employee number was stamped on the brass coal check and the miner attached one of these checks to each load of coal

he sent to be weighed. In those days of pick and shovel mining and hand loading a miner could be expected to load six to eight tons of coal in a day.

At meal time, the miner took his dinner bucket to the “dinner hole.” This was typically a place for food, rest and practical jokes before miners returned to work.
Before the unions improved working conditions for many coal miners, it was not uncommon for miners to work much longer than eight hours in a day. Many miners left their homes before sunrise and returned after sunset.

Miner's Daily Work
Quiz

1. What type of lamps did the miners use in the early 1900's? _____

2. Carbide is made from _____.

3. The miner was paid according to the _____.

4. Do an internet search to discover what miners in the early 1900's took to work in their dinner buckets. What do they take in their lunch buckets today?

http://www.wcyb.com/community/27000888/detail.html
http://www.youtube.com/watch?v=BqWfyAfaFZI

Teacher's Page:
Miner's Daily Work
Quiz (Answers)

1. What type of lamps did the miners use in the early 1900's? Oil or Carbide

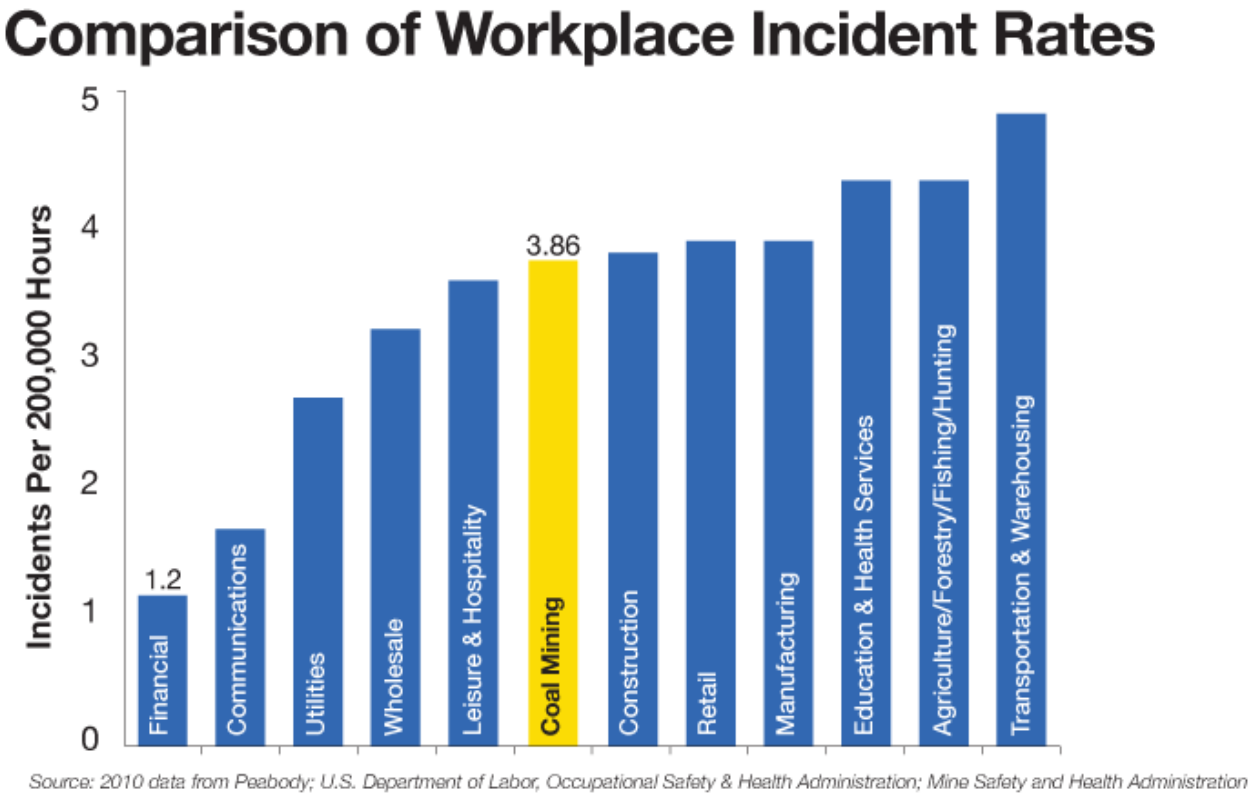
2. Carbide is made from coked coal.

3. The miner was paid according to the weight of the coal he dug.

4. Find out what miners in the early 1900's took in their lunch buckets. What do they take in their lunch buckets today?

Safety First!
Core Content:
MA-04-4.1.1: Students will analyze and make inferences from data displays (drawings, tables/charts, tally tables, pictographs, bar graphs, circle graphs, line plots, Venn diagrams).
RD-04-2.0.3: Students will locate key ideas or information in a passage
RD-04-2.0.4: Students will interpret the meaning of specialized vocabulary (words and terms specific to understanding the content). RD-04-3.0.4: Students will identify main ideas and details that support them.

The U.S. produces almost a billion tons of coal annually and both surface and underground mines have volunteer emergency teams that are trained in first aid, firefighting, and other rescue and life-saving skills. In the years since the Yancy Mine Disaster and the Scotia Mine Explosion, the use of safety and rescue teams has become more widespread. Another plus for workers has been the creation of tighter regulations and strict government enforcement to ensure miner safety. See the chart below to discover the safety of the miner's workplace.



Mining Safety

M	Y	L	Z	H	V	F	P	P	M	N	M	A	R	C	N	S	H	D	N
H	E	G	A	S	D	E	T	E	C	T	I	O	N	O	O	N	V	K	O
J	C	T	C	M	S	K	K	S	Z	V	N	E	I	C	F	A	L	H	I
V	B	B	S	J	E	J	O	N	U	M	E	T	Z	G	H	F	L	Z	T
C	Z	U	O	Y	L	T	E	X	J	D	A	Y	D	U	Q	E	M	R	A
B	M	J	B	Z	S	T	H	M	C	L	L	E	N	H	R	N	O	J	L
K	L	V	M	L	Y	N	L	A	I	U	Z	A	B	O	O	I	Y	L	I
I	A	T	J	T	P	P	O	T	N	M	G	A	O	C	O	M	U	A	T
V	N	D	E	L	M	D	N	I	A	E	B	D	X	C	F	Q	G	L	N
K	X	F	O	S	N	E	I	F	T	W	G	S	T	C	B	H	R	Q	E
Q	A	J	R	F	V	H	O	W	E	A	M	A	B	S	O	H	S	G	V
S	P	I	Z	R	U	N	L	X	B	E	L	N	S	G	L	S	K	M	E
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V	F	O	L	P	W	L	P	O	I	S	O	N	T	N	E	B	E	E	I
Y	P	C	L	M	O	Q	I	D	R	R	X	R	D	N	R	I	E	L	M
O	B	F	A	S	B	E	G	U	G	G	A	T	A	M	E	G	P	Z	I
T	C	S	I	Q	L	P	A	R	R	W	H	S	C	F	M	V	Q	J	V
X	X	O	G	G	Q	W	E	J	A	B	U	F	K	Z	V	S	E	C	I
W	N	E	L	B	A	M	M	A	L	F	A	Z	Y	V	J	S	O	T	I
S	S	I	M	N	P	Q	R	K	L	S	B	X	E	Y	F	B	I	D	A

COAL	COAL DUST	EXPLOSIONS
FLAMMABLE	GAS DETECTION	METHANE GAS
MINE	MINE FANS	MINE VENTILATION
POISON	POOR VENTILATION	ROOF BOLTER
SAFETY	VENTILATION SYSTEM	

Scotia Mine Explosions-1976
Core Content:
RD-04-2.0.3: Students will locate key ideas or information in a passage
RD-04-2.0.4: Students will interpret the meaning of specialized vocabulary (words and terms specific to understanding the content). RD-04-3.0.4: Students will identify main ideas and details that support them.

In Letcher County Kentucky on March 9, 1976, 15 men died when underground gases exploded at Scotia Coal Company. The first explosion was caused when a mixture of methane and air was ignited by an electric arc from a battery-powered locomotive. On March 11, eleven men died in a second explosion inside the same mine. This explosion was caused when methane mixed with air and ignited. In total, 26 men lost their lives.

The Mining Enforcement and Safety Administration (MESA) concluded in their investigation that the explosion of March 9th resulted from inadequate ventilation and the use of electric equipment that was poorly maintained. Their report also suggested that the lack of air movement prohibited safe and timely completion of the recovery operations.

Scotia Mine Explosion
Quiz

1. When was the Scotia Mine Explosions? _____

2. How many men lost their lives? _____

3. What caused the gas explosion? _____

Teacher's Page:
Scotia Mine Explosion
Quiz (Answers)

1. When was the Scotia Mine Explosions? March 9, 1967 & March 11, 1967

2. How many men lost their lives? 26

3. What caused the gas explosion? Inadequate ventilation & poorly maintained equipment

YANCEY MINE DISASTER – 1932
Core Content:
RD-04-2.0.3: Students will locate key ideas or information in a passage
RD-04-2.0.4: Students will interpret the meaning of specialized vocabulary (words and terms specific to understanding the content). RD-04-3.0.4: Students will identify main ideas and details that support them.

On December 9, 1932, twenty three men lost their lives deep beneath the surface of Black Mountain in Yancey, Kentucky. It was the worst mining disaster in Harlan County history.

A sudden swirl of leaves out of the mouth of the mine entry was the first indication that something was wrong. Moments later, twelve men rushed out of the Zero mine, escaping the deadly gas that invariably followed an explosion. As five rescue teams worked, family and friends gathered. Nelson Massingill, 78, a miner until he retired at 76, waited for word of his six sons. The hope of survivors dimmed as rescue efforts, hampered by gas and debris-choked passages, continued. Twenty four hours later, the last victim was brought out of the mine. The Massingill family was not alone in suffering more than one loss, losing six sons. Arthur, Harold, and Eugene Woods were brothers and Herman, Eddie and George Hendricks were half-brothers.

On Saturday of that week, estimated five thousand people walked slowly past the bodies at the Cumberland Mortuary. On Sunday, joint rites were held for the Massingill brothers at a cemetery near Tazewell, Tennessee. They were buried in one large grave. All brothers left wives, five of them had children.

Yancey Mine Disaster
Quiz

1. The Yancey mine disaster occurred on _____.
2. What was the name of the family that lost six sons in the disaster? _____

In Class Project Suggestion:
Ask students to write a letter to the safety officer of a hazardous occupation and invite them to your class to give a talk on safety.

The top ten most hazardous occupations for 2011 were:

1. Fisherman
2. Logger
3. Airplane Pilot
4. Farmer & Rancher
5. Mining Machine Operator
6. Roofer
7. Sanitation Worker
8. Truck Driver/Delivery Man
9. Industrial Machine Repairman
10. Police Officer

Teacher's Page:
Yancey Mine Disaster
Quiz (Answers)

1. The Yancey mine disaster occurred on December 9, 1932.
2. What was the name of the family that lost six sons in the disaster? Massingill

Memorial Page

Yancy Zero Mine Disaster 1932	Scotia Mining Co. 1976
Robert Benko	Glen Barker
Charles Davenport	Dennis Boggs
Jim Davis	Everett Scott Combs
Herman Eddie	Virgil Coots
Benjamin Fields	Don Coots
Alfred Graves	Larry David McKnight
George Hendricks	Earl Galloway
Henry Hibbard	David Gibbs
Harrison Jackson	Robert Griffith
Luther Jones	John Hackworth
Campbell Massingill	J.B. Holbrook
Esau Massingill	Denver Widner
Henry Massingill	James Williams
James Calvin Massingill	Kenneth Kiser
Thomas Massingill	Roy McKnight
Will Newell	Laurence Peavy
Will Reynolds	Carl Polly
O.A. Reynolds	Richard Sammons
Mace Turnbough	Tommy Ray Scott
Author L. Woods	Ivan Gail Sparkman
Eugene Woods	James Sturgill
Harold Woods	Monroe Sturgill
	Kenneth Turner
	Grover Tussey

Local roadside historic markers have been provided to memorialize these lost coal miners. A local highway has been designated as Miners Memorial Highway in memory of the lost Zero Mine disaster miners. Several special days and programs are planned each year to honor miners that are lost on in mining accidents.

Safety First!
Core Content:
RD-04-2.0.3: Students will locate key ideas or information in a passage
RD-04-2.0.4: Students will interpret the meaning of specialized vocabulary (words and terms specific to understanding the content).
RD-04-3.0.4: Students will identify main ideas and details that support them.

Mining is classified by the method used to extract the coal. When coal seams lay near the surface of the earth, removing the layers of dirt, rock and debris is not too expensive and surface mining is used to remove the coal.

Where coal is found far below the surface, underground mining is needed. Shafts, vertical or slanted tunnels, are cut down to the underground coal seam. Air, equipment, coal and workers travel these shafts. Common types of underground mining are the drift and slope mining methods.

From the mine, coal is transported to the processing plant where it is crushed into smaller pieces of coal and cleaned. The coal is then sent truck, train, barge or even pipeline to a final user. In Kentucky, about 95% of mined coal is used to produce electricity.

Links to videos of Modern Mining:
http://www.youtube.com/watch?v=ylkdUuNOJzw&feature=related
http://www.youtube.com/watch?v=Bk-jrbCi7Sc
http://www.youtube.com/watch?v=tODSpfIzZnE

Coal Camp School Children at Play
Benham, Kentucky

Coal Camp Schools
Core Content:
SS-E-5.1.2 History can be understood by using a variety of primary and secondary sources and tools (e.g., artifacts, diaries, time lines).
SS-E-5.2.3 The way we live has changed over time for both Kentuckians and Americans because of changes in many areas (e.g., communication, innovations/inventions, homes, transportation, recreation, tradition, education).

Soon after the beginning of the 20th century, coal-mining companies began buying property and establishing businesses in Eastern Kentucky. The region was rural and the population was scattered through beautiful green valleys and on hillside farms, and travel was difficult. The men in the area were ready to work hard, but most were untrained in coal mining. In order to assemble enough men to work in the mines, laborers from outside the region had to be recruited. The companies realized that housing would be needed and began to build communities close to the mines. These companies did not only provide housing for the workers in their mines but also built the buildings used for offices and other needs of their employees. A coal mining community, called a coal camp, had a hospital, a post office, boarding houses and a company store where workers and their families could purchase necessities and luxuries. Churches, clubs, and schools were also built. Many coal camps also included a theater, park, and hotel.

The sons and daughters of mine company employees studied in coal camp schools. Some schools were small buildings with few students and several grades met in one room. Other camp schools were large two story brick schools that looked much like buildings in use today. In Benham, an International Harvester built Coal Camp and where Kentucky Coal Museum is located, the brick school was built in 1926. Before that time, classes were held in a smaller white frame building. The school was established about 1909 and the company sent to distant colleges to recruit the best teachers for their community. The first school was one large room and heated during cold weather with two coal stoves at each end of the room. Instead of a water fountain, the children drank from a pump on the back porch. The students each carried lunch from home every day because there was no cafeteria or dining room at school. At lunchtime and recess the children gathered on the yard around the school and played games, ran, and laughed with their friends. They enjoyed fast games of softball on the yard behind the school building. The children who went to school in coal camp schools frequently had plays and programs and invited their parents to watch. The school was an important part of family life in the coal camp.

Journal Entries from the Past
Social Studies: Culture/Heritage
Core Content:
SS-E-5.1.2 History can be understood by using a variety of primary and secondary sources and tools (e.g., artifacts, diaries, time lines).
SS-E-5.2.3 The way we live has changed over time for both Kentuckians and Americans because of changes in many areas (e.g., communication, innovations/inventions, homes, transportation, recreation, tradition, education).

These journal entries represent the stories told by people who lived and worked in the coal mining camps of Benham and Lynch, Kentucky during the last one hundred years. The memories of the retired miners and their families give us a glimpse of daily life in the Eastern Kentucky coalfields during the early and mid-1900s.

After reading these passages in class, ask your students to assume the persona of a coal camp resident and to create a journal entry or other writing that describes some of his or her activities during an average day. Use the RAFT writing strategy, if desired. More information on RAFT is located at the end of these readings.

Journal Entry of a Pastor's Wife

Today is Wednesday and I have had a busy week. Mr. Scott was killed in a rock fall at the coal mine on Monday morning. The funeral services were so nice with the choir singing beautifully. The ladies from the church made sure there was a big meal for the family and the church was filled with poor Mr. Scott's family and friends. The Girl Scout troop will be meeting at the church this afternoon and tomorrow the Boy Scouts will meet. The Creech family is busy this week preparing for their elder daughter's wedding on Saturday. They will be decorating the church on Friday evening with flowers from all the flowerbeds on their street. I visited dear Mrs. Vicini today and I took her a jar of my homemade grape jelly. The grape arbor was loaded with the most wonderful fruit last year. I do hope the vines bear as well this season. Oh my, it sounds like a storm is coming and I haven't pulled the weeds out of my flowerbeds and I have laundry hanging on the clothesline!

Diary of a Nurse's Assistant

I am so tired! Today has been a busy day at the Notre Dame Hospital. Mrs. Massey came in to have her blood pressure checked. (She was wearing the nicest hat!) One of the children of the coal miner who passed away at the first of the week has broken out with the measles. The School Superintendent called the doctor because he was worried that there could be a measles epidemic. Doctor is more concerned about Mr. Lucas than about a few cases of measles! Mr. Lucas was seriously injured in a rock fall at Mine Portal #30 last week. This afternoon, several school children were brought to the hospital to see the doctor. I helped give some of them injections and one little boy was really mad at me by the time his mother took him home. What a temper!

A Teacher's Journal

My students were extremely lively today. They were excited because the annual Spelling Bee will start tomorrow. We hope our school will have a State winner this year. Other reasons for excitement included the Girl Scouts talking about the work they are doing on a cooking patch and the Boy Scouts bragging about a camping trip planned for this weekend. After the Spelling Bee, we will get busy on the Spring Operetta. The families enjoy their children participating in this program each spring. The parents are proud anytime the children sing and dance for the community. I must check with the other teachers and the mothers on the progress of the costumes. How could we survive without those wonderful mothers who cut and sew the children's costumes? Speaking of community programs, the High School Band Spring Concert was great today. Director, Johnny Coppinger does a great job!

The Journal of a Coal Camp Police Officer

Today, I checked on two families who hadn't sent their children to school this week. I also directed traffic for the Veterans Day Parade. The Hungarian Band looked great in the parade—they really strutted down Main Street! The fellows marched in perfect step and their music was great. I also arrested two young boys who were stealing from the company store. Their parents were really embarrassed. I'll bet those kids got a real licking from their Dad when they got home. Occasionally, the company manger reprimands an employee because his child got in trouble. Sneaking a candy bar can sure cause more trouble than it is worth!

Architect's Diary

I finished the final plans for the New Lynch theatre this morning. The building will be beautiful and the families are going to have a wonderful place for movies, plays and concerts. The miner's and their families will enjoy seeing cowboy movies and the great musicals that the company brings in from Hollywood! And it will be fun to hear the brass band concerts from local folks like the Takacs family. I also toured the work site and saw the newest houses for miners being built from my plans. More and more of the men are bringing their wives and families into the coal camp and the single men are quickly marrying. Lynch is certainly a fast growing community!

Journal of a Coal Camp Homemaker

This morning as I look out the window, I see Mrs. Cooper working in her flowerbeds. She is in her flowers almost every morning keeping every weed pulled out and the plants watered and sprayed. It is no wonder she won the prize for the prettiest yard in Lynch and got her picture in the newspaper. I must finish my laundry and scrub the front porch today. My flowerbeds will just have to wait until tomorrow. I'm going to try to make my sheets and towels look as white as those Mrs. Jones has hanging on her clothesline. I wonder what kind of soap she uses in order to have such pretty laundry. Maybe her children do not get as dirty as my children do. I declare, I can already smell cakes baking across the street at Mrs. Keleman's kitchen. The smell of that pound cake she bakes causes the whole neighborhood to get hungry. She must use a half dozen eggs and a pound of butter in that cake. If the children were not in school, they would be at her back door waiting for her to hand out little samples. She really knows how to win their hearts: good sweets and nice treats. I think I'll just have to let the laundry wait long enough for me to walk over there and ask for that recipe!

Coal Camp Timeline Activity (Teacher)
Social Studies: Culture/Heritage
Core Content:
SS-E-2.3.1 Various human needs are met through interaction in and among social groups (e.g., family, schools, teams, and clubs)
SS-E-2.1.2 Elements of culture (e.g., language, music, art, dress, food, stories, folktales) serve to define specific groups and may result in unique perspectives.
SS-E-5.1.2 History can be understood by using a variety of primary and secondary sources and tools (e.g. artifacts, diaries, time lines)

1. Divide the class into two groups. Ask one group to read the Benham History and the other group to read the Lynch History. Both are included in this lesson plan

2. Hang two long pieces of line or wire across different ends of the classroom and have a number of clothespins available.

3. After the students have read the histories of the two communities, ask each group to choose a number of important events from the reading they have just enjoyed. Next, the students should write each event with the year of its occurrence on a 5.5" x 8.5". The papers can be decorated as the students choose. Allow the students to hang the slips of paper in chronological order on the wire using the clothespins.

4. Once the timelines are complete have a time of discussion when students can discuss their choices of events added to the time line and compare the development of these two coal camps.

Below is listed further information for lesson enhancement.

Lynch was a much larger coal camp than Benham.

Benham was established much earlier than Lynch with land purchases beginning in 1906 and coal shipments beginning in 1911. Lynch, on the other hand, Lynch land purchases began in 1910.

For a time, Benham had the largest coke ovens in the world. Lynch did not have coke ovens. Benham shipped most of their coal out as coke but Lynch did not.

When unions became a part of mining life, Lynch was a U.M.W.A. mine while the International Harvester mines at Benham were Progressive Mine Workers.

Both Benham and Lynch had award winning Mine Rescue Teams, athletic teams (especially softball), active churches, civic clubs, and law enforcement officers.

Lynch had a Country Club and golf course.

Benham History—A Narrative

During the 1900 to 1910 era, the Wisconsin Steel coal camp was called Yowell. The Wisconsin Steel Coal Mining Division of the International Harvester Co. sent a land surveyor to purchase land to develop a coal camp in 1906. In 1910, the mines began operation and the first coal was mined. During the early 1920's the Benham mines reached a peak of over 1,200 employees and had a total of 408 coke ovens, which burned coal into coke. During this time, the company built a post office, a doctor's office, a market building, two school buildings, a theater, and the company store. During the Depression years of the 1930's employment decreased to about 300-400. Following World War II, employment increased to approximately 1,000. The mines operated successfully until the 1950's, when the number of employees dropped to 400-500. During the early 1960s the company began selling the houses and lots to the employees. In 1961 Benham became an incorporated 6th class city. In the same year the last class graduated from Benham High School.

In 1979, C.R. Chrisman and Bruce Ayers began a movement with the Chamber of Commerce to develop a coal museum. In 1986, International Harvester Company sold their holdings to Arch of Kentucky. The employees were terminated and the mines shut down. The county closed Benham Elementary School in 1992. The school building was sold at a public auction in 1993 to a group of private investors and then developed into the Benham School House Inn that opened in 1994. During the same year, the Kentucky Coal Mining Museum, formerly the commissary building for International Harvester was opened to the public.

Fast Facts

Wisconsin Steel was the second coal camp to be built in Harlan County. Between 1910 and 1963 a total of 30,446,753 tons of coal were mined.

In 1910, Benham Coal miners won the silver cup in a mine first aid contest.

During the 1930's, Benham had the first electric coal drill in Harlan County.

In the early 1950's, International Harvester built the first coal preparation plant in eastern Kentucky. This plant could wash, separate, and load the coal into gondolas for shipment.

Benham History Fast Facts

Unscramble the tiles to reveal a message.

C O A	A N T	H E F	I R S T	I N T	I N T
1 9 5	S T E R	E R N A		B U I	H E E
O ' S ,	A L H	A R L Y	L P R	I N E	N P L
C K Y .	E P A R	E N T U	T I O N	A T I O	L T T
A R V E	R N K	A S T E			

Created by Puzzlemaker at DiscoveryEducation.com

Answer Key:
In the early 1950's, International Harvester built the first coal preparation plant in eastern Kentucky.

Lynch History
Culture/Heritage: Student Reading

In 1918 the Lynch Hotel was constructed and contained 108 bedrooms. The building was constructed of cut stone and log.

The first Lynch school building was opened for classes in the fall of 1921. Before that time the students attended classes in the "Rock House".

Many Lynch residents was sick in 1917 and 1918 due to an influenza epidemic but the death rate was lower than in surrounding areas due to the excellent medical care.

In 1910, U.S. Steel Corporation began purchasing land from the owners to build a coal camp and mining facility in Lynch, Kentucky.

In 1920 the Lynch Hospital was constructed. This building was made of cut stone. There were fifty-four holding beds. The hospital closed in 1961.

The Bank of Lynch was organized in 1917. It was originally called the Bank of Tee-El. The bank operated until it faltered with the Depression and closed in 1933 and had a foreign exchange of currencies and notes from over 15 countries.

The Lynch Commissary opened for business in 1920. It was referred to as the "Big Store" and was filled with everything carried in a large city store. It closed in the 1960s.

In 1917, Lynch buildings had electric lights before many of the houses in Knoxville or Lexington.

The Lynch Bath House was built in 1922 of cut stone. Over 5,000 men showered in the bathhouse each day.

The Lynch Colored School opened for classes in 1924.

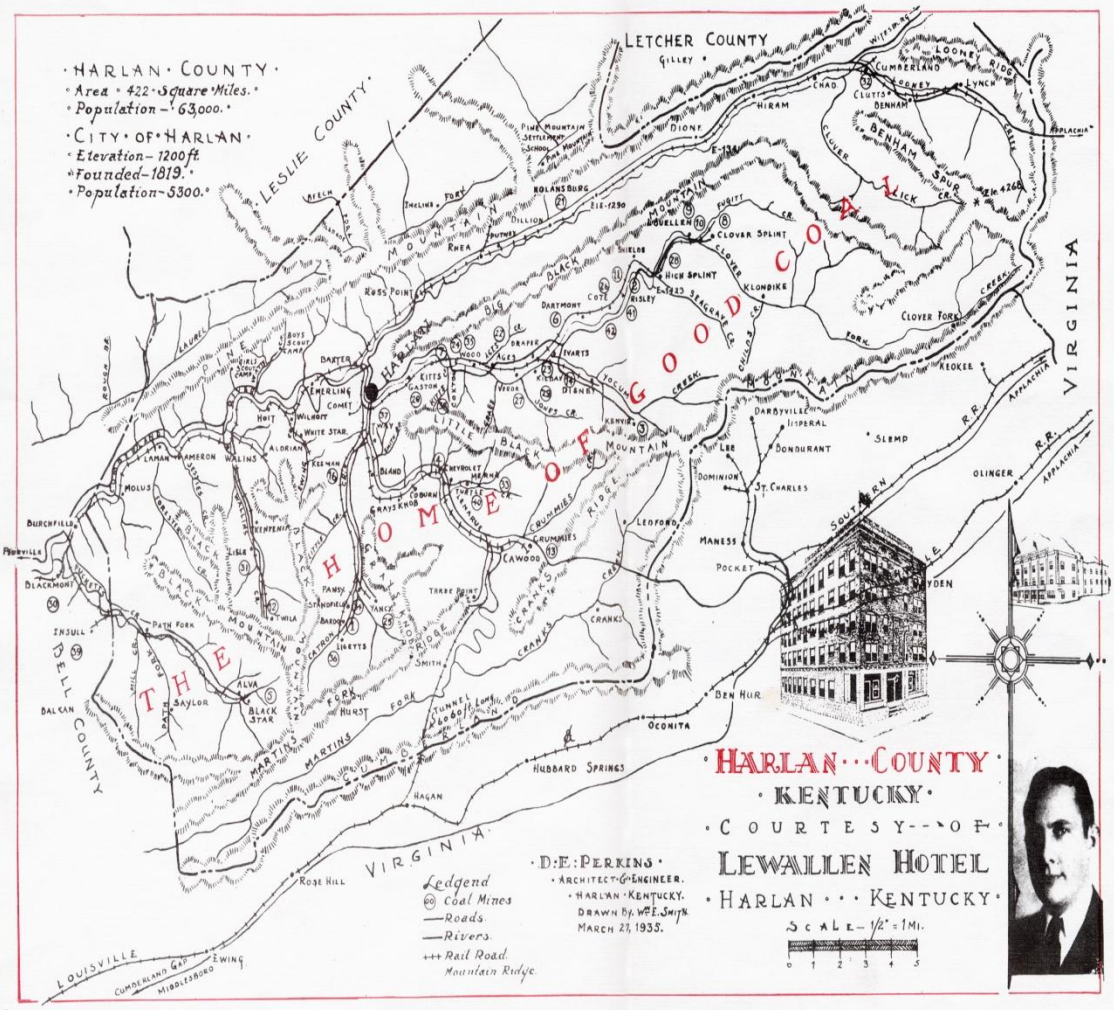
The United Mine Workers of America organized a union at the U. S. Steel mining facility in Lynch in 1936.

In the 1920's Lynch was one of the largest "Coal Camps" in the world.

The new Lynch Theatre held dedication ceremonies in March of 1937. The original 'movie house' was destroyed by fire.

In 1917 the first car of coal was shipped from Lynch.

A Bit of Nostalgia . . . The Early Days of Harlan County Coal Mining.



NAME OF COAL COMPANY / POSTOFFICE	MAP LOCATION
Black Star Coal Co., Alva, Kentucky	5
Bardo Coal Mining Co., Bardo, Ky.	1
Blue Diamond Coal Co., Chevrolet, Ky.	4
Black Mountain Corporation, Kenvir, Ky.	3
Berger Coal Mining Co., Lejunior, Ky.	2
Benito Mining Co., Benito, Ky.	11
Creech Coal Co., Twila, Ky.	12
Crummies Creek Coal Co., Crummies,Ky.	13
Clover Fork Coal Co., Kitts, Ky.	7
Cook & Sharp Coal Co., Lejunior, Ky.	26
Cornett Lewis Coal Co., Louellen, Ky.	9
Clover Splint Coal Co., Cloplint, Ky.	8
Darby Coal Co., Evarts, Ky.	6
Diamond Ashless Coal Co., Guffey, Ky.	42
Dixie Darby Coal Co., Lejunior, Ky.	26
Elcomb Coal Co., Elcomb, Ky.	16
Elkhorn Piney Coal Mining Co., Coxton, Ky.	24
Green-Silvers Coal Co., Harlan, Ky.	20
Harlan-Wallins Coal Corp., Verda, Ky.	27
Harlan Central Coal Co., Totz, Ky.	21
Harlan Fuel Co., Yancey, Ky.	25
Harlan Collieries Co., Brookside, Ky.	22
Harlan-Wallins Coal Corp., Molus, Ky.	30
Harlan Crown Mining Co., Draper, Ky.	0
Harlan Ridgeway Mining Co., Ridgeway, Ky.	41
High Splint Coal Co., High Splint, Ky.	28
Kentucky King Coal Co., Wallins Creek, Ky.	31
Kentucky Cardinal Coal Corp. Cardinal, Ky.	0
King Harlan Co., Kildav, Ky.	23
Mahan-Ellison Coal Corp., Liggett, Ky.	36
Mary Helen Coal Corp., Coalgood, Ky.	33
Perkins Harlan Coal Co., Liggett, Ky.	34
Southern Mining Co., Insull, Ky.	39
Splint Coal Corp., Splint, Ky.	21
Southern Harlan Coal Co., Lenarue, Ky.	40
Rex Mining Co., Kitts, Ky.	7
Three Point Coal Corp., Threepoint, Ky.	0
The P. V. & K. Coal Co., Lejunior, Ky.	42
United States Coal & Coke Co., Lynch, Ky.	0
Wisconsin Steel Co., Benham, Ky.	0
Walker Hosing Coal Co., Harlan, Ky.	0
R. C. Tway Coal Co., Harlan, Ky.	37

Coal Camp Food Traditions
Social Studies: Culture/Heritage
Core Content:
SS-E-2.3.1 Various human needs are met through interaction in and among social groups (e.g., family, schools, teams, and clubs)
SS-E-2.1.2 Elements of culture (e.g., language, music, art, dress, food, stories, folktales) serve to define specific groups and may result in unique perspectives.
SS-E-5.1.2 History can be understood by using a variety of primary and secondary sources and tools (e.g. artifacts, diaries, time lines)

Food Celebrations in Harlan County

Holiday food celebrations are as individual as the family. Each family develops their own traditions and even in close communities, celebrations differ from home to home. Take birthdays, for example. You may look forward to parties, gifts, a birthday cake with candles, and maybe even a costumed cartoon character or clown as one of the guests. At Kentucky Coal Museum we have photographic proof of a similar type of celebration in the early 1900s in Benham. There were several children invited to a party to celebrate their friend's birthday with refreshments, games, and gifts. All the guests were dressed in their best church clothes and the party was held on the front lawn of the coal camp home.

However, when that party was going on in Benham, many families in the same county were not celebrating birthdays with candles or gifts or birthday cakes. Many families could not afford to spend their small amount of money on such things and other celebrated in different ways. One senior citizen said that a birthday celebration in their childhood began and ended with a special supper featuring the favorite foods of the celebrant….or as many of their favorite foods as were available. The beautifully decorated cakes of today were not on the table. She said one of her brothers always asked for a fruitcake made from dried apples and raisins but she requested apple pie. She was an older adult before she ever blew out candles on a cake! Often a small hand-crafted toy was given to a child as the only gift. Birthdays just didn't seem as important to celebrate as they are now.

Other celebrations when the family had special food traditions include: Christmas Ham, Thanksgiving Turkey, Halloween Candy, Easter Eggs, Valentine's Day Chocolate, and Fourth of July Watermelon! Also, associated with special food traditions are church events such as homecomings and dinners on the ground, weddings, fellowship dinners, and bake sales. Community events that include traditional foods could be a special lollipop you always had while you watched the Christmas parade, foods taken for friends and families at wakes and funerals, popcorn at the movies, or hotdogs at the big game.

Food traditions help define our role in the family and help us learn about our family's roots. Sharing food traditions in a culturally diverse community increases our appreciation of our neighbors and their heritage. The next time you think, it just wouldn't be Christmas without Aunt June's fruit salad or 'it just isn't a birthday party without Cousin Fred's special BBQ', stop and consider your family food traditions. Then enjoy the good food!

Food Memories of Harlan Countians

I remember:
"…my dad frying oysters for breakfast on Thanksgiving morning…"
"…the delicious fried green tomatoes my mother use to fix…"
"…the big juicy blackberries my granddad picked on the hillside…"
"…the peanut butter candy my dad cooked once in a while…"
"…wild greens we picked along the fence around the hill…"
"…all the good garden vegetables dad grew every summer and mom cooked…"
"…fried apples and hot biscuits for breakfast…"
"…fruit at Christmastime…"

Birthday Cake History - Some historians think that the custom of the birthday cake was observed in ancient Greece, and they report that the birthday cake began with the Greeks who used to make honey cakes or bread. Ancient Romans celebrated three different types of birthdays: Private celebrations among family and friends, the birthdays of cities and temples and the birthdays of past and present emperors or members of the imperial family. The 50th year was celebrated with a honey cake made of wheat flour, grated cheese, honey, and olive oil.

Others contend that the Birthday Cake tradition was started in Germany in the Middle Ages where sweetened bread dough was made in the shape of the baby Jesus in swaddling clothes and were used to commemorate his birthday. The Birthday Cake later re-emerged in Germany as a kinderfest, or a birthday celebration for a young child.

In England, birthday cakes are baked with symbolic objects inside. In medieval times, objects such as coins and thimbles were mixed into the batter. People believed that the person who got the coin would be wealthy, while the unlucky finder of the thimble would never marry. Today, small figures, fake coins and small candies are more common.

Birthday candles originally were placed on cakes to bring birthday wishes up to God. In ancient times, people prayed over the flames of an open fire. They believed that the smoke carried their thoughts up to the gods. Today, we believe, that if you blow out all your candles in one breath, your wish will come true.

http://whatscookingamerica.net/History/CakeHistory.htm

Student Activities

Make your own "…I remember…" list. List special foods you remember eating with family or friends.
Choose one food from your list and write a paragraph describing what you remember about the food and eating it. Who were you with; where were you at; what were you doing; was it a special celebration day?
Think of a favorite food that someone in your home prepares regularly. Ask that person to help you write a recipe for that dish. Ask them to help you prepare that food for your family or friends.
Describe a celebration you have participated in that included food.

Something's Cooking in the Coal Camp!
Core Content:
MA-E 1.1.1 Whole numbers (0 to 100,000,000), fractions, mixed numbers, and decimals through thousandths
MA-E 1.1.2 The operations of addition, subtraction, multiplication, and division
MA-E 1.2.3 Add and subtract fractions with like denominators' add and subtract decimals though hundredths
RD-04-2.0.3: Students will locate key ideas or information in a passage
RD-04-2.0.4: Students will interpret the meaning of specialized vocabulary (words and terms specific to understanding the content).
RD-04-3.0.4: Students will identify main ideas and details that support them.
SS-E-2.3.1 Various human needs are met through interaction in and among social groups (e.g., family, schools, teams, and clubs)
SS-E-2.1.2 Elements of culture (e.g., language, music, art, dress, food, stories, folktales) serve to define specific groups and may result in unique perspectives.
SS-E-5.1.2 History can be understood by using a variety of primary and secondary sources and tools (e.g. artifacts, diaries, time lines)

Activity: Ask students to read the introduction and recipes together. Divide into small groups and ask each group to discuss the section titled Food for Thought . Allow time for sharing their thoughts with the class afterward.

The Coal Camp Kitchen

Something good was always cooking in the homes of the hard working miners!

The kitchen was the center of home life in the coal camp with meal preparation, dining, and clean-up all taking place in a single room. Many evening tasks and recreational activities were also done around the kitchen table. Most wives and mothers were full time homemakers in the days that Benham and Lynch were two of Kentucky's most productive coal mining operations. Even when household funds were scarce, it seemed there was always something warm and satisfying bubbling on the stove to welcome the children home from school and the men home from a hard day's work.

Many of the homemakers cooked foods that had a long history in other countries, serving the same meals their parents in Eastern Europe had served them. Others cooked 'mountain fare'. Many of the families kept a garden for a sure supply of fresh vegetables and the men often supplemented the menu with wild game. Many coal camp residents kept chickens, a cow, or a pig to add protein and delicious food to their family's menu.

There were no quick stops for pizza or hamburgers in those days. Boxed convenience foods were unknown. Frozen dinners, meals in a box, or 'just add water' were undreamed of for those families. The stove was coal fired, had a warming oven for keeping foods hot, and usually had a reservoir for heating water. There were no microwaves or small electric appliances in most homes during the early days of coal mine camps. Cooking was a little more complicated, more time consuming, and very rewarding for the homemakers who took pride in the job they were doing.

Following are several recipes that a homemaker in a coal mining camp could have used to prepare a meal for her family. Think about the type of foods your family eats as you read the recipes.

Coal Camp Recipes

Fried Green Tomatoes

4 large green tomatoes
2 cups plain white corn meal
1 ½ tablespoon salt
½ teaspoon of black pepper
½ cup fat

Wash the tomatoes and pat dry. Slice tomatoes in 1/4-inch slices. Sprinkle with salt and pepper. Coat each slice with corn meal and lay aside. Heat fat in iron skillet. Fry tomato slices until golden brown. Serve hot with lots of crusty cornbread!
Yield: 4 servings

Fried Sweet Corn

8 ears young corn
¼ cup bacon drippings
¾ cup milk
Salt and pepper to taste
1 teaspoon sugar
(optional)
1 tablespoon butter
Cut corn close to outer edge and then scrape the ear to remove all the milk. Add corn to bacon drippings that have been heated in heavy iron skillet. Add milk, salt, pepper, and sugar. Stir frequently. Cook approximately 20-30 minutes. Add butter during the last few minutes of cooking.
Yield: 4 servings

Blackberry Cobbler

Pastry for 1 pie:
1 cup all-purpose flour
½ teaspoon salt
¼ lb. butter, at room temperature
¼ cup fat
3 tablespoons ice cold water

Filling:
4 cups blackberries
1 ¼ cups sugar
4 tablespoons flour
¾ cup water

2 tablespoons butter

Preheat Oven to 400°. Prepare pastry: Put flour, salt, butter, and fat into a bowl and mix with fork until the size of small peas. Add ice water and mix to pastry consistency. Set bowl in a shallow pan of cold water or set in dairy (cooler) while preparing filling. Wash and cap berries; drain. Combine berries, sugar, flour, and water, and place in heatproof baking pan. Roll out pastry on floured board and cut into 3/4 " strips. Place small pieces of pastry into berry mixture. Arrange rest of pastry strips on top of berries and top with dots of butter or margarine; sprinkle lightly with sugar. Bake at 400° until crust is golden brown. Serve hot with ice cream or sweetened whipped cream.
Yield: 6 - 8 servings

Old Fashioned Gingerbread

1-cup sugar
2 teaspoons soda
1-cup molasses
2 teaspoons baking powder
1-cup butter
2 eggs
2 cups buttermilk
2 tablespoons ginger

Add all to pan of flour, add butter and mix as biscuit dough.
Roll out, place in pans and bake at 425 degrees until done.

Hungarian Goulash (Gulyasleves)

2 pounds stew beef
1-teaspoon salt
2 onions, chopped
2 Tablespoons lard or shortening
2 Tablespoons, sweet paprika 2 bay leaves
1 quart water
4 peeled and diced potatoes
1/4 tsp. black pepper

Cut beef into 1-inch squares and add ½ teaspoon salt. Brown onions in shortening and then add the beef and paprika. Simmer the beef in its own juices for 1 hour on low heat. Add water, diced potatoes and remaining salt. Cover and simmer until potatoes are done and meat is tender.

Prepare egg dumpling batter:
1 egg
6 Tbsp. flour
1/8 tsp. salt

Add flour to unbeaten egg and salt.
Mix well. Let stand for 1/2 hour for flour to mellow. Drop by teaspoonful into Goulash. Cover and simmer 5 minutes after dumplings rise to surface. Serves 6.

Food for Thought

How is your family kitchen similar to a coal camp kitchen? How is it different?
Name several ways your meals are similar and several ways your meals are different from the meals described in the coal camps.
How would it change your evenings if there were no convenience foods, fast food, or microwaves?
Make a list of activities you can do at the kitchen table.
Make a grocery list of the items and amounts you would need to buy in order to make two cakes of gingerbread.
You only need Blackberry Cobbler for 3 or 4 people. Write the recipe for the correct amounts of ingredients.

Coal Town Commissary (General Store)
Core Content:
RD-04-2.0.3: Students will locate key ideas or information in a passage
RD-04-2.0.4: Students will interpret the meaning of specialized vocabulary (words and terms specific to understanding the content).
RD-04-3.0.4: Students will identify main ideas and details that support them.

Coal Town general stores or commissaries in the early 1900s were often located in small cramped buildings and filled with merchandise to meet the needs of miners and their families. Food, clothing and cloth, shoes, animal feed, tools, hardware, guns and ammunition, tools, appliances and household items were a few of the supplies residents could purchase there. Miners in the coal town had a credit account at the company store. The coal company owned and operated the commissary and collected the money their employees owed the commissary each payday.

If the coal town happened to be a Cadillac or Model Coal Camp (a coal town with good living and working conditions and with modern amenities) the general store might be more like the superstore or mall in your local hometown. This type of general store was often arranged like a department store with the merchandise divided into specific areas: shoe department, ladies clothing, soda fountain, garden supplies, furniture, etc.

The Benham Coal Company Commissary in Benham, KY, was located in a three story brick building built in 1923. It was known for having a large Shoe Department and for the delicious chocolate milk shake made at its Soda Fountain. Furniture and appliances, garden needs, and clothing were also for sale in this commissary. Benham's company store did business as Benham Department Store. It was located in a Cadillac coal town. Another Model Coal Camp was at Lynch, Kentucky where the commissary was located in a large, modern building with numerous choices for shoppers.

Coal Town Commissary
Quiz

1. The general stores in the early coal camps were called _____.

2. The name given to the big coal camps where there were good living and working conditions and with modern amenities was called a _____or _____.

3. List some of the different departments or specific area you might find in those stores:

In Class Project Suggestion
Ask students to interview their grandparents or an older person if they lived in a coal camp that had a commissary and if so, what it was like to shop there. Have the students share their finding with the class.

Teacher's Page:
Coal Town Commissary
Quiz (Answers)

1. The general stores in the early coal camps were called Commissaries.
2. The name given to the big coal camps where there were good living and working conditions and with modern amenities was called a Cadillac or Model Coal Camp.
3. List some of the different departments or specific area you might find in those stores: Food, shoes, Soda Fountain, Garden Supplies, Furniture, Baby Clothing, Ladies clothing, Men's Clothing, Appliance, House wares

Coal Town Commissaries

S	T	U	S	M	S	R	G	K	P	J	S	C	S	T	Z	D	C	C	B
N	T	U	D	G	E	T	A	N	C	F	L	U	O	B	S	I	O	D	E
U	H	Z	Z	N	K	R	O	Q	I	O	G	U	M	C	C	O	I	O	K
G	W	N	Y	I	F	W	C	R	T	D	S	U	P	P	L	I	E	S	F
Q	I	A	U	H	C	T	A	H	E	O	L	V	D	J	B	Q	B	U	A
B	W	V	J	T	I	Q	N	G	A	D	Z	I	R	C	R	E	D	M	E
P	M	I	K	O	R	D	I	Z	S	N	C	B	U	Q	P	B	M	K	E
E	L	J	F	L	V	Q	M	P	I	G	D	H	H	B	T	U	Y	R	Y
M	V	V	V	C	L	I	A	G	Z	V	B	I	C	Z	N	R	A	D	A
H	O	U	S	E	H	O	L	D	I	T	E	M	S	I	S	W	F	R	I
K	L	E	R	D	E	P	F	J	C	L	T	Q	T	E	D	S	S	T	K
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F	S	B	V	S	H	D	E	M	H	E	O	W	A	D	B	O	H	U	C
L	N	B	M	R	O	U	D	Z	M	N	S	H	E	S	W	E	Y	E	Q
Q	N	S	E	C	N	A	I	L	P	P	A	I	Z	M	J	S	T	D	B

AMMUNITION
ANIMALFEED
APPLIANCES
BUILDING
CLOTH
CLOTHING
FOOD
GUNS
HARDWARE
HOUSEHOLDITEMS
MERCHANDISE
SHOES
STORE
SUPPLIES
TOOLS

The Key to Refreshment:
The Commissary Soda Shop

In 1922-23, when International Harvester Company designed and built their new three-story commissary in downtown Benham, Kentucky, a portion of the floor space was reserved for a Soda Fountain. The community planners knew how important the Soda Fountain would become to their customers and employees. When construction was complete, a large, square counter was placed on the left side of the commissary's first floor. Small, round metal tables and chairs dotted the area. The menu displayed behind the counter included hotdogs, hamburgers, and soda's as well as ice cream treats. Banana splits and sundaes were available, but chocolate milkshakes were a frequently requested specialty.

Mining company employees who worked in the commissary, hospital, and other downtown building enjoyed the convenience of the Soda Fountain for grabbing a cup of coffee, a soda, or a quick sandwich. Many of those same workers (who didn't want to walk home at lunchtime) ate their mid-day meal at the counter. Shopper, also, took advantage of the convenience of the Soda Fountain and enjoyed a cup of coffee and rested between errands. Many of the students who attended Benham School came to the Soda Fountain for lunch. As the child of a company employee, a student could charge their lunch to their dad's account if he had approved it. Of course, if a student treated their friends or spent too much, their father often cut off their credit when he checked his bills at the end of the month. That resulted in a student walking home or packing a meal for lunch each day. It also meant missing the fun of walking down the hill from school to the commissary and not being able to visit with their buddies during lunch. No one wanted to risk losing the privilege of eating at the Fountain counter or crowding around one of the small round tables in the vast coolness of the Commissary.

After the last school bell in the afternoon, the students returned to the Soda Fountain. Boyfriends carried stacks of books down the hill from the school while the girls wore their boyfriend's letter sweaters and strolled close beside them. Once inside the massive brick structure that housed the community's shopping center, they chose a table, sat head to head and shared a float or a soda with two straws. Groups of girls, sharing secretes, stopped for sodas while their male classmates huddled around their own tables loaded with ice cream sundaes. Laughter rang through the commissary.

Kentucky Coal Mine Scrip
Core content:
PL-04-3.1.1: Students will explain the difference between wants and needs as it relates to consumer decisions.
PL-04-3.2.1: Students will explain the purpose of a budget and define the basic components (income, expenses, and savings).
AH-04-2.1.1: Students will identify how music has been a part of cultures and periods throughout history.
Cultures: Native American,
Traditional Appalachian
West African
Similarities and differences in the use of music (e.g., ceremonial purposes) and the use of elements of
music among cultures (musical instruments, e.g., Native American – rattles, drums, flutes, Appalachian – dulcimer, fiddle, banjo, guitar, West African – drums, rattles, thumb piano); polyrhythm in West African music not in Native American
Periods:
Colonial American (e.g., work songs, game songs, patriotic music, lullaby, folk music)
Native American includes period in North America before European settlement
RD-04-2.0.3: Students will locate key ideas or information in a passage
RD-04-2.0.4: Students will interpret the meaning of specialized vocabulary (words and terms specific to understanding the content).
RD-04-3.0.4: Students will identify main ideas and details that support them.

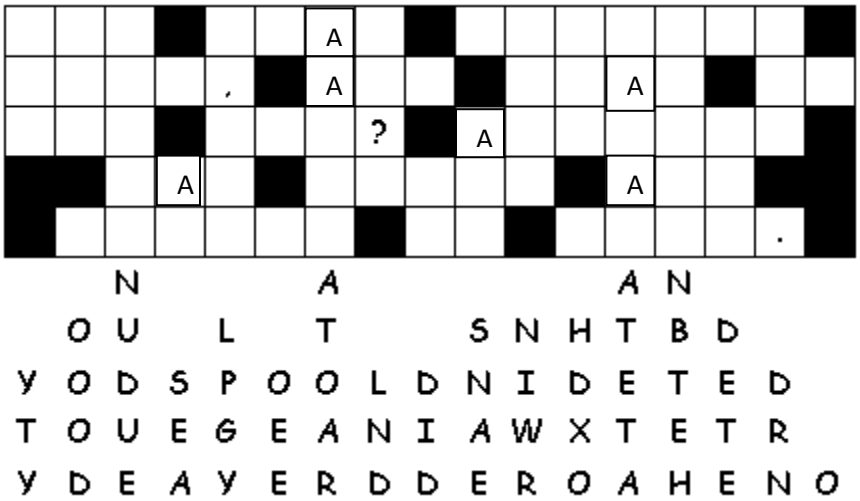
Coal mining began to grow into a significant industry in Eastern Kentucky in the late 1800s. Due to the rural situation of mining operations and difficulties transporting large amounts of cash over poor roadways, many coal companies chose to issue tokens to pay their workers. By the 1920's the use of coal mine scrip had become common practice. The scrip was good at the company store or other company owned businesses. The miner could receive U. S. currency on payday if he did not owe the company money. In addition to groceries, clothing, and other necessities for the home, a miner often had to pay rent to live in a company house, pay for his own tools, powder, caps, and provide other mining supplies. He was often charged a monthly fee for the company doctor, water, electricity, blacksmith charges on his tools, and make a contribution to a funeral fund. In the song "Sixteen Tons": "You load sixteen tons, and what do you get? Another day older and deeper in debt. St. Peter don't you call me cause I can't go-I owe my soul to the company store", was the way of life for many coal miners.

Scrip was made from aluminum, copper, brass, paper fiber, bronze, nickel, wood, and zinc. Most metal scrip were punched with a letter or symbol that made it easier to recognize and sort. The use of scrip by businesses such as mining companies stopped in the mid 1950s, but the metal tokens are now a favorite collector's item.

Listen to the definitive mining song, "Sixteen Tons"
Link: Wikipedia: http://en.wikipedia.org/wiki/Sixteen_Tons

16 Tons

Fill in the blanks with the missing letters to write a verse in the song “16 Tons”. All the “a’s” have been placed for you. (Hint: The verse is in the paragraph written above.)



Created by Puzzlemaker at DiscoveryEducation.com

Kentucky Coal Mine Scrip
Quiz

1. When did coal mining begin to grow into an industry in Kentucky?

2. What was scrip?

3. What was scrip made from?

4. What charges were cut from a coal miner's pay?

5. When was scrip no longer used by industries?

Teacher's Page
Kentucky Coal Mine Scrip
Quiz (Answers)

1. When did coal mining begin to grow into an industry in Kentucky? In the late 1800s

2. What was scrip? Tokens used by coal companies to pay miners wages.

3. What was scrip made from? Aluminum, copper, brass, paper fiber, bronze, nickel, wood, zinc

4. What charges were cut from a coal miner's pay? Items bought from the company store such as: groceries, clothing, necessities for the home; rent, tools, black powder (explosive), caps, mining supplies, medical charges or insurance, water, electricity, blacksmith charges for tools, and funeral fund charges.
5. When was scrip no longer used by industries? mid-1950's

Two Miners Working With An Auger

Mining for Math Solutions
Grades 3, 4
Student Sheet

1. A Coal Miner worked 5 days each week and 8 hours each day. How many hours did the miner work each week?

2. In 1947, the Kentucky Coal Association was formed. In 1997, The Association celebrated its 50th anniversary. How many years has the Kentucky Coal Association been in service?

3. During one accounting year, four Eastern Kentucky coal counties produced the following amounts of coal: Pike County produced 34 million tons, Perry County produced 12 million tons, Knott County produced 11 million tons, and Harlan County produced 10 million tons of coal. How many million tons of coal did these four counties mine?

4. In 1980 there were 34,521 mining related jobs in eastern Kentucky coal counties. In 2000 there were 12,900 mining related jobs. How many mining related jobs were lost in those 20 years?

5. In 2000, there were 19 counties in Eastern Kentucky and 9 counties in Western Kentucky that produced coal. How many Kentucky counties were coal producing in 2000?

6. In Harlan County, mining permits have been issued to 40 underground mines and to 18 surface mines. How many mining permits have been issued for Harlan County? Which type of mining is larger?

7. In the Commonwealth of Kentucky, there are 3 major ways to transport coal from mines to markets. Over 94.6 million tons are shipped by railway, over 24 millions of tons are shipped by waterways and over 1.94 billion ton are transported by truck. Which method of transportation moves the most tons of coal?

8. Kentucky has 120 counties. There are nine coal-producing counties in Western Kentucky and 19 in Eastern Kentucky. How many counties are not coal-producing counties?

9. 97% of Kentucky electricity is generated from coal. What percentage of the electricity in Kentucky is generated from other resources?

10. In 2001, Kentucky issued permits for two coal-fired electric power plants to be built. These were the first permits to be issued in 20 years. What was the last year for a permit to be issued in Kentucky?

Mining for Math Solutions
Grades 3, 4 (Teacher)
Core Content:
MA-E 1.1.1 Whole numbers (0 to 100,000,000), fractions, mixed numbers, and decimals through thousandths
MA-E 1.1.2 The operations of addition, subtraction, multiplication, and division

1. A Coal Miner worked 5 days each week and 8 hours each day. How many hours did the miner work each week? **40 Hours**

2. In 1947, the Kentucky Coal Association was formed. In 1997, The Association celebrated its 50th anniversary. How many years has the Kentucky Coal Association been in service? **Answer will vary according to current year. In 2003: 56 years**

3. During one accounting year, four Eastern Kentucky coal counties produced the following amounts of coal: Pike County produced 34 million tons, Perry County produced 12 million tons, Knott County produced 11 million tons, and Harlan County produced 10 million tons of coal. How many million tons of coal did these four counties mine? **67 million tons**

4. In 1980 there were 34,521 mining related jobs in eastern Kentucky coal counties. In 2000 there were 12,900 mining related jobs. How many mining related jobs were lost in those 20 years? **21,621**

5. In 2000, there were 19 counties in Eastern Kentucky and 9 counties in Western Kentucky that produced coal. How many Kentucky counties were coal producing in 2000? **28**

6. In Harlan County, Kentucky, mining permits have been issued to 40 underground mines and to 18 surface mines. How many mining permits have been issued for Harlan County? **58** Which type of mining is more common? **Underground Mines**

7. In the Commonwealth of Kentucky, there are 3 major ways to transport coal from mines to market. Over 94.6 million tons are shipped by railway, over 24 millions of tons are shipped by waterways and over 1.94 billion ton are transported by truck. Which method of transportation moves the most tons of coal? **More coal is shipped by railway. 94.6 million > 24 million and 94.6 million >1.94 billion.**

8. Kentucky has 120 counties. There are nine coal-producing counties in Western Kentucky and 19 in Eastern Kentucky. How many counties are not coal producing counties? **92 counties**

9. 97% of Kentucky electricity is generated from coal. What percentage of the electricity in Kentucky is generated from other resources? **3 %**

10. In 2001, Kentucky issued permits for two coal fired electric power plants to be built. These were the first permits to be issued in 20 years. In what year had the last permit been issued in Kentucky? **1981**

Mining for Math Solutions
Grades 5, 6
Student Sheet

1. A mining crew of seven men mined enough coal to fill 3, one hundred thousand ton gondolas (train coal cars) in an 8-hour shift. For how many tons would each miner be responsible?

2. The KY coal industry paid $141.2 million in coal severance taxes in the fiscal year 2000/2001. $2.3 million in severance taxes was paid to the coal producing counties in Western Kentucky. How much severance tax money was paid to Eastern Kentucky counties?

3. A coal company employed 120 miners. Seventy of those miners worked 40 hours weekly, while 50 worked 44 hours each week. Each miner earned $19.00 per hour. How much was the company's payroll?

4. Harlan County is 4th in the Eastern Kentucky coalfields in coal production. In 2000, there were 1,146 mining related jobs. In 1994, there were 2,175 mining related jobs. How many jobs were lost in Harlan County between 1994 and 2000?

5. Harlan County lost over 1,000 jobs in 6 years. How much money did the Harlan County economy lose in unpaid payroll? The 2000 payroll was $46,829,016 and the 1994 payroll was $84,956,110.

6. One pound of coal can produce 1.25-kilowatt hours of electricity. This is enough electricity to light one 100-watt bulb for 10 hours. If your home has six rooms and each room has two 100-watt bulbs burning for 10 hours per day how many pounds of coal would you use?

7. With the lowest rates in the U.S., most Kentuckians pay 4.1 cent per kilowatt-hour for electricity. If your home used 126-kilowatt hours, how much would your cost be?

8. 78% of coal produced in Western Kentucky and 57% of coal produced in Eastern Kentucky were from underground mining. What percent of coal was produced in surface mining in each area? In the state as a whole?

9. In 2000, Kentucky had 246 underground mines in operation. The continuous mining method extracted 68.3 million tons while conventional mining methods produced 1.7 million tons. 10.0 million tons were produced by the longwall mining method and other types of underground mining accounted for .02 million tons. How many tons of coal was produced in 2000?

10. In 2000, Kentucky had 162 surface mines in operation. Surface method produced 12.6 million tons. 36.3 million tons of coal were extracted using the surface and auger method.

Auger Mining produced 1.6 million tons of coal in the same year. How much coal was produced in Kentucky in 2000?

Mining for Math Solutions
Grades 5, 6 (Teacher)
Core Content:
MA-E 1.1.1 Whole numbers (0 to 100,000,000), fractions, mixed numbers, and decimals through thousandths
MA-E 1.1.2 The operations of addition, subtraction, multiplication, and division

1. A mining crew of seven men mined enough coal to fill 3, one hundred thousand ton gondolas (train coal cars) in an 8-hour shift. For how many tons would each miner be responsible? 300,000 /7 = 42,857.1 tons

2. The KY coal industry paid $141.2 million in coal severance taxes in the fiscal year 2000/2001. $23 million in severance taxes was paid to the coal producing counties in Western Kentucky. How much severance tax money was paid to Eastern Kentucky counties? **$118.2 Million**

3. A coal company employed 120 miners. Seventy of those miners worked 40 hours weekly, while 50 worked 44 hours each week. Each miner earned $19.00 per hour. How much was the company's payroll? **$95,000.00**

4. Harlan County is 4th in the Eastern Kentucky coalfields in coal production. In 2000, there were 1,146 mining related jobs. In 1994, there were 2,175 mining related jobs. How many jobs were lost in Harlan County between 1994 and 2000? **1,029 jobs**

5. Harlan County lost over 1,000 jobs in 6 years. How much money did the Harlan County economy lose in unpaid payroll? The 2000 payroll was $46,829,016.00 and the 1994 payroll was $84,956,110.00. **$38,127,094**

6. One pound of coal can produce 1.25-kilowatt hours of electricity. This is enough electricity to light one 100-watt bulb for 10 hours. If your home has six rooms and each room has two 100-watt bulbs burning for 10 hours per day how many pounds of coal would you use? **12 pounds of coal**

7. With the lowest rates in the U.S., most Kentuckians pay 4.1 cent per kilowatt-hour for electricity. If your home used 126-kilowatt hours, how much would your cost be? **$5.17**

8. 78% of coal produced in Western Kentucky and 57% of coal produced in Eastern Kentucky were from underground mining. What percent of coal was produced in surface mining in each area? In the state as a whole? **KY: 65%, W. KY: 22%, E. KY: 43%**

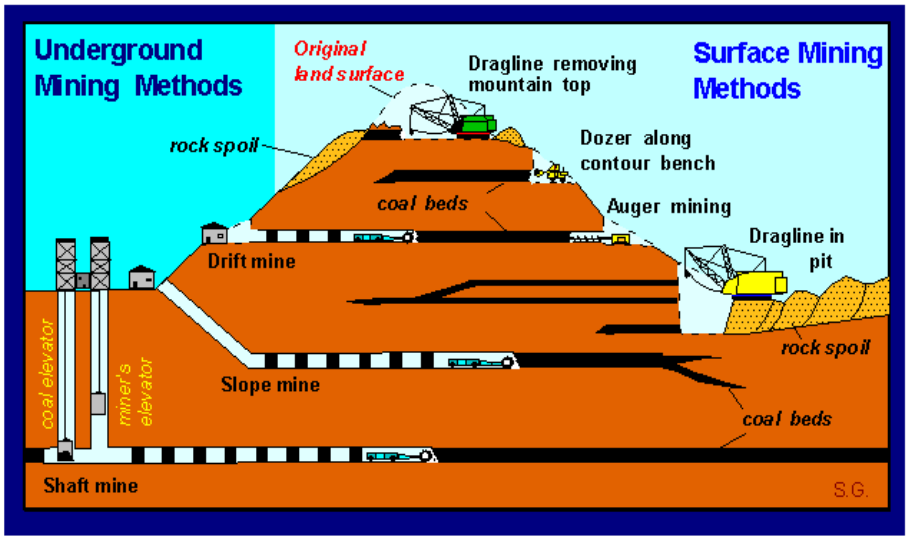
9. In 2000, Kentucky had 246 underground mines in operation. The continuous mining method extracted 68.3 million tons while conventional mining methods produced 1.7 million tons. 10.0

million tons were produced by the longwall mining method and other types of underground mining accounted for .02 million tons. How many tons of coal was produced in 2000? **80.02 million tons**

10. In 2000, Kentucky had 162 surface mines in operation. Surface method produced 12.6 million tons. 36.3 million tons of coal were extracted using the surface and auger method. Auger Mining produced 1.6 million tons of coal in the same year. How much coal was produced in Kentucky in 2000? **50.5 million tons**

Mining Activity
Math/Science/Social Studies
Core Content:
MA-E-1.1.2 The operations of addition, subtraction, multiplication, and division.
SC-E- 2.1.1 Earth minerals include solid rocks and soils, water, and the gases of the atmosphere. Minerals that make up rocks have properties of color, texture, and hardness. Soils have properties of color, texture, the capacity to retain water, and the ability to support plant growth. Water on Earth and in the atmosphere can be a solid, liquid, or gas.
SC-E – 2.1.2 Earth materials provide many of the resources humans use. The varied materials have different physical and chemical properties, which make them useful in different ways, for example, as building materials (e.g., stone, clay, marble), as sources of fuel (e.g., petroleum, natural gas), or growing the plants we use as food.
Social Studies
SS-E-3.1.3 Every time a choice is made, an opportunity cost is incurred. Opportunity cost refers to what is given up when an economic choice is made.
SS-E-3.2.1 Economic systems can be large (e.g., U.S. economy) or small (e.g., individuals and households).
SS-E-3.2.4 Profit is the difference between revenues and the costs entailed in producing or selling goods or services.

Objective:
Mining is a complex process in which relatively small amounts of valuable (gold) or useful (coal) minerals or metals are extracted from very large masses of rock. This activity will illustrate how this "needle in a haystack" process works. Students will be able to experience "hands-on" the difficulty that miners face in locating valuable mineral deposits. They will also learn a simple lesson in economics--a less valuable commodity may be more profitable because it is more abundant. Students will be shown the importance of clean, environmentally conscious mining, and will learn that all mining operations must pay for reclamation work.



(http://www.uky.edu/KGS/coal/webcoal/pages/coalming.htm)

Materials:
Wild Bird Food - any commercial birdseed mix with sunflower seeds and at least 2 other seed varieties.
Shallow pans (inexpensive plastic paint pans work well).
Small beads (approximately 2mm) blue, gold and silver.
Medium beads (approximately 4-6mm) white color.

Activity:
Divide students into groups of 4 to 6.
Pour approximately 1 pound of birdseed in each pan.
Add 2 gold beads, 4 silver beads and 8 blue beads, and 3 white beads to each pan - mix into birdseed.
The beads and seeds represent the following:

Gold beads = Gold
Silver beads = Silver
Blue beads = Coal
Sunflower seeds = Copper
All other seeds = Waste
White beads = Reclamation (These beads will be assigned a COST rather than a VALUE because reclamation must be done at all mining operations regardless of how much profit was made. See #7.)

Students search through the seed mixture and separate out or "mine" beads, sunflower seeds and other grain products, making piles of each. Allow 5 to 10 minutes for the mining activity. (NOTE: The instructor should hint to the students that they should mine NEATLY, not mixing

waste seeds with their beads, sunflower seeds and not scattering seeds all over the area. Instructor can have the option of examining the work of each group, or assigning a helper to monitor each group to see how cleanly the "mining" is being done. Instructor or helper may assign an arbitrary "fine" to cover costs for "environmental damage" at the messy tables.
Assign a value for each type of bead or seed. Example follows:

Gold bead = Gold = $5.00 each
Silver bead = Silver = $4.00 each
Blue bead = Coal = $3.00 each
Sunflower seeds = Copper = $2.00 each
All other seeds = Waste = $0.00
White beads = Reclamation = $100.00 each

Have the students count up the number of gold, silver, and blue beads, sunflower seeds from their piles and multiply the number of each by their values given in #6. Document all information on the "Birdseed Mining Spreadsheet." Students should also note the amount of any environmental damage fines on the spreadsheet. Students should count the number of white beads in their pile and multiply by the reclamation factor. This number should be recorded on the reclamation cost line on the spreadsheet.
Have each group total up the dollar value of their "mining" operation, subtracting the environmental damage fines and reclamation costs. Have each group share their success with the others. Prizes may be awarded to the best table of "miners."

Birdseed Spreadsheet - K-3
Gold bead = GOLD:
Number of beads _____ x _(price)__ = _(value)__
Silver bead = SILVER:
Number of beads _____ x _(price)__ = _(value)__
Blue beads = COAL:
Number of beads _____ x_(price)__ = _(value)__
Sunflower seeds = COPPER:
Number of Sunflower seeds _____ x _(price)__ = _(value)__
TOTAL Value of all Products = _____
SUBTRACT cost of Environmental Damage fines = _____
SUBTOTAL = _____
Number of WHITE beads _____ x $100.00 = _____
SUBTRACT reclamation cost from SUBTOTAL = _____
GRAND TOTAL = _____

Birdseed Spreadsheet - Grades 4-12
GOLD BEAD: Each gold bead = 10 oz. of gold ($280/oz).
Number of beads _____ x 10 oz. = _____ x_(price)__ = _(value)__
SILVER BEAD: Each silver bead = 10 oz. of silver ($5.70/oz).
Number of beads _____ x 10 oz. = _____ x _(price)__ = _(value)__
BLUE BEAD: Each blue bead = 100 lbs. of coal (or 2,000 lbs. of coal = 1 ton = $23.00/ton).
Number of beads _____ x 100 lbs. = _____ x _(price)__ = _(value)__
SUNFLOWER SEEDS: Each Sunflower seed = 100 lbs. of copper (or 2,000 lbs. of copper = 1 ton $0.75/ton).
Number of Sunflower seeds _____ x 100 lbs. = _____ x _(price)__ = _(value)__

TOTAL Product Value = _____
SUBTRACT cost of Environmental Damage fines = _____
SUBTOTAL = _____
Number of WHITE beads _____ x $100.00 = _____
SUBTRACT reclamation cost from SUBTOTAL = _____
GRAND TOTAL = _____

Adapted from materials provided by Women In Mining, Kentucky Geological Survey and coaleducation.org

Be A Coal Miner Math Game (Teacher)
Core Content:
Grade 3-5:
MA-E 1.1.1 Whole numbers (0 to 100,000,000), fractions, mixed numbers, and decimals through thousandths
MA-E 1.1.2 The operations of addition, subtraction, multiplication, and division
Grade 6:
MA-E 1.1.2 The operations of addition, subtraction, multiplication, and division
MA-E 1.2.3 Add and subtract fractions with like denominators' add and subtract decimals though hundredths

Be a Coal Miner

The Coal Miner's job today is both mentally and physically challenging. This activity illustrates the miner's workday from portal to portal. Solve math problems to advance through each mining task and finish the day to become a genuine coal miner!

Complete the problems with each step before marking the coal beside the number.

1. The miner begins the day very early after you dress in special clothing and put on your safety equipment. You enter the mine portal and ride to the working section on a mantrip. Complete problems 1, 2, and 3 before marking this step.

2. This morning the miner's job is clearing the cable (making sure the electrical cable does not hang up on anything or get in way of the machinery). You work near the continuous miner (a machine that runs constantly, digging the coal from the coal seam). Complete problems 4 and 5 before you mark this step.

3. Another miner working on your section tells you a joke. As you work, he also shares a concern about a family problem. Miners form close relationships and you are a good friend to your co-workers. Mark this step.

4. The miner spreads rock dust on the top and ribs (side walls) and wets down the face of the mine (the area where coal is being removed) in order to prevent explosions and to keep down dust. Complete problems 6 and 7 before marking this step.

5. Lunchtime. The miners eat in the dinner hole. You remembered your sandwich, milk, and pie. You put a heavy rock on top of your dinner bucket so the rats couldn't open your bucket and eat your lunch. Good job! Mark this step.

6. The mining supervisor asks you to clear the beltline. This means you must pick up rocks and shovel mud away from the conveyor belt that carries coal out of the mine. Work problems 8 and 9 before marking this step.

7. Every miner knows that smoking in the coalmines is a safety hazard. You never smoke and you use your facemask that is provided by the coal company to protect you from inhaling coal dust that can damage your lungs. Mark this step.

8. After lunch you are asked to help the roof bolter. He is the miner that uses a roof-bolting machine to drill long pieces of metal up through the rock top of the mine. These bolts help support the top by securing the layers of rock together. Complete problems 10, 11, and 12 before marking this step.

9. The mantrip has arrived with a load of mine supplies. You help unload the supplies and prepare the mantrip for the miners to leave the mine. Complete problems 13 and 14 marking this step.

10. You leave the mantrip and head to the bathhouse. Take a shower, change your clothing and go home for dinner with your family. Complete problem 15 and mark the final step of the day.

You are now a coal miner.

Math Game

Be a Coal Miner

The Coal Miner's job today is both mentally and physically challenging. This activity illustrates the miner's workday from portal to portal. Solve math problems to advance through each mining task and finish the day to become a genuine coal miner!

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Problems for Math Game
Unit 3 Grade 4

1. 5 x8	2. 6 x7	3. 9 x6	4. 4 x3	5. 8 x9
6. 11 x9	7. 39 x5	8. 38 x3	9. 63 x8	10. 19 x6
11. 189 x71	12. 323 x63	13. 474 x29	14. 204 x16	15. 538 x49

Problems for Math Game Teacher's Key
Grade 4

1. 5	2. 6	3. 9	4. 4	5. 8
x8	x7	x6	x3	x9
40	42	54	12	72

6. 11	7. 39	8. 38	9. 63	10. 19
x9	x5	x3	x8	x6
99	195	114	504	114

11. 189	12. 323	13. 474	14. 204	15. 538
x31	x33	x24	x16	x41
5859	10659	11376	3264	22058

Math Game Unit 3 Grade 5

1. 283 x 41	2. 810 x 76	3. 195 x 71	4. 354 x 28
5. 638 x 51	6. 657 x 52	7. 969 x 32	8. 369 x 58
9. 916 x 77	10. 836 x 26	11. 799 x 39	12. 779 x 74
13. 372 x 34	14. 716 x 95	15. 406 x 49	

Problems for Math Game Unit 3 Grade 5
Teacher's Key

1. 283 x 41 11603	2. 810 x 76 61560	3. 195 x 71 13845	4. 354 x 28 9912
5. 638 x 51 32538	6. 657 x 52 34164	7. 969 x 32 31008	8. 369 x 58 21402
9. 916 x 77 70532	10. 836 x 26 21736	11. 799 x 39 31161	12. 779 x 74 57646
13. 372 x 34 12648	14. 716 x 95 68020	15. 406 x 49 19894	

Problems for Math Game
Unit 3 Grade 3

Find the sum of the numerals below. Work the problems as the instruction sheet directs before advancing through the mine shaft.

1. 765 + 326	2. 468 + 364	3. 192 + 348	4. 280 + 288
5. 129 + 758	6. 982 + 402	7. 245 + 787	8. 107 + 460
9. 952 + 6	10. 566 + 167	11. 962 + 343	12. 382 + 468
13. 553 + 77	14. 228 + 573	15. 345 + 636	

Problems for Math Game Teacher's Key
Unit 3 Grade 3

Find the sum of the numerals below. Work the problems as the instruction sheet directs before advancing through the mine shaft.

1. 765	2. 468	3. 192	4. 280
+ 326	+ 364	+ 348	+ 288
1091	832	540	568
5. 129	6. 982	7. 245	8. 107
+ 758	+ 402	+ 787	+ 460
887	1384	1032	567
9. 952	10. 566	11. 962	12. 382
+ 6	+ 167	+ 343	+ 468
958	733	1305	850
13. 553	14. 228	15. 345	
+ 77	+ 573	+ 636	
630	801	981	

Problems for Math Game
Unit 3 Grade 6

1. $\frac{1}{2} + \frac{3}{6} + \frac{2}{3} =$

2. $\frac{3}{5} + \frac{1}{2} + \frac{2}{5} =$

3. $\frac{4}{7} + \frac{3}{7} + \frac{5}{7} =$

4. $\frac{1}{2} + \frac{3}{8} + \frac{5}{16} =$

5. $3 + \frac{5}{6} + 3 =$

6. $\frac{7}{8} + \frac{4}{8} + \frac{1}{4} =$

7. $7 - \frac{5}{7} - \frac{1}{7} =$

8. $\frac{3}{5} + \frac{1}{5} + \frac{5}{5} =$

9. $\frac{9}{5} - \frac{3}{5} + 3 =$

10. $\frac{4}{9} + \frac{6}{9} + \frac{2}{3} =$

11. $\frac{2}{3} + \frac{5}{6} - \frac{5}{6} =$

12. $\frac{5}{7} + \frac{2}{7} - \frac{3}{7} =$

13. $\frac{2}{3} + \frac{7}{6} + 5 =$

14. $\frac{3}{10} + \frac{3}{5} - \frac{2}{5} =$

15. $\frac{4}{5} + \frac{5}{10} - \frac{2}{10} =$

Problems for Math Game Teacher's Key
Unit 3 Grade 6

1. $\frac{1}{2} + \frac{3}{6} + \frac{2}{3} = 1\ \mathbf{2/3}$

2. $\frac{3}{5} + \frac{1}{2} + \frac{2}{5} = 1\ ½$

3. $\frac{4}{7} + \frac{3}{7} + \frac{5}{7} = 1\ \mathbf{5/7}$

4. $\frac{1}{2} + \frac{3}{8} + \frac{5}{16} = 1\ \mathbf{3/16}$

5. $3 + \frac{5}{6} + 3 = 6\ \mathbf{5/6}$

6. $\frac{7}{8} + \frac{4}{8} + \frac{1}{4} = 1\ \mathbf{5/8}$

7. $7 - \frac{5}{7} - \frac{1}{7} = 6\ \mathbf{1/7}$

8. $\frac{3}{5} + \frac{1}{5} + \frac{5}{5} = 1\ \mathbf{4/5}$

9. $\frac{9}{5} - \frac{3}{5} + 3 = 4\ \mathbf{1/5}$

10. $\frac{4}{9} + \frac{6}{9} + \frac{2}{3} = 1\ \mathbf{7/9}$

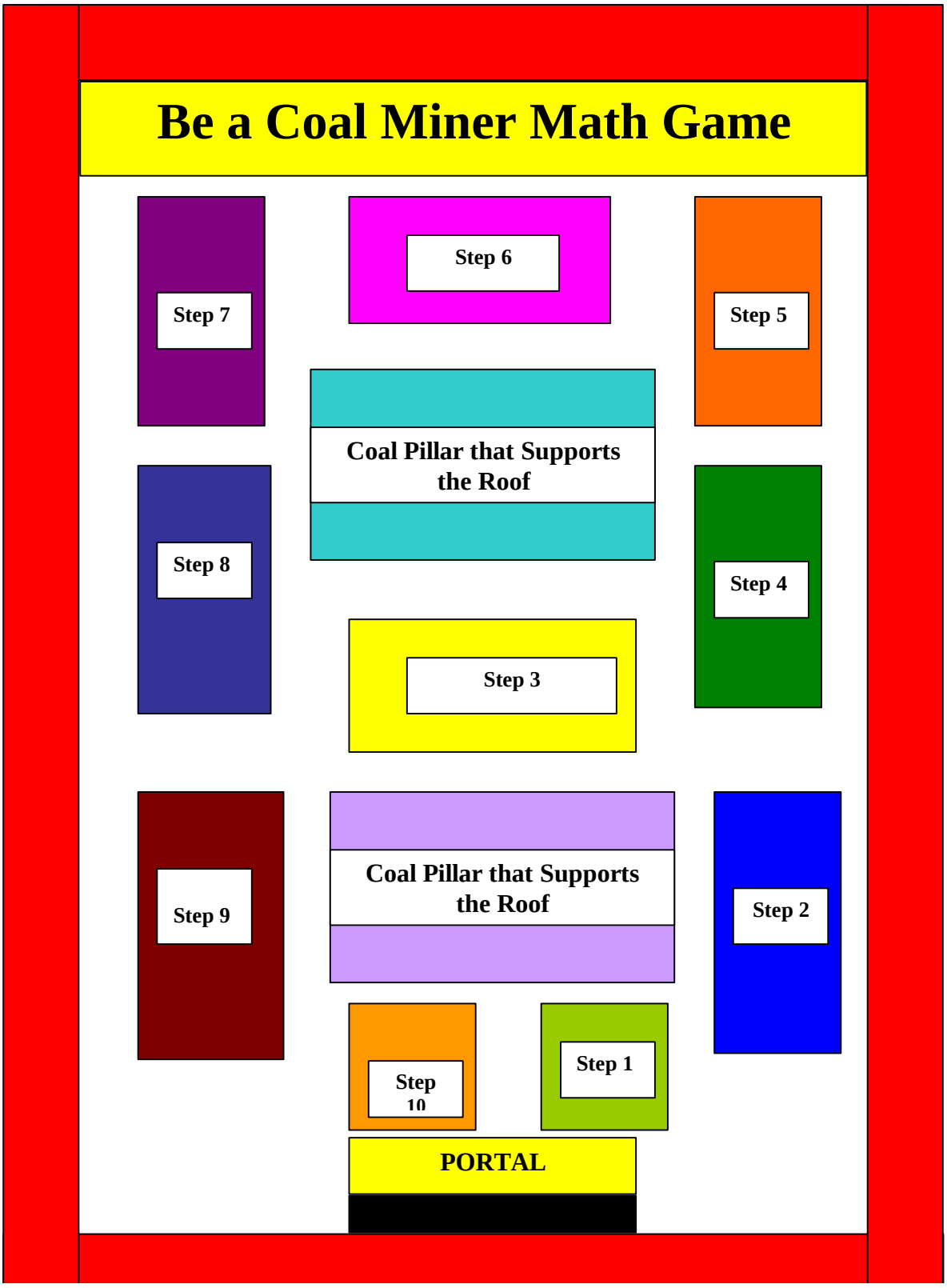
11. $\frac{2}{3} + \frac{5}{6} - \frac{5}{6} = \mathbf{2/3}$

12. $\frac{5}{7} + \frac{2}{7} - \frac{3}{7} = \mathbf{4/7}$

13. $\frac{2}{3} + \frac{7}{6} + 5 = 6\ \mathbf{5/6}$

14. $\frac{3}{10} + \frac{3}{5} - \frac{2}{5} = ½$

15. $\frac{4}{5} + \frac{5}{10} - \frac{2}{10} = 1\ \mathbf{1/10}$


Be a Coal Miner Math Game
Step 7
Step 6
Step 5
Coal Pillar that Supports the Roof
Step 8
Step 4
Step 3
Step 9
Coal Pillar that Supports the Roof
Step 2
Step 10
Step 1
PORTAL

Mining for Math Solutions
3rd&4th Grade

1. Coal is the major fuel used for generating electricity worldwide - countries that depend on coal for electricity include:

South Africa	93%	Kazakhstan	70%	Morocco	55%
Poland	90%	India	69%	Greece	55%
PR China	79%	Israel	63%	USA	45%
Australia	76%	Czech Rep	56%	Germany	44%

Which two countries depend on coal for the same percent of electricity? Using the chart above, find the mean for the percents.

2. 6185 million tons (mt) of coal are produced yearly in the world. 3162 mt is produced in China alone. 932 mt is produced in the USA. How many million tons are produced throughout the rest of the world?

3. Each person in the U.S. uses 3.4 tons of coal every year. Ben has 5 people in his family. Which equation, when solved, will tell how many tons of coal Ben's family used?

- 3.4 x c = 5
- 3.4 x 5 = c
- c – 5 = 3.4
- 3.4 + c = 5

4. The average miner makes $64,000 per year in salary, not including overtime, bonuses, and benefits. If he/she makes $10,000 in overtime and $8,000 in bonuses, how much would he/she make in a year?

- $78,000
- $98,000
- $82,000
- $84,000

5. In 1830, 2,000 tons of coal was produced in Kentucky. In 1837, 10,000 tons of coal was produced in Kentucky. Which equation, when solved, will show the difference in coal production from 1830 – 1837?

- 2,000 + c = 10,000
- 10,000 - 2,000 = c
- 2,000 – c = 10,000
- 2,000 + c = 10,000

6. Refer to the above question. Which equation, when solved will show how many years have passed?

- 1837-1830=5
- 1837-1830=7
- 1837-1830=6
- 1837-1830=8

7.Stan’s section produced 3,000 tons of coal on Monday, 5,000 tons on Tuesday, 7,000 tons on Wednesday, and 9,000 tons on Thursday. If the pattern continues, how many tons will Stan’s section produce on Friday?

- 8,000
- 11,000
- 12,000

8. Stan and David went to the Commissary after work to buy groceries. Stan bought $26 in supplies, and David bought $33 in supplies. About how much money was spent in all? Choose the better estimate.

- $50.00
- $60.00

9. If 48 million tons of coal were produced in Kentucky in one year, how many tons per month would that be?

- 12 million tons
- 8 million tons
- 4 million tons

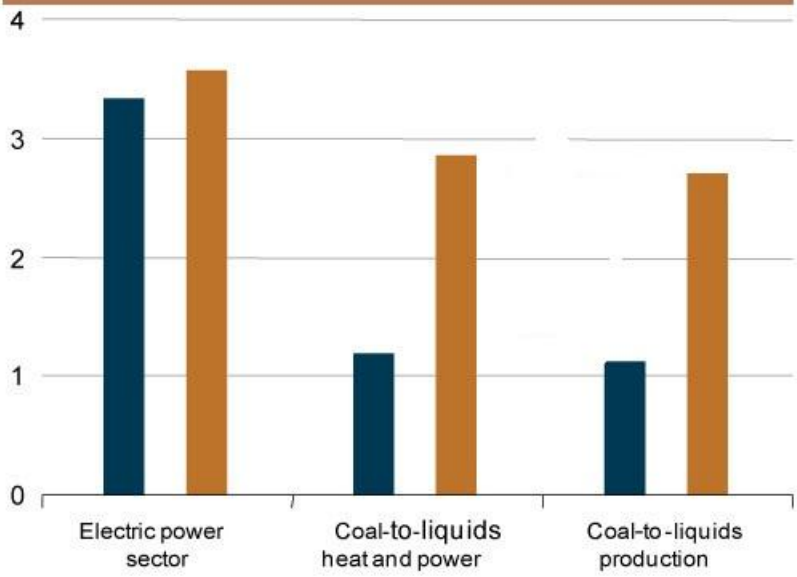
10. Felix went to the coal mine at 9:05 A.M. He worked underground for 4 hours & 45 minutes and then picked rock from the belt for 3 hours & 10 minutes, then went home. What time was it when Felix left the mine?

- 3:30 P.M.
- 4:30 P.M.
- 5.00 P.M.
- 6:00 P.M.

11. Tawney's mother gave her $99 in scrip to go to the commissary. Tawney bought 3 loaves of bread and 5 cartons of orange juice. Each loaf of bread cost $4 and each carton of orange juice cost $2. How much money does Tawney have left?

- $78
- $76
- $79
- $77

This chart shows the projected U.S. coal consumption begining in 2009 and ending in 2035. Which has the greater change?



- Electric power sector
- Coal-to-liquids production
- Coal-to-liquids heat and power

Teacher's Page:
Mining for Math Solutions
3rd & 4th Grade Answers

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South Africa	93%	Kazakhstan	70%	Morocco	55%
Poland	90%	India	69%	Greece	55%
PR China	79%	Israel	63%	USA	45%
Australia	76%	Czech Rep	56%	Germany	44%

Which two countries depend on coal for the same percent of electricity? **Morocco & Greece**

Using the chart above, find the mean for the percents. **66.25%**

2. 6185 million tons (mt) of coal are produced yearly in the world. 3162 mt is produced in China alone. 932 mt is produced in the USA. How many million tons are produced throughout the rest of the world? **2091 mt's**

3. Each person in the U.S. uses 3.4 tons of coal every year. Ben has 5 people in his family. Which equation, when solved, will tell how many tons of coal Ben's family used?

- 3.4 x c = 5
- **3.4 x 5 = c**
- c – 5 = 3.4
- 3.4 + c = 5

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- **5.00 P.M**.
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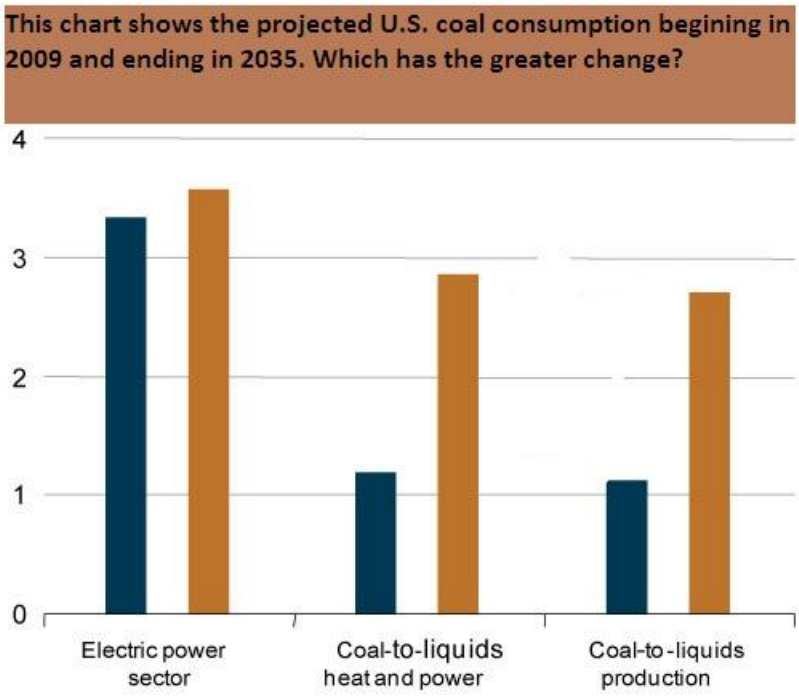

- Electric power sector
- Coal-to-liquids production
- **Coal-to-liquids heat and power**

Mining for Math Solutions
5th & 6th Grade

1. Coal is the major fuel used for generating electricity worldwide - countries that depend on coal for electricity include:

South Africa	93%	Kazakhstan	70%	Morocco	55%
Poland	90%	India	69%	Greece	55%
PR China	79%	Israel	63%	USA	45%
Australia	76%	Czech Rep	56%	Germany	44%

Using the chart above, find the mean for the percents.

2. 6185 million tons (mt) of coal are produced yearly in the world. 3162 mt is produced in China alone. 932 mt is produced in the USA. About what percent of the yearly amount did China produce? About what percent was produce from the USA?

3. The U.S. leads the world with over 260 billion tons of renewable coal reserves, 0.28 of total global reserves. Convert the decimal into a fraction.

4. The average miner makes $64,000 per year in salary, not including overtime, bonuses, and benefits. If he/she makes $10,000 in overtime and $8,000 in bonuses, how much would he/she make in a year?

- $78,000
- $98,000
- $82,000
- $84,000

5. More than 1/3 of coal produced in the U.S. comes from the Appalachian Region. Which fraction is the same as 1/3?

- 2/4
- 3/9
- 4/8
- 5/10

6. Of the tons of coal sold last week from John's Coal Company, 3/10 were short tons and 3/10 were long tons. What fraction of the tons of coal sold were either short tons or long tons?

Simplify your answer.

7. Each person in the U.S. uses 3.4 tons of coal every year. Ben has 5 people in his family. Which equation, when solved, will tell how many tons of coal Ben's family used?

- 3.4 x c = 5

- 3.4 x 5 = *c*
- *c* – 5 = 3.4

8. Mike needs to fill 7 giant cars with coal. Each car can hold 550 pieces of coal. How many pieces of coal will be placed in the cars?

- 3700
- 3850
- 3800
- 3750

9. Stan's section produced 3,000 tons of coal on Monday, 5,000 tons on Tuesday, 7,000 tons on Wednesday, and 9,000 tons on Thursday. If the pattern continues, how many tons will Stan's section produce on Friday?

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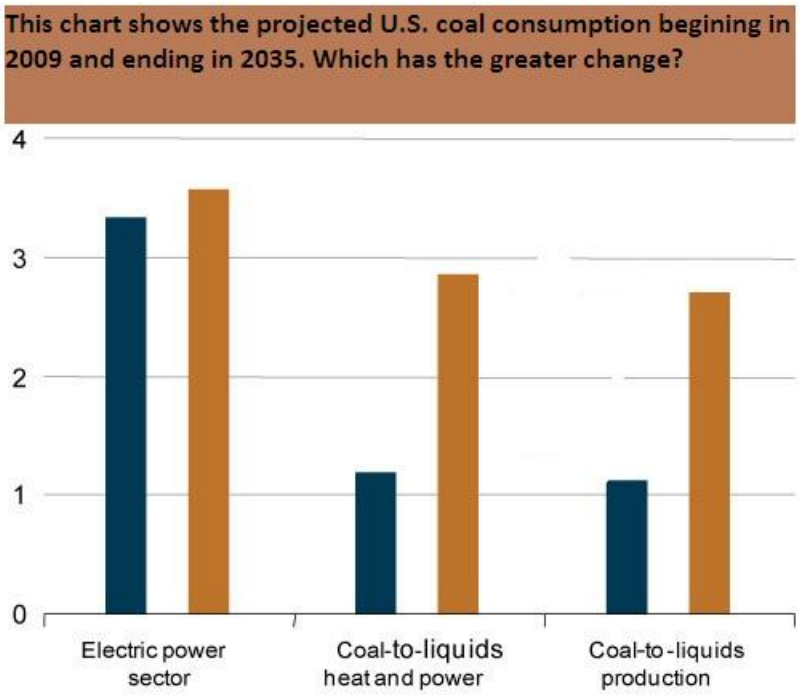

- Electric power sector
- Coal-to-liquids production
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- 3:30 P.M.
- 4:30 P.M.
- 5.00 P.M.
- 6:00 P.M.

13. Dustin's shift finished loading coal cars. 6 out of the 24 cars were short tons. What percentage of the cars were short tons?

- 25%
- 30%
- 20%
- 35%

Teacher's Page:
Mining for Math Solutions
5th & 6th Grade Answers

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Using the chart above, find the mean for the percents. **66.25%**

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3. The U.S. leads the world with over 260 billion tons of renewable coal reserves, 0.28 of total global reserves. Convert the decimal into a fraction. **28/100**

4. The average miner makes $64,000 per year in salary, not including overtime, bonuses, and benefits. If he/she makes $10,000 in overtime and $8,000 in bonuses, how much would he/she make in a year?

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Simplify your answer. **3/5**

7. Each person in the U.S. uses 3.4 tons of coal every year. Ben has 5 people in his family. Which equation, when solved, will tell how many tons of coal Ben's family used?

- $3.4 \times c = 5$
- **$3.4 \times 5 = c$**
- $c - 5 = 3.4$

8. Mike needs to fill 7 giant cars with coal. Each car can hold 550 pieces of coal. How many pieces of coal will be placed in the cars?

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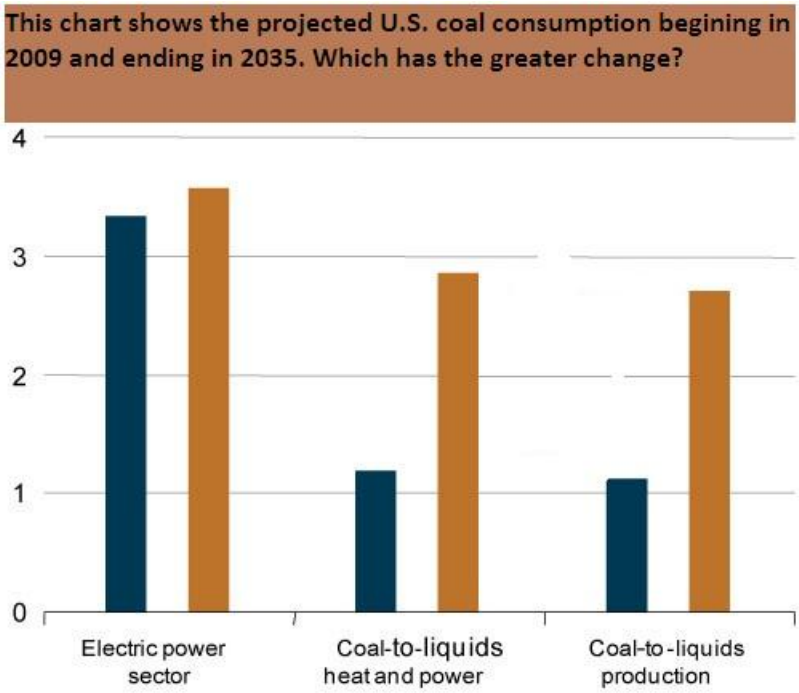

- Electric power sector
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13. Dustin's shift finished loading coal cars. 6 out of the 24 cars were short tons. What percentage of the cars were short tons?

- **25%**
- 30%
- 20%
- 35%

Addition and Subtraction

Add or subtract the fractions. When you get an answer, change that answer to the code letter shown below. Place that letter below your answer. The code will give you 2 pieces of safety equipment that miners wear.

$\frac{3}{4} - \frac{1}{2}$ = ____

$\frac{2}{6} + \frac{2}{3}$ = ____

$\frac{4}{10} + \frac{2}{5}$ = ____

$\frac{4}{8} - \frac{1}{2}$ = ____

$\frac{6}{8} - \frac{1}{2}$ = ____

$\frac{3}{12} + \frac{3}{4}$ = ____

$\frac{4}{9} - \frac{1}{3}$ = ____

$\frac{11}{10} - \frac{1}{10}$ = ____

$\frac{2}{6} + \frac{2}{4}$ = ____

$\frac{6}{12} - \frac{1}{2}$ = ____

$\frac{6}{24} + \frac{4}{8}$ = ____

$\frac{6}{12} + \frac{3}{6}$ = ____

$\frac{4}{7} - \frac{9}{21}$ = ____

$\frac{12}{18} - \frac{3}{9}$ = ____

$\frac{9}{9} - \frac{8}{9}$ = ____

$\frac{3}{9} + \frac{1}{5}$ = ____

$\frac{12}{15} - \frac{3}{5}$ = ____

$\frac{3}{8} + \frac{1}{4}$ = ____

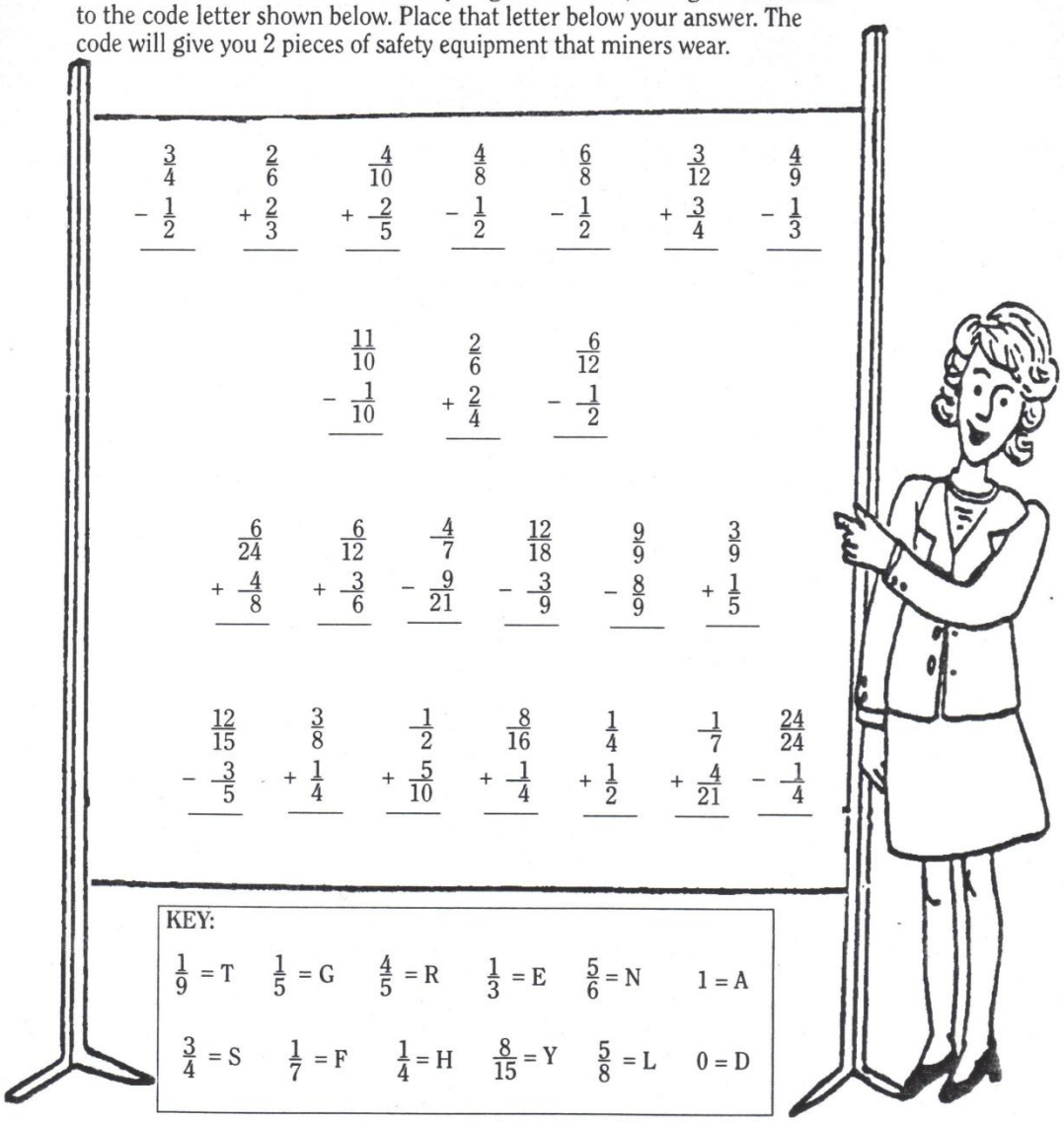
$\frac{1}{2} + \frac{5}{10}$ = ____

$\frac{8}{16} + \frac{1}{4}$ = ____

$\frac{1}{4} + \frac{1}{2}$ = ____

$\frac{1}{7} + \frac{4}{21}$ = ____

$\frac{24}{24} - \frac{1}{4}$ = ____



KEY:

$\frac{1}{9}$ = T	$\frac{1}{5}$ = G	$\frac{4}{5}$ = R	$\frac{1}{3}$ = E	$\frac{5}{6}$ = N	1 = A
$\frac{3}{4}$ = S	$\frac{1}{7}$ = F	$\frac{1}{4}$ = H	$\frac{8}{15}$ = Y	$\frac{5}{8}$ = L	0 = D

ANSWER:

Benham Coal Company's Coke Ovens

Formation of Coal

Science (Teacher)

Core Contents:

SC-E 2.1.1 Earth materials include solid rocks and soils, water, and the gases of the atmosphere. Minerals that make up rocks have properties of color, texture, and hardness. Soils have properties of color, texture, the capacity to retain water, and the ability to support plant growth. Water on Earth and in the atmosphere can be a solid, liquid, or gas.

SC-E-2.1.2 Earth materials provide many of the resources humans use. The varied materials have different physical and chemical properties, which make them useful in different ways, for example, as building materials (e.g. stone, clay, marble), as sources of fuel (e.g., petroleum, natural gas), or growing the plants we use as food.

SC-E- 2.2.2 Objects in the sky (e.g., sun, clouds, moon) have properties, locations, and real or apparent movements that can be observed and described.

SC-E-3.1.1 Things in the environment are classified as living, nonliving, and once living. Living things differ from nonliving things. Organisms are classified into groups by using various characteristics (e.g. body coverings, body structures).

Student Reading

About 300 million years ago when the earth was hot and humid, a dense jungle grew from bogs, swamps and inland seas. The atmosphere was unstable, and violent storms tore through the jungle, uprooting massive trees and crushing the grasses and ferns that grew to great heights. During this time, strange animals lived on the earth and weird looking fish filled the waters of the swamps. Dragonflies with 30-inch wings, hummed above the algae covered water as they searched for a meal. As the plants and animals died, they sank into the mud beneath the swamps and layers of sand, rocks, and mud covered them. As these fallen plants and dead animals sank into the muck, new plants grew quickly to take their place. Again and again jungle plants passed through the life cycle of growth, death and decay. Eventually, a layer of decaying matter built up below the swamp waters. This dead forest matter is called peat. During this time volcanoes and earthquakes shook the land and some land areas raised up and others sank. Many of the in-land seas and the swamps receded or dried up. Eventually, hundreds or even thousands of feet of soil covered the decomposed plants and animals. The weight of this accumulated soil put pressure on the decomposed matter and heat was generated. The process that begins with the burial and decomposition of organic material and continues with compression and the generation of heat due to the weight of the covering material and continues for a long period of time is called coalification. This process changes the decomposed matter into fossil fuel—coal, oil, or gas.

The type of vegetation in the organic material and the amount of weight, temperature and time the material is buried determines the type or rank of fossil fuel produced during coalification. There are four ranks of coal. Each type or rank of coal burns differently and releases different types of emissions. Coal is ranked according to the carbon, hydrogen, and oxygen in the coal. In the stages of coalification, the deposit becomes more and more carbon rich. Beginning as a layer of peat is transformed into lignite, the process continues as lignite changes to sub-bituminous coal, and the sub-bituminous coal is altered to bituminous coal. This is the type of coal found in Kentucky deposits. With further heat, pressure, and time bituminous coal is altered to anthracite coal and then into graphite, a pure carbon mineral. It is interesting that graphite has also been found in meteorites.

Discussion Questions

1. Coal formed about 300 million years ago. What was the world like at that time?
300 million years ago, the earth was hot and humid, covered with a dense jungle, bogs and swamp. The atmosphere was unstable and stormy. Massive trees and grasses grew then, along with strange animals and fish.

2. What is peat?
Peat is organic material that slowly is converted into coal by heat and pressure. It forms from plants that pass through the life cycle and build up in layers in swampy areas.

3. What is coal ranking and how is rank determined?
The amount of carbon in coal determines the rank. The ranks or types of coal are lignite, sub-bituminous, bituminous, and anthracite.

4. Discuss the steps of coalification.
Organic material is covered with soil and rocks that exert pressure and generate heat. Over time this decomposed matter is converted into coal or other fossil fuels.

5. What type or rank of coal formed in Kentucky?
Bituminous Coal

Classroom Activity

Students should choose partners. Suggest that they are prehistoric television meteorologists (much like the Flintstones) and should prepare a script describing the day's weather and the forecast for the coming week to be broadcast on the evening news program.

Formation of Coal-Student Worksheet
Science

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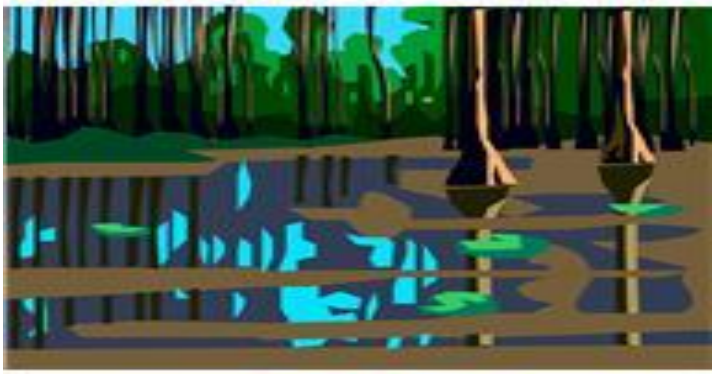


Discussion Questions

1. Coal formed about 300 million years ago. What was the world like at that time?

2. What is peat?

3. What is coal ranking and how is rank determined?

4. Discuss the steps of coalification.

5. What type or rank of coal formed in Kentucky?

Formation of Coal
Student's Page

Unscramble each of the clue words. Take the letters that appear in ◯ boxes and unscramble them for the final message.

TAEP	□ □ ◯ □
KARN	□ □ □ □
CINTOIFOICAAL	□ □ □ ◯ □ □ □ □ □ □ □ ◯ □
TYEP	□ □ □ □
TENCYKKU	□ □ □ □ □ ◯ □ □

□ □ □ □

Created by Puzzlemaker at DiscoveryEducation.com

Teacher's Page:
Formation of Coal (Answer)
Unscramble each of the clue words

Peat
Rank
Coalification
Type
Kentucky
Coal

.
Take the letters that appear in ◯ boxes and unscramble them for the final message.
Created by Puzzlemaker at DiscoveryEducation.com

Glossary of Terms
Science

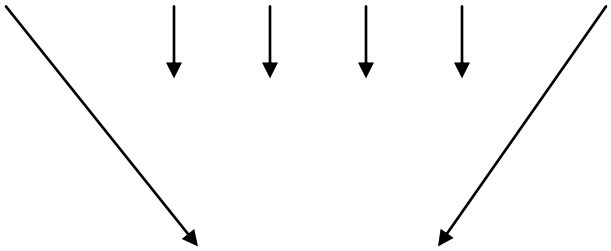
1. Peat—dead forest matter

2. Coalification—the process that begins with the burial and decomposition of organic material and continues with compression and the generation of heat due to the weight of the covering material and continues for a long period of time.

Coalification

Covering of Soil and Rocks

Pressure **Heat**



Organic Matter

Coal

3. Rank—type of coal. This is determined by the kind of vegetation in the organic material and the amount of weight, temperature, and time the material is buried. There are four ranks of coal: anthracite coal, bituminous coal, sub-bituminous coal, and lignite coal.

4. Life Cycle—the life, death, and decay of forest plants

5. Deposit—matter or sediment in a layer, vein, or pocket; such as a coal deposit

6. Lignite Coal—the first type or rank of coal. Lignite Coal is soft, brown, and has a low carbon content.

7. Bituminous Coal—A middle rank coal (between sub-bituminous and anthracite) formed by additional pressure and heat on lignite. This is the rank of coal found in Kentucky

8. Anthracite Coal—This rank of coal is hard and shiny black. It has a high carbon content.

9. Graphite—a pure carbon mineral

10. Compression—the act of applying pressure and reducing the volume of a substance by pressure.

Geological Timeline (In-Class Activity)
Science (Teacher)
Core Content:
SC-E-2.1.1 Earth materials include solid rocks and soils, water, and the gases of the atmosphere
SC-E-2.1.2 Earth materials provide many of the resources humans use. The varied materials have different physical and chemical properties, which make them useful in different ways, for example, as building materials (e.g., stone, clay, marble), as sources of fuel (petroleum, natural gas), or growing the plants we use as food.
SC-E-2.1.3 Fossils found in Earth materials provide evidence about organisms that lived long ago and the nature of the environment at that time.
SC-E-3.1.1 Things in the environment are classified as living, nonliving, and once living. Living things differ from nonliving things. Organisms are classified into groups by using various characteristics (e.g., body coverings, body structures).

This activity will strengthen the student's understanding and increase the student's knowledge of when coal was formed. Students will design a geological time line showing when coal was formed. Working alone or in small groups, students will determine the shape, form, and type of geological time line that he/she/they would like to create to portray the age of the Earth and its subsequent creations. Students will explain their work to their classmates. The student may communicate his findings creatively by using songs, skits, or interviews with a person such as a space alien visiting the young earth, Fred Flintstone, or a time machine traveler. Using a wide variety of materials, the students will complete the project in class.

Materials:
Student Information Sheet "Geological Clock"
Suitable paper
Paints
Crayons or Markers
Chalk

Information to place on timeline:

Birth of Anthracite: 10:46 a.m.
Birth of Bituminous: 10:48 a.m.
Birth of Lignite: 10:40 a.m.

Geological Clock-Student Information Sheet
Science In-Class Activity

The idea of geologic time seems almost too complicated to understand. A tool to improve our understanding is to consider all of Earth's history as a single half-day, with the birth of our planet set at midnight, and the present time at noon. If we use a clock instead of a calendar, this is the way earth's history would look.

12:00 Midnight (4,500 million years ago.)
The Earth has formed, along with the other bodies in the solar system, from a cloud of dust and gas swirling around our sun. This is the beginning of the Precambrian era.

1:00 a.m. (4,125 million years ago.)
The young planet Earth has cooled, has almost no free oxygen, and is a very different world from the one we know today. No life forms exist yet.

2:00 a.m. (3,750 million years ago.)
The oldest still-existing rocks are just forming (3,690 million years ago). The very first life is just about to appear in the form of simple, single-celled organisms.

3:00 a.m. (3,375 million years ago.)
Simple life forms continue to spread out. The blue-green algae are a major lifeform.

4:00 a.m. (3000 million years ago.)
The first bacteria to make energy from light appear. All life forms remain in the sea, where the environment is less changeable and there is protection from the sun's ultraviolet rays. This bacterium adds oxygen to the atmosphere in the process of producing its energy from light.

5:00 a.m. (2,625 million years ago.)
The Archaebacteria (unusual bacteria) make their appearance.

6:00 a.m. (2,250 million years ago.)
Half of Earth history has passed, and the first organisms made up of more than one cell are just appearing.

7:00 a.m. (1,875 million years ago.)
Two massive solar system objects strike Earth and leave huge craters in South Africa and Canada. The first plants (green algae) that make energy from light appear.

8:00 a.m. (1,500 million years ago.)
The worldwide spread of aquatic life that produces oxygen when it produces energy has significantly altered the make-up of the atmosphere. The oxygen builds up the ozone, blocking damaging light and paving the way for life on land (although it is still in the distant future).

9:00 a.m. (1,125 million years ago.)
Fungi appear. A fracture forms in the middle of the continent that will become North America.
10:00 a.m. (750 million years ago.)

Things speed up as we near the start of the Cambrian period. Brown and red algae have formed, and the first animals (Annelids) are immediately around the corner.

11:00 a.m. (374 million years ago.)
The Devonian period, the Age of Fishes, is here. In the last hour, plants and insects have begun the colonization of the land, and the first amphibians have pulled themselves out of the water. Great forests will appear soon.

12:00 Noon (Now.)
The first reptiles appeared early in the hour, the dinosaurs lived for about 26 minutes later in the hour, and the first hominids appeared about 39 seconds ago. Modern humans have been on Earth for the past 6 seconds or so.

Information Courtesy of:
coaleducation.com
seaborg.nmu.edu/earth/timelines.html

Uses of Coal

Access to modern energy services contributes to economic growth, increased family incomes, and improves quality of life by encouraging better education and health services. All sources of energy will be needed to meet future energy demand.

Coal has many important uses worldwide. The most significant uses are in electricity generation, steel production, cement manufacturing and as a liquid fuel. Around 6.1 billion tons of hard coal were used worldwide last year and 1 billion tons of brown coal. Since 2000, global coal consumption has grown faster than any other fuel. The five largest coal users - China, USA, India, Russia and Japan - account for 77% of total global coal use.

Different types of coal have different uses. Steam coal - also known as thermal coal - is mainly used in power generation. Coking coal - also known as metallurgical coal - is mainly used in steel production.

The biggest market for coal is Asia, which currently uses over 65% of coal produced globally. China uses a significant proportion of this. Many countries do not have natural energy resources sufficient to cover their energy needs, and need to import energy to help meet their requirements. Japan, Chinese Taipei and Korea, for example, import significant quantities of steam coal for electricity generation and coking coal for steel production.

Coal & Electricity

Coal fuels over 40% of electricity worldwide

Coal & Steel

Global steel production is dependent on coal. Almost 70% of the steel produced today uses coal.

Coal & Cement
Coal is an important source of the energy required to produce cement.

Teacher's Page
Uses of coal
Quiz (Answers)

1. What are three important uses of coal? Electricity generation, steel production, and cement manufacturing

2. Where is the largest market for coal? Asia

3. What country in Asia uses the most coal? China

Uses of coal
Quiz

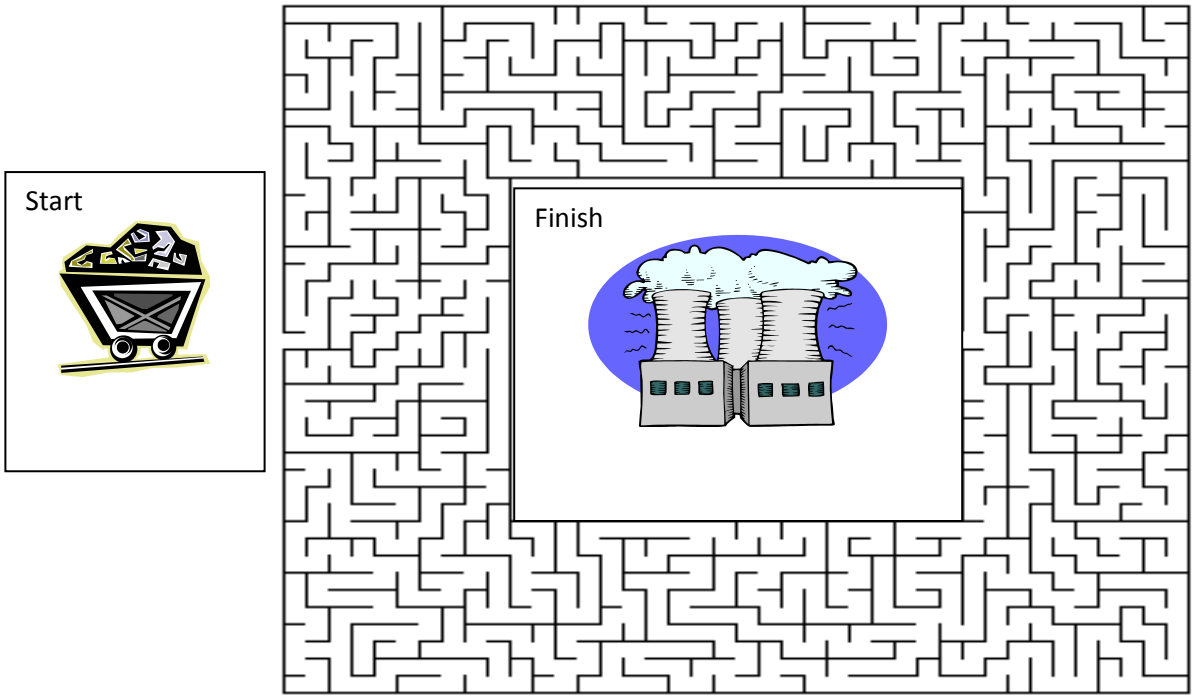
1. What are three important uses of coal?

2. Where is the largest market for coal?

3. What country in Asia uses the most coal?

Coal Cart to Power Plant

Transport the coal from the coal cart to the Power Plant by completing this maze!



Created by Puzzlemaker at DiscoveryEducation.com

Uses of Coal

Find the words in the list below.

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Z S Q A H A F O C J S V P T O A B C S L
Z I E N I B V F A T M H G H A R R J R U
D E G Y U I F H M J B F A S E E X Z E B
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T E N N I S R A C K E T S S P A O Q I I
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F H P N E L I A C C V O N F T E N S E F
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M S V E I T I Z T W G P R L A Z T W T J
X U R E E N O C E I P C L T L Z A M G S
S S H S Q K S D S L N C S E E K I P V T
M O U N T A I N B I K E S R N S L T U I
M B R L P L A S T I C S L S E R N Z P W
J P Q O W A T E R R E P E L L E N T S B
F U D O P H X L O Z N R S E E P P S C H
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AIR FILTERS
AMMONIA SALTS
ASPRINS
BENZENE
COSMETICS
CREOSOTE OIL
DYES
FERTILISERS
LUBRICANTS
MOUNTAIN BIKES
NAPHTHALENE
NITRIC ACID
NYLON
PHENOL
PLASTICS
RAYON
RESINS
SHAMPOOS
SOAP
SOLVENTS
TENNIS RACKETS
TOOTHPASTES

WATER FILTERS
WATER REPELLENTS

Teacher's Page:

Uses of Coal

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x S x x x x x x x x S x P x x x x C S L
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x x x Y x x x x x x x x A x E E x x E B
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T E N N I S R A C K E T S S P x O x I I
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AIR FILTERS
AMMONIA SALTS
ASPRINS
BENZENE
COSMETICS
CREOSOTE OIL
DYES
FERTILISERS
LUBRICANTS
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NYLON
PHENOL
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RAYON
RESINS
SHAMPOOS
SOAP
SOLVENTS
TENNIS RACKETS

TOOTHPASTES
WATER FILTERS
WATER REPELLENTS

The Cost of Electricity (Teacher)
Core Content:
MA-E 3.1.3 The process of using data to answer questions (e.g., pose a question, plan, collect data, organize and display data, interpret data to answer question)
MA-E 3.2.1 Pose questions that can be answered by collecting data
MA-E 3.2.2 Collect, organize, and describe data (e.g., drawings, tables, charts)
MA-E 3.2.5 Make predictions and draw conclusions based on data
MA-E 4.2.3 find solutions to number sentences with a missing value (e.g., 7 = N = 10, N = 5 > 14)

Costs of Electricity

Coal produces more than half of the electricity used in the United States, and is our most abundant domestic nonrenewable energy source. More than 75% of the coal mined in the United States is used to produce electricity. Typically it takes about one ton of coal to produce 2500 kilowatt-hours of electricity. By checking the number of kilowatt-hours used during a billing period, a customer can determine how many pounds (lbs.) of coal were used to meet his or her needs-- presuming that all the power was coal-generated, of course.

Here are some examples of how much coal is used yearly by a family of four to produce the electricity needed to operate various appliances:

	Electric Appliance	lbs. of coal
1.	Water heater	3,375
2.	Stove/oven	560
3.	Television	256
4.	Iron	48
5.	Hairdryer	20
6.	Vacuum cleaner	37
7.	Clock	14

The U.S. has approximately 30% of the world's coal reserves. Most of the costs of mining and burning coal in an environmentally safe manner are included in the cost of today's electricity. Consequently coal should remain a reasonably priced source of electricity compared to other sources (oil, gas, nuclear power). The cost of transportation to deliver coal to the power plant can be the largest influence in the price people pay for electricity.

Students Activity:

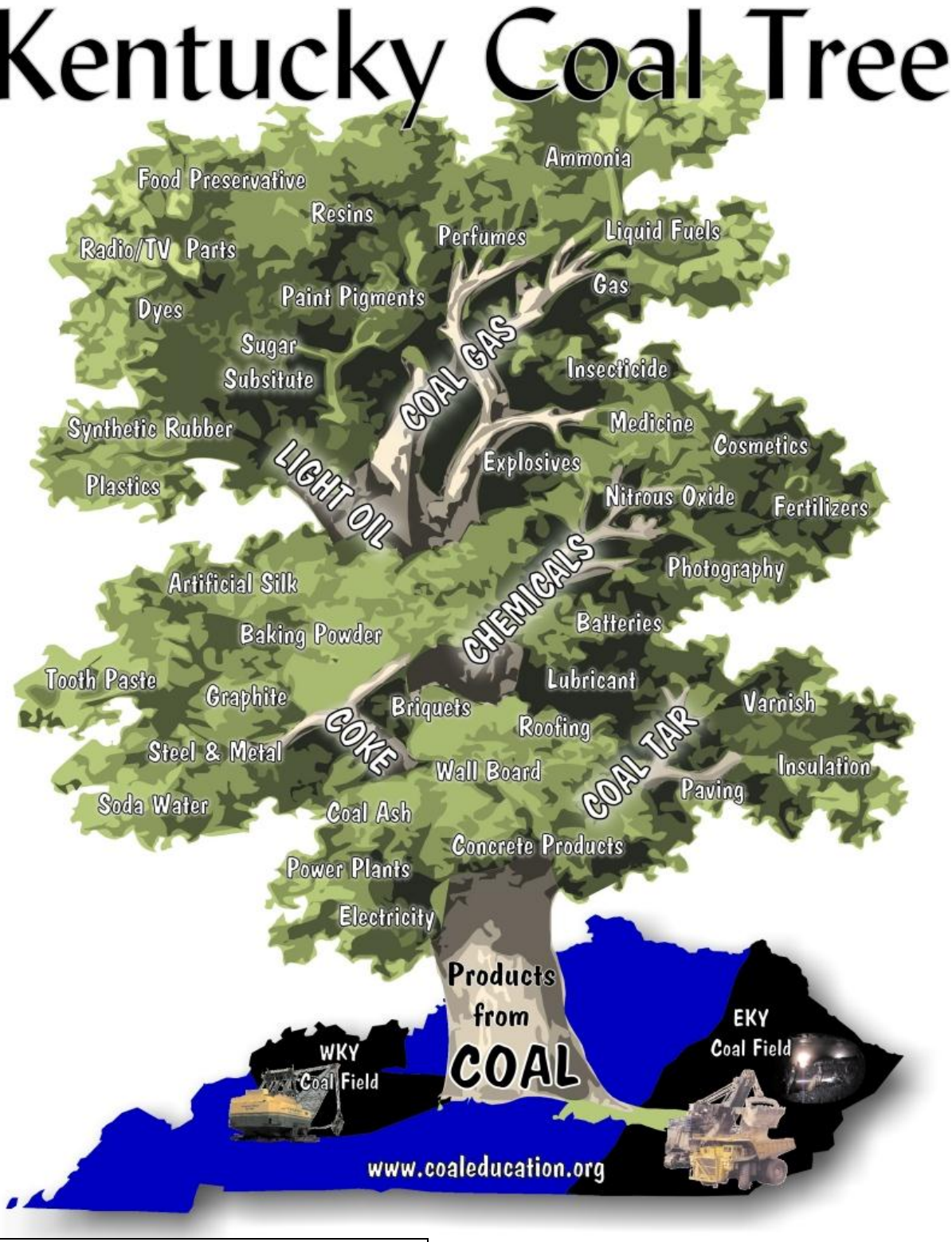
Have the students do the calculation listed in the activity and fill out the chart provided. Discuss the actual cost per hour to operate a florescent bulb in your area and the reasons that regional electrical costs vary.

First determine how much electrical energy it takes to light your classroom for 1 hour, then compute the cost. Record this amount on the table below.
Number of tubes in your classroom x .03= Cost per hour to light your classroom
(Fluorescent tubes cost approximately .03 per hour for the electricity needed to light them. The cost ranges from .02 to .045 per hour, depending on where you live.) Then, compute how much it costs to light your classroom for 1 day. Make a record below.
Cost per hour to light your classroom x hours per day classroom is lit=Cost per day.

	Classroom	School
Cost per hour		
Cost per day		
Cost per week		
Cost per month		
Cost per year		
Kilowatt hours used		
Tons of coal used		

Discussion:
How much does it cost to light your classroom for 1 week? 1 month? 1 year?
How many kilowatt hours (kwh) of electricity were used?
How many fluorescent tubes are there in your school? How many classrooms?
How much does it cost to light your entire school for 1 hour? 1 day? 1 week? 1month? 1 year?
How many kwh of electricity were used? Record your calculations below.

An average 2500 kwh of electricity are produced by burning 1 ton of coal.
How many tons of coal would it take to light your classroom? Your school?
Discuss how you could "lower" the cost of lighting your classroom and your school?
Why is coal a good fuel source for producing electricity?
What are some of the problems we need to solve to make coal a better fuel source?
Information provided by the Mineral Information Institute and coaleducation.org



Created by: Mining Consulting Services, Inc.

Kentucky Coal Tree Puzzle Find the words from the Coal Tree!!

P	T	O	O	T	H	P	A	S	T	E	P	I	R	B
H	A	N	C	I	A	E	X	L	V	H	D	N	E	A
V	F	I	R	O	M	I	U	Z	O	Y	T	S	Z	T
E	A	V	N	U	S	B	N	T	E	M	M	E	I	T
L	L	R	F	T	R	M	O	O	V	E	N	C	L	E
H	E	R	N	I	P	G	E	P	M	O	Z	T	I	R
C	E	U	C	I	R	I	Q	T	I	M	M	I	T	I
P	W	A	F	A	S	H	G	T	I	Z	A	C	R	E
A	N	S	P	D	T	H	A	M	T	C	J	I	E	S
T	A	H	Y	J	I	L	K	I	E	Y	S	D	F	R
Y	Y	H	H	N	U	U	U	G	D	N	Z	E	M	E
Y	B	P	Z	S	R	C	Q	V	G	D	T	I	M	S
R	G	B	N	E	N	I	C	I	D	E	M	H	H	I
Y	T	I	C	I	R	T	C	E	L	E	H	M	Q	N
S	U	G	A	R	S	U	B	S	T	I	T	U	T	E

AMMONIA	BATTERIES	COSMETICS
DYE	ELECTRICITY	FERTILIZER
INSECTICIDE	INSULATION	LIQUID FUEL
LUBRICANT	MEDICINE	PAINT PIGMENT
PERFUME	PHOTOGRAPHY	RESIN
SUGAR SUBSTITUTE	TOOTHPASTE	VARNISH

Teacher's Page:

Kentucky Coal Tree Puzzle Solution

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+ T F E R T I L I Z E R + N +
+ N B A T T E R I E S + I L +
+ E T S A P H T O O T S P E +
S M E D I C I N E + E + H U +
C G A I N O M M A R + + O F +
I I N S E C T I C I D E T D I
T P T N A C I R B U L + O I N
E T U T I T S B U S R A G U S
M N E + + + H + + + + + R Q U
S I + M + + S D Y E + + A I L
O A + + U + I + + + + + P L A
C P + + + F N + + + + + H + T
+ Y T I C I R T C E L E Y + I
+ + + + + + A E + + + + + + O
+ + + + + + V + P + + + + + N
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AMMONIA(9,5,W)
BATTERIES(3,2,E)
COSMETICS(1,12,N)
DYE(8,10,E)
ELECTRICITY(12,13,W)
FERTILIZER(3,1,E)
INSECTICIDE(2,6,E)
INSULATION(15,6,S)
LIQUID FUEL(14,11,N)
LUBRICANT(11,7,W)
MEDICINE(2,4,E)
PAINT PIGMENT(2,12,N)
PERFUME(9,15,NW)
PHOTOGRAPHY(13,3,S)
RESIN(10,5,NE)
SUGAR SUBSTITUTE(15,8,W)
TOOTHPASTE(11,3,W)
VARNISH(7,15,N)

http://www.puzzlemaker.com/WordSearchSetupForm.html

AT ONE TIME

in the U.S., nearly everyone depended on coal for vital basic needs. That's why it was known as "King Coal!"

Fossils and Fossil Fuels (Student)

What is a fossil? Fossils are the remains of skeletons, shells of animals, and pieces of plants from the past. Do you know how fossils are formed? When a plant or animal died it lay where it fell, and in time its body became covered with sand and mud. More sand and mud buried it as the years went by. This slowly hardened into rock, and the bones, shells, and plant pieces were confined in the ground. After millions of years, the pieces of plant, bones, and shells became hard and stony, or fossilized. These were the beginnings of coal.

The following activity will help you gain visual understanding of what fossils are and how they are formed.

Materials you will need:
Play dough (homemade or purchased)
Empty margarine tub
Vegetable oil
Plaster of Paris (powder)
Water
Item to make a fossil cast of (chicken bone, leaf, stick, seed, plastic toy, etc.)

Activity:
Pack the play dough into the empty margarine tub until it is about one half full and make the surface smooth.
Coat the item of which you are making a cast with a thin film of oil. Make sure it is thoroughly coated so the play dough will not stick to it.
Press the object firmly into the play dough, making a clear, deep imprint.
Remove the object and set the play dough aside for two days so you have a hard "fossil" mold.
When completely hardened, coat the "fossil" mold with more oil, again making sure it is thoroughly covered.
Mix the plaster of Paris and the water together (be sure to follow the safety precautions on the plaster of Paris box).
Pour the mixture over the top of the mold and set aside to dry in a warm spot. This will take a few days but do not be impatient because the plaster must be completely set before being moved.
When set, carefully separate the plaster and the play dough. Now you have a cast, which has the outward shape of the item used to make the mold.

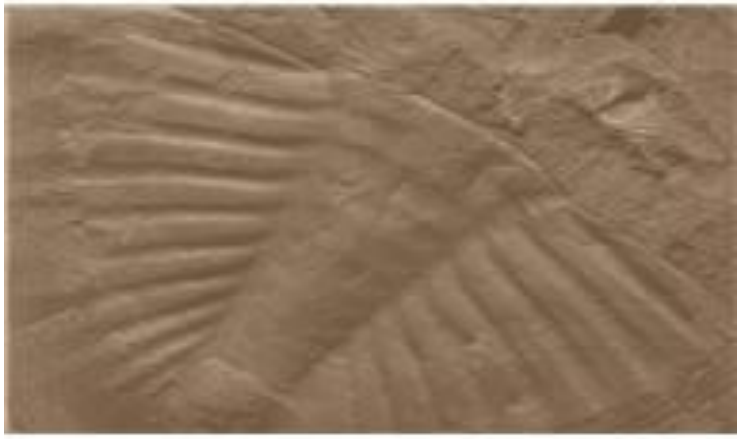
Discussion:

The play dough represents the soft mud that was once the ground million of years ago. Plants and animals made imprints in this mud and if nothing filled them in before they hardened, the imprints eventually became fossil molds similar to the one you made. The plaster of Paris that you used represents the sediments that later filled in the molds and made cast fossils. Common cast fossils are leaf imprints, tree bark, and shells. Paleontologists can trace the history of our planet's life millions of years ago by studying these fossils.

The fossil fuels—coal, gas, and oil—are organic. That is they were formed in nature by the decaying of plants or animals. Coal, which is the most abundant of the fossil fuels, was created in a process called coalification.

Assignment

Read in an encyclopedia or on the Internet about coalification and use the information you find to make a museum exhibit card for your fossil. A museum exhibit card should include the following information: Name of the object, two or three sentences describing the object, explaining its importance, or telling its history.



Adapted from EarthNet activities and coaleducation.org

Fossils: Coal is a Fossil Fuel
Science Activity (Teacher)
Core Content:
SC-E 2.1.3 Fossils found in earth materials provide evidence about organisms that lived long ago and the nature of the environment at that time.
AH-E 2.4 Scales and models

Materials:
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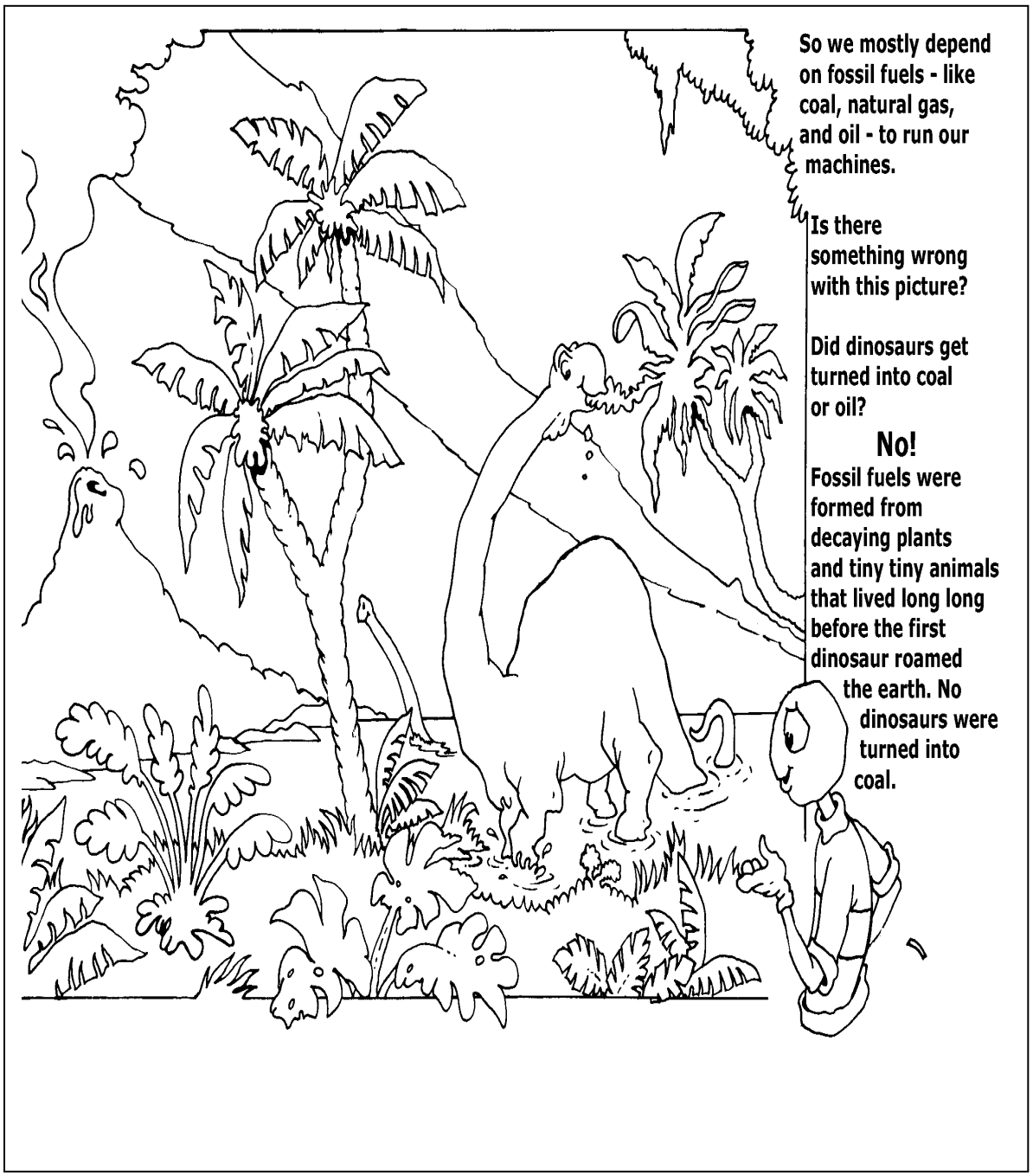
Adapted from EarthNet activities and coaleducation.org



http://faculty.washington.edu/crowther/KidsZone/EACBp02.html

Formation and Importance of Coal
Science (Teacher)
Core Content:
SC-E-2.1.1-Earth materials include solid rocks and soils, water, and the gases of the atmosphere. Minerals that make up rocks have properties of color, texture, and hardness. Soils have properties of color, texture, the capacity to retain water, and the ability to support plant growth. Water on Earth and in the atmosphere can be a solid, liquid, or gas.
SC-E-2.1.2-Earth materials provide many of the resources humans use. The varied materials have different physical and chemical properties, which make them useful in different ways, for example, as building materials (e.g., stone, clay, marble) as sources of fuel (e.g., petroleum, natural gas), or growing the plants we use as food.
SC-E-2.1.3-Fossils found in earth materials provide evidence about organisms that lived long ago and the nature of the environment at that time.
SC-E-2.3.1-The surface of the Earth changes. Some changes are due to slow processes such as erosion or weathering. Some changes are due to rapid processes such as landslides, volcanic eruptions, and earthquakes.
SC-E-1.3.2-Heat can be produced in many ways such as burning or rubbing. One way heat can move from one object to another is by conduction. Some materials absorb and conduct heat better than others. For example, metal objects conduct heat better than wooden objects.
SC-E-1.3.3-Electricity in circuits can produce light, heat, sound, and magnetic effects. Electrical circuits require a complete conducting path through which an electrical current can pass.

Coal Formation and Importance

Coal is America's most abundant fossil fuel resource, and the United States has more reserves than any other single country in the world. Thirty-eight of the fifty states have large coal deposits. Opposite to popular belief, fossil fuels are not the remains of dinosaurs. Actually, fossil fuels were formed millions of years before dinosaurs roamed the earth. These fuels were produced when the weight of upper layers of soil and rock compressed plant material into a dense substance that when subjected to heat, altered slowly into these energy resources.

The word **fossil** is defined as hardened remains of plant or animal life from some previous geological period that are preserved in the Earth's crust. Therefore **fossil fuels** are materials that can be used today to produce energy (heat or power) but were created from plants and animals that lived millions of years ago. Like many fossils, these fossil fuels may be found deep in the layers of the Earth.

Fossil energy is a term used for the group of energy resources formed from prehistoric plants and animals. **Fossil fuels** refer to the members of this group. Coal, natural gas, and petroleum are members of this group.

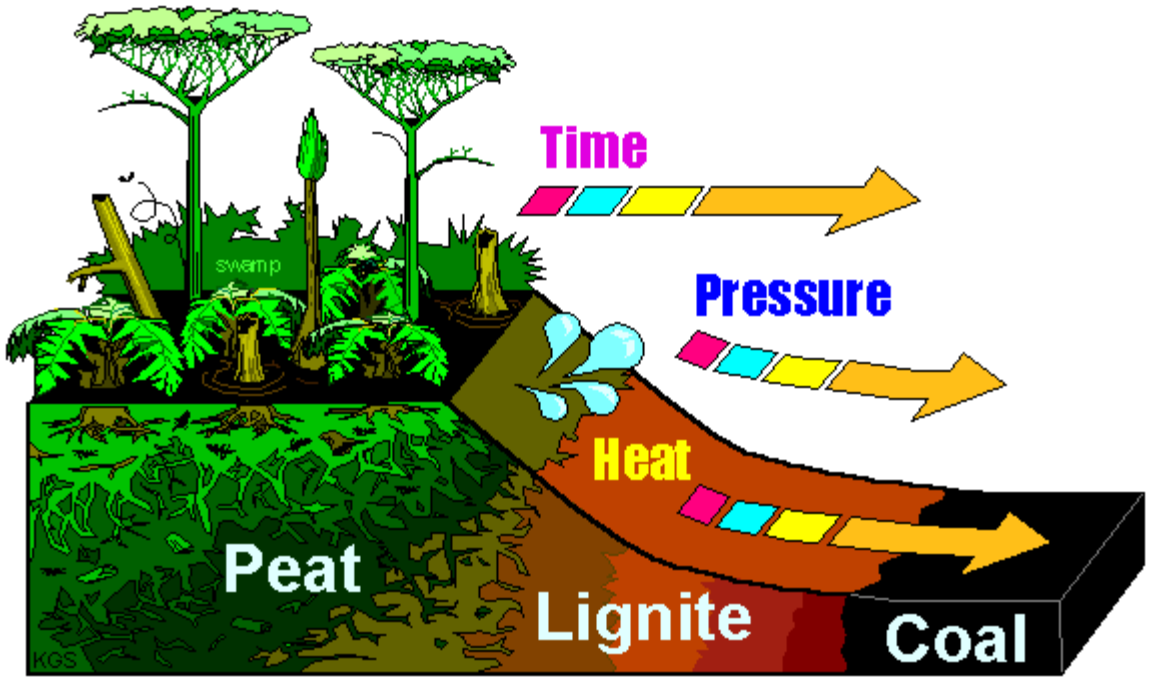
All living things need energy. The dinosaur ate and used food as fuel to produce the energy it needed to move, play, and even sleep. Our bodies need energy for the same reasons. Our body is much like an engine that needs energy to make it run. We must have fuel to run our engine (heart) that enables our levers (arms), wheels (feet), computer (brain), etc. to operate. Energy is the fuel we use to power our engine. People get energy from consuming many kinds of food. After we eat the food our bodies digest it and then burn it to produce energy.

However, besides needing energy for our bodies we need energy to power many things we use in our everyday life. We take machines such as televisions, cars, and computers for granted and expect them to turn on when we push the right button or turn the key. But these machines need energy to run. Many times the energy used to power these things comes from **fossil fuels**. We also, burn natural gas, coal, and other fossil fuels to heat our homes. We use "gasoline", a product made from a liquid fossil fuel called "petroleum" to power our cars. Televisions and computers need "electricity" to make them work. We also need electricity to produce light, which is so important to our everyday living. This electricity is produced using fossil fuels that were formed from plants and animals that lived and died millions of years ago.

A fossil fuel rock called **coal** is used to produce much of the electricity we use today. Coal is a very, very old type of fossil. It was formed from plants that flourished in the great swamp forests over 300 million years ago.

The Earth's climate, soil, and atmosphere were favorable for thick plant growth. Many large areas of flat swampy land of perpetual summer existed where plants grew plentifully, died, and fell into the shallow waters. The plants could be enormous. Plants, which today occasionally grow to three feet in tropical forests, grew to heights of 30 to 125 feet (impressive tall oak trees today are 100 feet tall). Some of these plants had branches that grew directly out of their trunks making them look like 100-foot tall bottlebrushes. Over millions of years these dead plants became coal. Anthracite, the hardest type of coal, can be over 100 million years older than a dinosaur fossil.

Coal, the hard black fossil fuel found in many states in the United States is very plentiful in the state of Kentucky and Harlan County. It important for its use in producing electricity, but it is also important as a source of employment for many families in the area.



Discussion Questions

What do you and a dinosaur have in common?
Both need energy and fuel to make that energy.

Why is coal called a fossil fuel?
Coal was formed from prehistoric plants and animals.

Why do people and animals need energy and where do they get energy?

All living things need energy. The dinosaur ate and used food as fuel to produce the energy it needed to move, play, and even sleep. Our bodies need energy for the same reasons. Our body is much like an engine that needs energy to make it run. We must have fuel to run our engine (heart) that enables our levers (arms), wheels (feet), computer (brain), etc. to operate. Energy is the fuel we use to power our engine. People get energy from consuming many kinds of food. After we eat the food our bodies digest it and then burn it to produce energy.

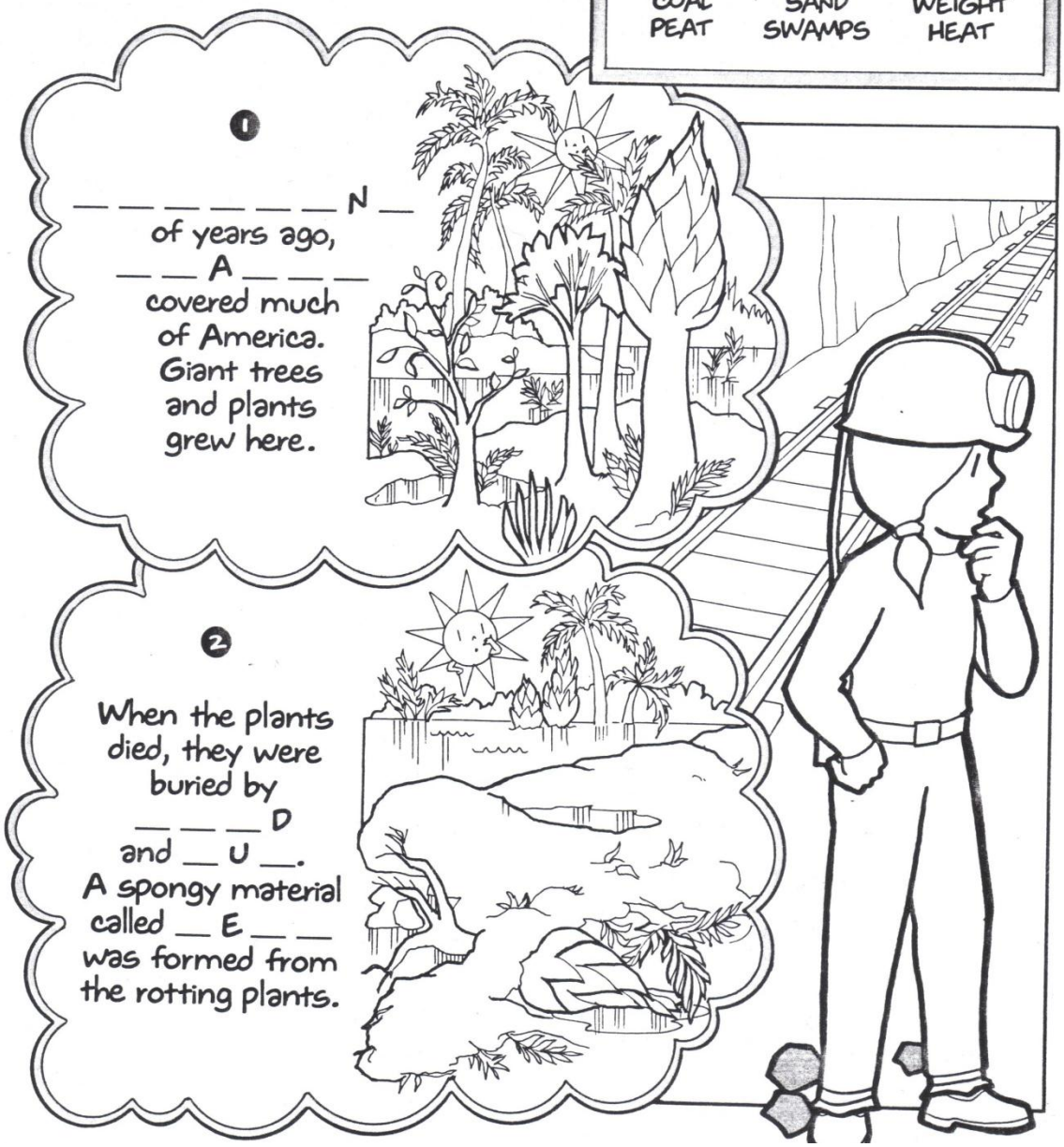
List ways fossil energy is used at your home.

Lights, television, clock, computer, heat and air conditioning, video games, cars, refrigerator, etc.

COAL COMES FROM
inside the earth!

Use this word list to complete the sentences below.

MUD	PRESSURE	MILLIONS
COAL	SAND	WEIGHT
PEAT	SWAMPS	HEAT



Importance of Coal
Science Student Worksheet

Coal is America's most abundant fossil fuel resource, and the United States has more reserves than any other single country in the world. Thirty-eight of the fifty states have large coal deposits. Opposite to popular belief, fossil fuels are not the remains of dinosaurs. Actually, fossil fuels were formed millions of years before dinosaurs roamed the earth. These fuels were produced when the weight of upper layers of soil and rock compressed plant material into a dense substance that when subjected to heat, altered slowly into these energy resources.

Fossils are the remains of plants or animals that lived a long time ago or the evidence of them. **Fossil fuels** are materials that can be used today to produce energy (heat or power) but were created from plants and animals that lived millions of years ago. Like many fossils, these fossil fuels may be found deep in the layers of the Earth.

Fossil energy is a term used for the group of energy resources formed from prehistoric plants and animals. **Fossil fuels** refer to the members of this group. Coal, natural gas, and petroleum are members of this group.

All living things need energy. The dinosaur ate and used food as fuel to produce the energy it needed to move, play, and even sleep. Our bodies need energy for the same reasons. Our body is much like an engine that needs energy to make it run. We must have fuel to run our engine (heart) that enables our levers (arms), wheels (feet), computer (brain), etc. to operate. Energy is the fuel we use to power our engine. People get energy from consuming many kinds of food. After we eat the food our bodies digest it and then burn it to produce energy.

However, besides needing energy for our bodies we need energy to power many things we use in our everyday life. We take machines such as televisions, cars, and computers for granted and expect them to turn on when we push the right button or turn the key. But these machines need energy to run. Many times the energy used to power these things comes from **fossil fuels**. We also, burn natural gas, coal, and other fossil fuels to heat our homes. We use "gasoline", a product made from a liquid fossil fuel called "petroleum" to power our cars. Televisions and computers need "electricity" to make them work. We also need electricity to produce light, which is so important to our everyday living. This electricity is produced using fossil fuels that were formed from plants and animals that lived and died millions of years ago.

A fossil fuel rock called **coal** is used to produce much of the electricity we use today. Coal is a very, very old type of fossil. It was formed from plants that flourished in the great swamp forests over 300 million years ago.

The Earth's climate, soil, and atmosphere encouraged thick plant growth. Many large areas of flat swampy land of perpetual summer existed where plants grew plentifully, died, and fell into the shallow waters. The plants could be enormous. Plants, which today occasionally grow to three feet in tropical forests, grew to heights of 30 to 125 feet (today's tall oak trees are 100 feet tall). Some of these plants had branches that grew directly out of their trunks making them look like 100-foot tall bottlebrushes. Over millions of years these dead plants became coal. Anthracite, the hardest type of coal, can be over 100 million years older than a dinosaur fossil.

Coal, the hard black fossil fuel found in many states in the United States is very plentiful in the state of Kentucky and Harlan County. It is important for its use in producing electricity, but it is also important as a source of employment for many families in this area.

Discussion Questions

1. What do you and a dinosaur have in common?

2. Why is coal called a fossil fuel?

3. Why do people and animals need energy and where do they get energy?

4. Make a list ways fossil energy is used at your home.

Uses of Common Fossil Fuels

F	Q	B	E	E	Z	L	U	F	S	B	X	L	H	C	C	Z	F	Y	B	S	E	S	S	T
H	Q	M	O	W	V	A	M	O	F	U	N	G	E	V	O	L	I	U	S	Z	K	T	Y	L
P	A	R	A	F	F	I	N	W	A	X	Q	H	K	U	E	O	F	R	E	C	E	N	K	A
G	A	S	O	L	I	N	E	E	B	Q	L	Y	G	Z	F	K	L	E	A	L	R	A	G	H
M	N	O	I	T	C	U	D	O	R	P	L	E	E	T	S	L	R	I	E	T	O	C	V	P
H	E	A	T	I	N	G	I	D	I	C	O	O	U	L	L	F	E	T	N	A	S	I	A	S
Q	E	Y	F	Q	T	U	C	W	C	X	X	A	W	F	I	H	H	S	H	G	E	R	L	A
S	C	I	T	S	A	L	P	S	S	L	Q	N	E	T	T	A	L	N	E	M	N	B	U	S
S	R	E	Z	I	L	I	T	R	E	F	M	Z	N	N	N	E	R	G	T	I	E	U	A	X
L	T	V	J	Q	V	Y	J	W	U	M	Y	A	A	E	R	T	J	H	U	J	D	L	Y	E

ANTIFREEZE	ASPHALT	COOLING
DIESEL FUEL	ETHANE	FABRICS

FERTILIZERS	FUEL OILS	GASOLINE
HEATING	JET FUEL	KEROSENE
LUBRICANTS	PARAFFIN WAX	PLASTICS
STEEL PRODUCTION	TAR	WAX

Created by Puzzlemaker at DiscoveryEducation.com

Teacher Information
Strategies for Reading Comprehension
RAFT Papers
[Nancy Vandervanter, in Adler, 1982]
RAFT

Role/Audience/Format/Topic
The RAFT strategy offers students a creative outlet for demonstrating understanding. Students communicate information by taking an unusual point of view and writing for a specific audience. RAFT stands for:

Role (of the writer)	What is the writer's role: reporter, critic, observer, or eyewitness?
Audience	Who will be reading this writing: the teacher, other students, a parent, or community members?
Format	What is the best way to present this writing: in a letter, an article, a report, a poem?
Topic	Who or what is the subject of this writing: a famous inventor, life in the future?

RAFT Papers are simply a way to think about the four main things that all writers have to consider:
Role of the Writer

Who are you as the writer? Are you Abraham Lincoln? A warrior? A homeless person? An auto mechanic? The endangered snail darter?

Audience
To whom are you writing? Is your audience the American people? A friend? Your teacher? Readers of a newspaper? A local bank?

Format
What form will the writing take? Is it a letter? A classified ad? A speech? A poem?

Topic
What's the subject or the point of this piece? Is it to persuade a goddess to spare your life? To plead for a re-test? To call for stricter regulations on logging?

RAFT Papers give students a fresh way to think about approaching their writing. They occupy a nice middle ground between standard, dry essays and free-for-all creative writing. RAFT papers combine the best of both.

www.coaleducation.org

Role of
Writer:

Format:
Audience: Topic:

Coal Keeps the Lights On!

Science (Teacher)

Core Content:

SC-E 1.3.3-Electricity in circuits can produce light, heat, sound, and magnetic effects. Electrical circuits require a complete conducting path through which an electrical current can pass.
SS-E-3.1.2-Consumers use goods and services to satisfy economic wants and needs.
PL-E-3.1.1-There is a distinction between needs and wants.

Goal: Students will identify coal as the primary fuel used to generate electricity.

Background Information:

Coal is used to generate over one-half of the United States' electricity. Global demand for electricity continues to increase. Historically, many areas of Kentucky and rural areas of other states did not have electric power available during the early part of the 1900s. The modern electric utility industry began in urban areas in the 1880s and spread rapidly during the 1890s. It was during 1890 that coal was first used to generate the electricity. By 1907, about 8% of U.S. residents used electricity and by 1932 the numbers had risen to 67%, the overwhelming majority of that number were urban customers. The U.S. Steel mining facility at Lynch, Kentucky completed a power plant and provided electric power to mines and residents as early as 1920.

Materials:

Worksheets
Pencils

Activities:

Discuss coal use in the production of electricity and the necessity of electricity in modern life. Create small work groups to discuss and complete "When the Lights Go Out" worksheet. Have each group share what they wrote.

Assign "My Two Hours Without Electricity" worksheet.

Review worksheet with class the next day. Ask students if their earlier written predictions came true and how they felt about being without electricity for only a fraction of a day. Ask students how they might better conserve electricity.

Have students use the RAFT writing method to create an original letter, poem, or essay based on their thoughts generated from this lesson.

Coal Keeps the Lights On!
Student Worksheet

Our way of life has become increasingly dependent on electricity. It seems that the electric meter on the side of the house is constantly spinning. Electricity is a source of energy. If you use electricity, you are using coal because coal generates over one-half of the electricity consumed in America each day, far more than any other energy source. We have appliances and machines that change electrical energy into other forms of energy, and then they do work for us.

What would it be like if the power was turned off and there was no electricity? Would our lifestyle be just like the lifestyles of about a hundred years ago? Would you be able to survive?

Write a paragraph explaining what would happen to life in your home if the electricity was turned off.

List what changes would have to be made. Tell what new inventions you could come up with that would replace the electricity entering your home from your power company.

My Two Hours Without Electricity Worksheet

Science

Time period I went without using electricity: _____

After spending two hours at your home without electricity, mark the items in the list that you did not use and then answer the questions. Remember to put your answers into sentences in paragraph form.

During this time I did not use the following that I normally would have if I had electricity.

radio/stereo	computer	washing machine	oven/stove(electric)
hairdryer	dishwasher	TV/VCR	clothes dryer (electric)
lights/lamps	video games	coffee maker	can opener
garage door opener	toaster	shower	refrigerator
freezer	alarm clock	electric hot water heater	microwave

Instead I ..... (Explain what you did during your two hour period without electricity.)

This made me feel ..... (How did you feel about going without electricity?)

I now realize that electricity ..... (What do you think about electricity now? Is it more or less important to you? Why?)

To conserve electricity at home I can ..... (What things can you do at home to avoid "wasting electricity?)

Science—Quiz
Student

Choose the best word to complete the sentences below.

1. Coal is classed or typed according to carbon content. There are four _____ of coal.
    a. seams
    b. building blocks
    c. ranks

2. Coalification creates layers or _____ of coal beneath the ground surface.
    a. deposits
    b. pools
    c. dinosaurs

3. A pure carbon mineral is _____.
    a. coal
    b. graphite
    c. granite

4. The _____ _____ is the repeating process of life, death, and decay of forest plants.
    a. coalification process
    b. life cycle
    c. coal ranking

5. Peat is _____.
    a. the highest rank of coal
    b. a geological time period
    c. dead forest matter

6. The _____ of decaying plant material by heavy soil and rocks brought about the formation of coal.
    a. compression
    b. freezing
    c. lifting

7. When soil and rocks cover decaying plant material causing heat and pressure for a long time, coal is formed. This process is called _____.
    a. ranking
    b. the big bang

c. coalification

8. About _____ years ago coal began forming in the earth.
   a. 300 million
   b. 300 thousand
   c. 30,000

Choose two of the following questions and answer each with a short paragraph.

1. If I visited the earth at the time coal was forming, I would see…..

2. If there was no electricity in my home, my life would be different ….

3. Now that I know coal is a fossil fuel, I think that….

Science—Quiz
Key

Choose the best word to complete the sentences below.

1. Coal is classed or typed according to carbon content. There are four _____ of coal.
    a. seams
    b. building blocks
    c. **ranks**

2. Coalification creates layers or _____ of coal beneath the ground surface.
    a. **deposits**
    b. pools
    c. dinosaurs

3. A pure carbon mineral is _____.
    a. **coal**
    b. graphite
    c. granite

4. The _____ _____ is the repeating process of life, death, and decay of forest plants.
    a. coalification process
    b. **life cycle**
    c. coal ranking

5. Peat is _____.
    a. the highest rank of coal
    b. a geological time period
    c. **dead forest matter**

6. The _____ of decaying plant material by heavy soil and rocks brought about the formation of coal.
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    b. freezing
    c. lifting

7. When soil and rocks cover decaying plant material causing heat and pressure for a long time, coal is formed. This process is called _____.
    a. ranking
    b. the big bang
    c. **coalification**

8. About _____ years ago coal began forming in the earth.
   a. **300 million**
   b. 300 thousand
   c. 30,000

Choose two of the following questions and answer each with a short paragraph.

1. If I visited the earth at the time coal was forming, I would see…..

2. If there was no electricity in my home, my life would be different ….

3. Now that I know coal is a fossil fuel, I think that….

Producing Coke
Core Content:

RD-EP-5.0.3: Students will apply knowledge of text features (e.g., pictures, lists, charts, graphs, tables of contents, indexes, glossaries, captions, headings) to answer questions about a passage.
RD-04-2.0.3: Students will locate key ideas or information in a passage
RD-04-2.0.4: Students will interpret the meaning of specialized vocabulary (words and terms specific to understanding the content). RD-04-3.0.4: Students will identify main ideas and details that support them.

Deep in the Kentucky Mountains in the early 1900s, International Harvester's Benham Coal Company began producing coke. Construction on the first coke ovens began in 1910. Because the bituminous coal in the Looney Ridge and Benham Spur made excellent coke, Benham Coal Company built 408 coke ovens near the coal mines there. Benham Coal manufactured its coke for Wisconsin Steel Mills in South Chicago and shipped their product by rail.

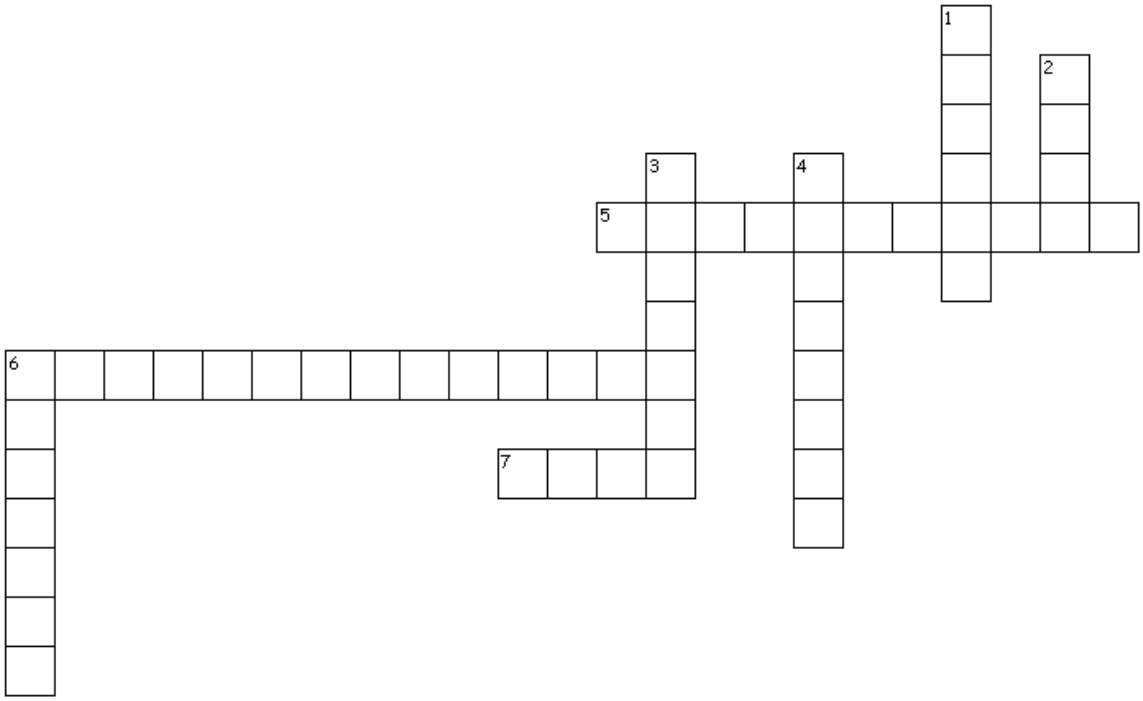
Coke formed when bituminous coal was heated in ovens to burn off gas, tar, and oil but the carbon content did not burn. The material left behind was coke. When burned, coke produced intense heat but little smoke, making an excellent fuel for blast furnaces and iron and steel production.

Many coke plants at that time used "beehive" coke ovens. Their names came from the dome shape of a beehive. Beehive ovens averaged around twelve feet in diameter, with sandstone or brick exteriors and firebrick interiors. Each had an opening at the top and on the side. Small railroad tracks ran across the top of each battery of ovens, and railroad cars carried coal to the ovens and the coke to the gondolas for shipment. During the coking process the side window in the oven was sealed, but a Leveler would frequently check the material inside to make sure the coal stayed level. After about 72 hours the seal was broken, the coke was removed and the trip began to the steel furnaces.

Glossary
Carbon – A substance which is present in all organic compounds and that occurs in a pure state as diamond and graphite, and almost pure in coke.
Bituminous Coal - a soft, mineral coal
Coke - the solid product resulting from the baking of coal in an oven or closed chamber
Beehive oven - an oven characterized by its dome-shaped roof and used for converting coal into coke
Battery - any large group or series of related things: such as a group of coke ovens
Spur -a ridge running along the side of a mountain or mountain range
Leveler – job title for a coke laborer who kept the coal in the beehive oven level for best coke production.
Diameter – the width of a round object.
Gondola - a railroad car with no top, a flat bottom, and fixed sides that is used chiefly for hauling heavy bulk commodities
Tar - a dark brown or black substance similar to asphalt that is produced in the manufacture of coal gas and often used in paving, shampoos, and medicines.

Carbon - A substance which is present in all organic compounds and that occurs in a pure state as diamond and graphite, and almost pure in coke.

Producing Coke Crossword



Across
5. an oven for converting coal into coke, characterized by its dome-shaped roof.
6. a soft, mineral coal
7. a ridge running along the side of a mountain or mountain range

Down
1. A substance which is present in all organic compounds and that occurs in a pure state as diamond and graphite, and almost pure in coke.
2. the solid product resulting from the baking of coal in an oven or closed chamber
3. job title for a coke laborer who kept the coal in the beehive oven level for best coke production.
4. the width of a round object.
6. any large group or series of related things: such as a group of coke ovens

Producing Coke
Quiz

1. Coke produces intense heat making it an excellent fuel for blast furnaces and _____ and _____ production.

2. Soft mineral coal is called _____.

3. It usually took about _____ hours in the furnaces to turn coal into coke.

In Class Project Suggestion

Have students do research to find out what the beehive coke ovens looked like. Using a 1" scale, make a beehive coke oven by using papier-mâché. Use paint to make it look like brick or sandstone.

Teacher's Page
Producing Coke
Quiz (Answers)

1. Coke produces intense heat making it an excellent fuel for blast furnaces and Iron and Steel production.

2. Soft mineral coal is called Bituminous.

3. It usually took about 72 hours in the furnaces to turn coal into coke.

Mine Gases Found Under the Earth
Core Content:

RD-04-2.0.3: Students will locate key ideas or information in a passage
RD-04-2.0.4: Students will interpret the meaning of specialized vocabulary (words and terms specific to understanding the content). RD-04-3.0.4: Students will identify main ideas and details that support them.
SC-04-1.1.1: Students will explain how matter, including water, can be changed from one state to another.
Materials can exist in different states--solid, liquid and gas. Some common materials, such as water, can be changed from one state to another by heating or cooling. Resulting cause and effect relationships should be explored, described and predicted.
SC-04-4.6.4: Students will: analyze models/representations of light in order to generalize about the behavior of light; represent the path of light as it interacts with a variety of surfaces (reflecting, refracting, absorbing).
Light can be observed as traveling in a straight line until it strikes an object. Light can be reflected by a shiny object (e.g., mirror, spoon), refracted by a lens (e.g., magnifying glass, eyeglasses), or absorbed by an object (e.g., dark surface).

Methane--Coal mine methane is a form of natural gas. A "fire damp" is particularly dangerous, because it consists mainly of methane, a flammable gas.
The presence of this gas is well known in underground coal mining, where it presents a serious safety risk. In undisturbed coal deposits, the methane is loosely attached to the coal molecules where the deposit is under pressure. If the area is opened by miners, the pressure is reduced and the methane bubbles out.
An "after damp" includes the same gases as a black damp, plus carbon monoxide, and usually forms after a mine explosion.
Carbon Monoxide (White damp) may be produced in large quantities by the reaction of incandescent carbon or soot on carbon dioxide. It is odorless, colorless and tasteless. A "white damp" is any air containing carbon monoxide, a gas that has no scent but is toxic in even low concentrations.
Carbon Dioxide (Blackdamp) is produced by the combustion of matter in a plentiful supply of air, it is a product of the burning of lamps, breathing of men and animals, combustion of coal and powder, and decay of timber, A "black damp" is a mix of carbon dioxide and nitrogen caused by corrosion, a process that can cause suffocation by drawing the oxygen from the air.

Mine Gases
Quiz

1. Name three gases found underground. _____, _____, _____

2. _____ is odorless, colorless and tasteless.

3. _____ is a very flammable gas that causes explosions.

In Class Project Suggestion

Have students go online and use a search engine to find information about hazardous gases that collect in homes. Then have them answer the questions:

What causes these hazardous gases to collect in homes?

What safety measures should families take to ensure there are no hazardous gases in their home?

Teacher's Page
Mine Gases
Quiz (Answers)

1. Name three gases found underground. Methane, Carbon Monoxide, Carbon Dioxide

2. Carbon Monoxide is odorless, colorless and tasteless.

3. Methane is a very flammable gas that causes explosions.

Prospecting for Coal
Core Content:

RD-04-2.0.3: Students will locate key ideas or information in a passage
RD-04-2.0.4: Students will interpret the meaning of specialized vocabulary (words and terms specific to understanding the content). RD-04-3.0.4: Students will identify main ideas and details that support them.
SS-04-3.2.1: Students will explain how profit motivates individuals/businesses to take risks in producing goods and services.
SS-04-3.4.2: Students will describe how new knowledge, technology/tools and specialization increases productivity and promotes trade between regions of Kentucky and the United States.
SS-04-4.1.1: Students will use geographic tools (e.g., maps, charts, graphs) to identify and describe natural resources and other physical characteristics (e.g., major landforms, major bodies of water, weather, climate, roads, bridges) in regions of Kentucky and the United States.
SS-04-5.2.3: Students will compare change over time in communication, technology, transportation and education in Kentucky.

Prospectors for coal in the late 19th century used geological knowledge to determine where coal is located. Being a prospector in those days required general knowledge of underground formations and special understanding of coal bearing formations. These early prospectors tended to roam likely areas on foot or mule, looking for visual evidence of fossil fuel deposits or an indication of minerals in outcrops.

Texts of the time encouraged prospectors who discovered a potential deposit of coal to consider the financial possibilities of a mining enterprise at a particular location before doing extensive surveys. The prospectors should first consider distance to a shipping point or a rail line. They should consider future transportation possibilities. The prospector should also look at local businesses and decide how much competition a new company would face at this site. He should ask himself who could the company hire to work and would these people require extensive training.

If all these answers created a positive business outlook, then the prospector could determin if a significant coal deposit was on that property. He begun by watching for ore deposits that were often located near coal seams.

Colors were a guide to finding ores related to coal reserves. Red, brown, and yellow indicate sulfide-bearing veins. Greens and blues could indicate oxidized copper minerals.

The prospector determined the suitability by a general assessment of the ground and outcroppings. In the early years of mining, the next step in the exploration was hand digging an exploratory shaft and a crew of laborers and a supervisor would evaluate the coal seam.

By the early 1900s, a core drilling sample could reveal the layers of rock and matter below ground level and the prospector did not need an entrance shaft for initial assessment of coal reserves. In core drilling, an auger or drill is used to remove a sample of underground material. To see a core drilling rig or a core sample go to:
http://en.wikipedia.org/wiki/Drilling_rig#Auger_drilling or to
http://en.wikipedia.org/wiki/Core_drill.

Modern methods of prospecting for coal reserves are carried out with the support of new field and laboratory tests. Geochemical prospecting involves the field and laboratory analysis of sampled rock, soil, vegetation, and other natural materials.

Imagery collected by aircraft and satellites is useful in prospecting and in the patterns of data associated with geographical information systems. Aerial photography is used to discriminate between types of exposed rock and soil and to emphasize the appearance of bleached and stained areas. For more information about these prospecting tools, link to: Geographic information systems or Remote sensing. Learn more about exploring for coal at: http://www.answers.com/topic/prospecting#ixzz1mZj2SGG3

Prospecting for Coal
Quiz

1. What type of transportation did early prospectors in Kentucky tend to use?

2. If a prospector thought he had found a coal deposit, what was his next consideration?

3. How did watching for colors help the prospector?

Teacher's Page
Prospecting for Coal
Quiz (answers)

1. What type of transportation did early prospectors in Kentucky tend to use? On Foot or Mule

2. If a prospector thought he had found a coal deposit, what was his next consideration? to consider the financial possibilities of a mining enterprise at a particular location before doing extensive surveys. The prospectors should first consider distance to a shipping point or a rail line. They should consider future transportation possibilities. The prospector should also look at local businesses and decide how much competition a new company would face at this site. He should ask himself who could the company hire to work and would these people require extensive training.

3. How did watching for colors help the prospector? Colors were a guide to finding ores related to coal reserves. Red, brown, and yellow indicate sulfide-bearing veins. Greens and blues could indicate oxidized copper minerals.

Make Colorful Crystals from Coal

Your child is probably familiar with coal: it's those chalky black briquettes that cook up burgers and hot dogs on the open grill. But does he know that with a lot of pressure—and even more time—coal can be transformed into glittering diamonds?

You don't have to wait millions of years to turn coal into a beautiful gem. Watch coal turn into crystals right before your eyes! While you're at it, take time to explain how diamonds are formed: he'll be surprised to learn that natural material, such as peat, is compressed over years and years into carbon-rich coal, and then into crystals!

What You Need:
Adult helper
Measuring spoon
Liquid bluing
Laundry detergent
Iodized salt (table salt)
Small bottle of ammonia
Small jar
Plastic picnic spoon or old table spoon
8 to 10 charcoal briquettes
Disposable pie tin
Food coloring

What You Do:
Measure 2 tablespoons each of liquid blueing, laundry detergent, salt, and ammonia into a small jar. Have an adult helper supervise this mixing. Avoid breathing the ammonia fumes as much as possible. Stir with an old tablespoon or plastic picnic spoon.
Place 3 or 4 charcoal briquettes on a disposable pie tin. Add a few drops of food coloring on each briquette.
Pour some of the detergent, salt, and ammonia solution over the top of the charcoal pieces. While the crystals are forming, replenish your supply of solution.
As you enjoy the beautiful colors and shapes that emerge, repeat the process with 3 or 4 more briquettes.

This fun activity will not only introduce your child to geologic concepts, it will also make your child realize that beautiful things can come from unlikely places, and that colorful jewels can hide even in the blackest briquette!

http://www.education.com/activity/article/Colorful_Crystals_Coal/

Science Resource Page

The resources listed below will increase the instructor's basic knowledge of the topics covered, provide additional information for class enrichment, and enhance enjoyment of the subject for teacher and students alike.

coaleducation.org
seaborg.nmu.edu/earth/timelines.html
uky.edu/KGS/coal/webcoal/pages/coal/when.html
uky.edu/KGS/coal/webgeoky/time
uky.edu/KGS/coal/webfossl/pages/pennsylvanianplants.html
Mike Thomas, Kentucky Historical Society, "In the Veins," a one person play about coal mining.

LINKS for Teachers and Students
for teachers and students
http://www.folklife.si.edu/education_exhibits/resources/guide/introduction.aspx
Fact Monster has games and facts and homework help for students
http://www.factmonster.com/ipka/A0193169.html
a step by step guide to use the Google wonder wheel search facilitator...Cool help for students
http://www.googleswonderwheel.com/
a public domain site for photography
http://edtechteacher.org/index.php/teaching-technology/research-writing/63-public-images

DOE curriculum—Fossil Energy
http://trackstar.4teachers.org/trackstar/ts/searchByKeyword.do?org.apache.struts.taglib.html.TOKEN=9eedc9bdbf904064b5903ff36f4a58f0&pageBegin=0&keywords=coal

Great resources for riddles about electricity
http://www.onlineschools.org/resources/brain/

Coal Town Curriculum:
Museum Exploration & Underground Adventure

Portal 31 Lynch, Kentucky
Safety and Rescue Team

Exploration—Adventure—Excitement—Discovery

Journey through Portal 31

Step aboard an authentic mantrip (a vehicle used to transport miners in and out of a coal mine) and ride the dark coal tunnels in Portal 31 Underground Mine. The all-metal mantrip runs tracks like a train. It has five bench-style seats and a metal roof. At a working mine, the mantrip would transport workers to the work area deep inside the mine but for now, visitors at Portal 31 can sit back and feel the clack, clack, clack of the wheels on the rail as the mantrip carries them deeper and deeper under the Looney Ridge of Big Black Mountain and further back into history.

Mantrip

(http://www.google.com/search?hl=en&q=teens+in+soda+fountain+1045&bav=on.2,or.r_gc.r_pw.r_qf.,cf.osb&biw=1024&bih=627&wrapid=tlif133219962020110&um=1&ie=UTF-8&tbm=isch&source=og&sa=N&tab=wi&ei=0MBnT72aDaTpsQLTvKSjCQ#um=1&hl=en&tbm=isch&sa=1&q=mantrip&oq=mantrip&aq=f&aqi=g2g-m1g-S7&aql=1&gs_l=img.3..0l2j0i5j0i24l7.605031l606810l7l608073l7l7l0l0l0l0l125l781l0j7l7l0.efis.1.&bav=on.2,or.r_gc.r_pw.r_qf.,cf.osb&fp=5b6a8f9de808a0bb&biw=1024&bih=566)

As the mantrip leaves the dock a long white plastic curtain hangs across the mine tunnel. This is a brattice curtain, a fire-resistant fabric or plastic partition used in a mine passage to confine the air and force it into the working place. As soon as the mantrip passes through the curtain the tunnel is dark. This is the dark of the underground mine. A visitor cannot see his hand before his

face or his friend beside him, but there is always the clack, clack, clack of the wheels on the rail as the mantrip carries him deeper under the Looney Ridge of Big Black Mountain.

In moments the mantrip will stop and lights will begin to glow beside the track and figures emerge from the shadows. You may think you have traveled back in time as you look at the animatronic coal miner and his mule. The exhibit seems to speak. The year is 1918 and his job is to dig coal and provide for his family. The miner's name is Joseph Marsili. He has just moved to Lynch from Italy to be a coal miner. These are days of danger and hard work in underground coal mining, but Mr. Marsili is lucky to have a job at a company that stresses 'safety first'.

Before the lights dim you may spot Mr. Marsili's shovel and pick for digging coal. Look for his carbide light and soft hat that was worn by all miners in the early days of the 1900s. (See photo.) You could look for a canary in its cage—it was used to warn the men of poisonous gas in the mine. If the bird collapsed the miners left the coal mine quickly.

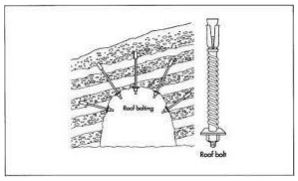

http://wasg.iinet.net.au/lamppics.html

Farther through Portal 31 a visitor may occasionally feel a drip of cold water splash on their shoulder as the mantrip clacks along the rail in the dark. As the mantrip slows to a stop Mr. Marsili and a mining scene 10 years later than the first appear beside the tracks. Mr. Marsili tells how Portal 31 has set a world-wide production record and rear screen projection introduces us to miners who seem to be approaching. One of the miners is Mr. Marsili's son and he tells his father that he is training a new man and making sure that he knows the safest way to work in the mine.

The next stop reveals that it is now 1940. An animatronic miner samples the air with an anemometer and tests the roof with a sounding bar. He explains how important it is to regularly check the mine for dangerous gases. He also talks with other miners about the depression the country is experiencing and about miners striking during the war.

(http://www.google.com/search?hl=en&q=teens+in+soda+fountain+1045&bav=on.2,or.r_gc.r_pw.r_qf.,cf.osb&biw=1024&bih=627&wrapid=tlif133219962020110&um=1&ie=UTF-8&tbm=isch&source=og&sa=N&tab=wi&ei=0MBnT72aDaTpsQLTvKSjCQ#um=1&hl=en&tbm=isch&sa=1&q=anemometer&oq=annemometer&aq=0s&aqi=g-s10&aql=1&gs_l=img.1.0.0i10l10.53914l65692l2l75645l11l11l0l0l0l0l125l1154l4j7l11l0.efis.1.&bav=on.2,or.r_gc.r_pw.r_qf.,cf.osb&fp=5b6a8f9de808a0bb&biw=1024&bih=566)

As the mantrip travels on through Portal 31 you will see and many animatronic miners, African American, Europeans and others carry on conversations about the importance of the work they are doing. You see miners at jobs like roof bolting to keep the roof of the mine safe, haulage that involves moving men, equipment or coal to the outside of the mine, and repairing the continuous mining machine. You really feel like you have witnessed the mining of coal! Roof Bolts made of steel are secured to rock in order to support the top of the tunnel.



(http://www.google.com/search?hl=en&q=teens+in+soda+fountain+1045&bav=on.2,or.r_gc.r_pw.r_qf.,cf.osb&biw=1024&bih=627&wrapid=tlif133219962020110&um=1&ie=UTF-8&tbm=isch&source=og&sa=N&tab=wi&ei=0MBnT72aDaTpsQLTvKSjCQ#um=1&hl=en&tbm=isch&sa=1&q=historic+roof+bolting+machine&oq=historic+roof+bolting+machine&aq=f&aqi=&aql=1&gs_l=img.3...39717l51885l6l52416l16l16l0l13l5l0l94l250l3l3l0.efis.1.&bav=on.2,or.r_gc.r_pw.r_qf.,cf.osb&fp=5b6a8f9de808a0bb&biw=1024&bih=566)


Joy Continuous Miner
(http://www.google.com/search?hl=en&q=teens+in+soda+fountain+1045&bav=on.2,or.r_gc.r_pw.r_qf.,cf.osb&biw=1024&bih=627&wrapid=tlif133219962020110&um=1&ie=UTF-8&tbm=isch&source=og&sa=N&tab=wi&ei=0MBnT72aDaTpsQLTvKSjCQ#um=1&hl=en&tbm=isch&q=joy+continuous+miner&revid=988055040&sa=X&ei=yNZtT9-lB5HBtgfn-5SzBg&ved=0CD0Q1QIoAA&bav=on.2,or.r_gc.r_pw.r_qf.,cf.osb&fp=5b6a8f9de808a0bb&biw=1024&bih=566)

The last stop on your trip under the mountain, whisks the tour group into a giant cavern that is saturated in light and sound; in dramatic fashion, you learn about how the land masses on the earth were formed, how continental upheavals and movement set the stage for the formation of coal, and how it rose in importance during the Industrial Revolution. The visitor also learns about Lynch and eastern Kentucky, how the miners came here from more than 30 different countries and built their lives around mining. While the stories are being told, the cavern is flooded with sights and sounds that give the visitor the impression of actually being part of the experience. The finale is the projection of hundreds of individual photographs of miners throughout the cavern.


(http://www.google.com/search?hl=en&q=teens+in+soda+fountain+1045&bav=on.2,or.r_gc.r_pw.r_qf.,cf.osb&biw=1024&bih=627&wrap

id=tlif133219962020110&um=1&ie=UTF-8&tbm=isch&source=og&sa=N&tab=wi&ei=0MBnT72aDaTpsQLTvKSjCQ#um=1&hl=en&tbm=isch&sa=1&q=joy+cutting+machine&oq=joy+cutt&aq=1S&aqi=g-S3&aql=1&gs_l=img.1.1.0i24l3.292766l293608l5l299879l4l4l0l1l1l0l125l343l1j2l3l0.efis.1.&bav=on.2,or.r_gc.r_pw.r_qf.,cf.osb&fp=5b6a8f9de808a0bb&biw=1024&bih=566)

Portal 31 History

When it was built, Portal 31 was the largest single loading coal plant in the U. S. In 1923, by preparing and shipping 12,880 tons of coal in a single shift, Lynch set a world's record for coal production. This accomplishment was credited to Lynch's "advanced development in mine and plant layout". Media reports described the design of the Lynch plant as a model to be copied. The portals to No. 31 were finished in 1920 while coal was being removed from temporary portals to the west. The mine was closed in 1963. In 1968 the three main entries were rehabilitated to serve the new Winifrede mine borehole, 1800 feet underground. The company's slogan "Safety, the first consideration" is engraved over the main portal. The Portal 31 has now found new life for it is not coal miners but visitors who ride through the dark coal tunnels intent on learn

KENTUCKY COAL MUSEUM
Scavenger Hunt

1. What method of payment did the miners use before payroll checks?

2. What services did the barbershop offer in the 1930's and 1940's that are not offered today?

3. Before the TV days, what types of entertainment did most homes have?

4. Name the five types of coal mining.

5. How much coal is needed to produce a kilowatt of power?

6. Name the 3 types of coal.

7. Name the different animals used in the coal mines years ago?

8. Why did the mules that worked in the mines go blind?

9. What is the title of one of John Fox, Jr. books displayed in the museum?

10. The _____was responsible for 8-hour days, hourly pay and vacation time.

11. What was the major railroad line during the coal boom?

12. _____ was the only coal camp in Harlan County that burned coal into coke.

13. In the early days what did the miners carry in their lunch pails?

14. Native Americans called coal _____ _____.

15. What Native American tribe was present here in the early days?

16. In the museum is a Native American Ceremonial Sword that dates back as early as the _____.

17. Name the 4 major types of light used by miners. - Past to Present-

18. The KY Coal Museum is located in what city?

19. What is the height of the "Mock Coal Mine" in the lower level of the Museum?

20. Name the general store where Loretta Lynn and her husband purchased bologna and bread on the way from Whitesburg radio station to Harlan Radio Station.

KENTUCKY COAL MUSEUM
Scavenger Hunt
Answer Key

1. What method of payment did the miners use before payroll checks? (Scrip)

2. What services did the barbershop offer in the 1930's and 1940's that are not offered today? (Shower and Shoeshine)

3. Before the TV days, what types of entertainment did most homes have?
(Musical instruments and family singing)

4. Name the five types of coal mining. (Drift/slope, open pit, auger, shaft, mountain top removal

5. How much coal is needed to produce a kilowatt of power?(One lb. of coal)

6. Name the 3 types of coal. (Anthracite, bituminous, lignite)

7. Name the different animals used in the coal mines years ago?
(Mules, ponies, oxen, goats, and dogs)

8. Why did the mules that worked in the mines go blind?
(They were kept in the dark for long periods of time)

9. What is the title of one of John Fox, Jr. books displayed in the museum?
(Trail of the Lonesome Pine, Little Shepherd of Kingdome Come, and etc)

10. John L Lewis was responsible for 8-hour days, hourly pay and vacation time.

11. What was the major railroad line during the coal boom? (L & N)

12. Benham was the only coal camp in Harlan County that burned coal into coke.

13. In the early days what did the miners carry in their lunch pails?
(Milk & cornbread, or biscuits w/ham, bacon or sausage)

14. Native Americans called coal Black Gold.

15. What Native American tribe was present here in the early days? (Cherokees or Shawnees)

16. In the museum is a Native American Ceremonial Sword that dates back as early as the __(1700's)__.

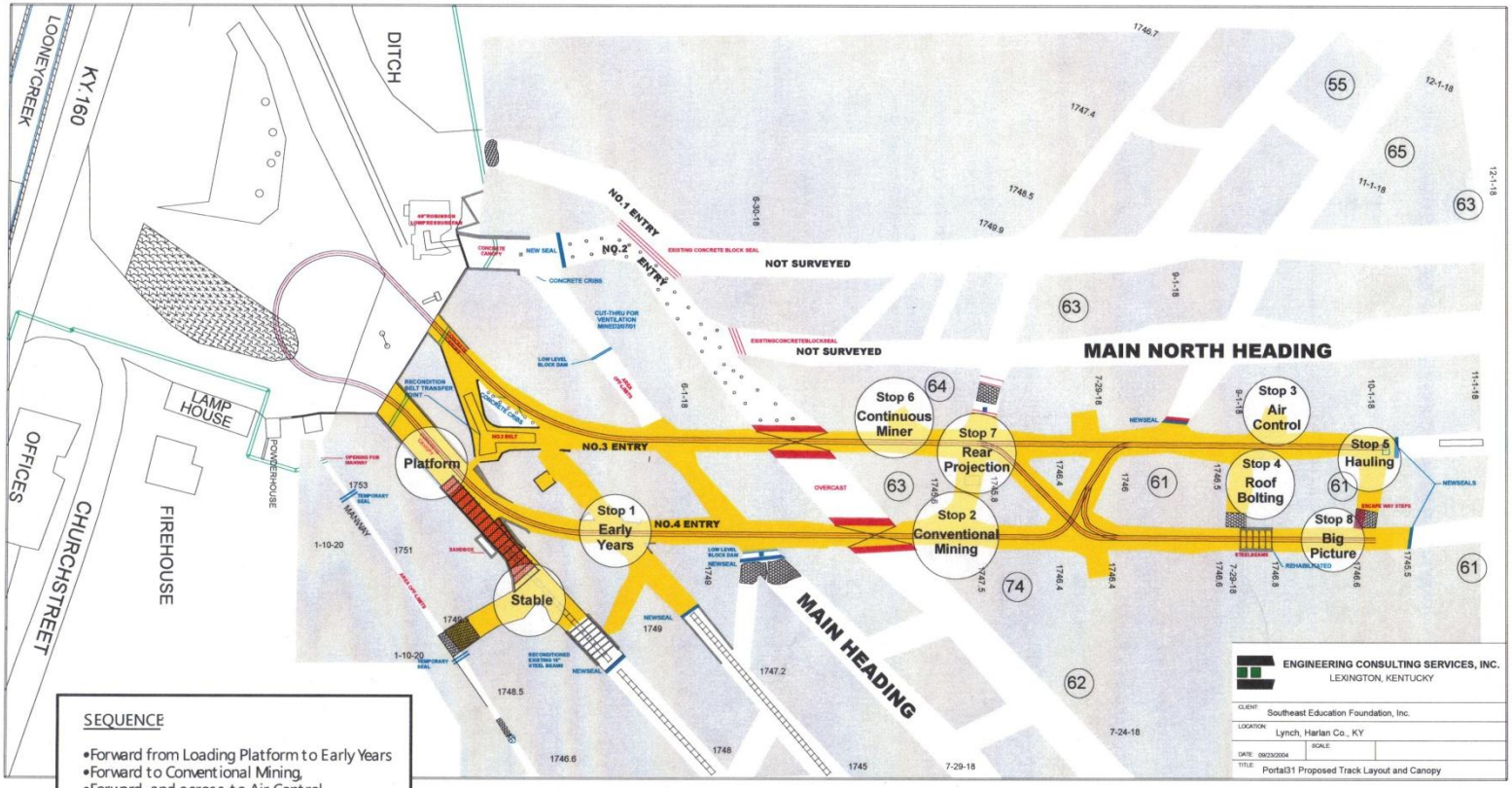
17. Name the 4 major types of light used by miners. - Past to Present- (Candle, oil, carbide, battery)

18. The KY Coal Museum is located in what city? (Benham)

19. What is the height of the "Mock Coal Mine" in the lower level of the Museum? (53")

20. Name the general store where Loretta Lynn and her husband purchased bologna and bread on the way from Whitesburg radio station to Harlan Radio Station. (J. D. Maggard's Store)

PORTAL 31 Exhibition Coal Mine



SEQUENCE

- Forward from Loading Platform to Early Years
- Forward to Conventional Mining,
- Forward and across to Air Control
- Forward thru Roof Bolting,
- Forward to Hauling,
- Reverse past Continuous Miner
- Forward to Continuous Miner
- Forward to Rear Projection
- Forward and across to Big Picture
- Reverse around to Air Control area
- Forward out to Equipment Yard
- Return to Platform to unload

Tour Map

Engineering Consulting Services, Inc
www.engrservices.com

Portal 31
www.portal31.org