Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
2004 Volume IV: Energy, Engines, and the Environment

Energy Generating a Culture: Early American Coal Miners and Coal Mining Culture

Curriculum Unit 04.04.01
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Introduction

Washing machines, cell phones, air traffic control towers, and the Panama Canal all have one thing in common: they each require tremendous quantities of energy. In America's free market system, many believe that the end-consumer is the one who absorbs all of the costs of the procurement of energy. In a sense, this may be true--each of us who purchases a commodity inherits a fraction of the costs incurred before reaching us. However, this does not tell the whole story of a commodity's journey. In the case of electricity, entire (sub)cultures have developed out of the profits generated by--and the costs incurred in--the generation of energy for consumers. One important example of this truth is coal mining culture. e.

Coal mining has been practiced in the United States since 1000 A.D., when the Hopi Tribe (of what is now the northeastern corner of Arizona1) used coal to bake their pottery.2 However, modern commercial coal usage began in 1748, where Huguenot settlers at Manakin, Virginia, began forming mines.3 In 1901, General Electric built the first alternating current power plant; it ran on coal. From that time on, Americans have had an energy policy that has been inextricably linked to coal mining. Thus, coal miners are a linchpin in the American social machinery.

Coal-fired power plants supply roughly fifty percent of America's electrical energy, and coal reserves range throughout Appalachia, across a five-state swath of the Midwest, and in the upper Midwest from the Dakotas through most of the Rocky Mountains. Perhaps America's most famous coal country is that of western Pennsylvania and West Virginia, but the largest reserves of coal can be found in Montana and the Dakotas. In fact, America has more coal than the rest of the world has oil--prompting the coal industry to refer to America as the "Saudi Arabia of Coal""4: the "Energy Information Administration (1995) estimated that the United States has enough coal to last 250 years."5

While the quality of coal varies from region to region, it is evident that coal will continue to be the preferred fuel for steam-turbine power plants well into our foreseeable energy future. Thus, coal miners will play a disproportionately important role in America's economic well-being until well into that future.

This unit will introduce students to the lives of coal miners through scientific, historical, and literary texts in

both print and electronic media. Sources will include missives from coal industry titans to regulators, as well as songs about children's worries for their fathers in the mines. Students will take away an empathetic understanding of what it takes to make their lights come on in both technological and human terms. Moreover, they will be able to articulate the contribution that coal miners make to our society through multiple performances of understanding: written, pictorial, and dramatic.

We will study the coal mining region of Western Pennsylvania for several reasons. First, it is close in proximity to Connecticut, which makes it the largest coal-producing member of our regional economy. Second, the anthracite-rich region also has a central role in the development of coal-related economic engines, such as the Carnegie steel mills and regional power plants. Third, events ranging from the 1892 Homestead strike and Mary Harris "Mother" Jones' children's crusade was another cultural development that figures centrally in American mining labor history.

Objectives

- Students will explain one of several scientific processes related to the production of electricity from a coal-fired power plant through a group presentation. (Performance Standard 2.2)
Students will choose one of the scientific processes that: a) involves coal as a fuel, and b) results in usable ac current electricity, and describe it through a group presentation.
- Students will synthesize information from multiple primary (sources created by a witness to an event; diaries, reports, etc.) and secondary sources (scholarly texts, analyses) to explore ideas and decisions, as well as political issues. (Performance standard 4.8)
By analyzing primary and secondary sources about either the anthracite strike of 1902, The Centralia Mine Blast of 1947, the Centralia Coal Fire of 1961, or the 2002 Quecreek mining accident, students will be able to form opinions about the regional attitudes of coal miners towards themselves and the attitudes of other social groups and agencies that interact with them.
- Students will write a persuasive letter using textual evidence to support a position. (Performance Standard 2.2)
Presently, Coal Mining support groups (both labor and management) are lobbying the United States Postal Service for the creation of a coal mining stamp. Students will write a letter on the behalf of coal miners arguing for a stamp to be made in their name. Students will also have the option of creating a mock stamp to include in their letter.
- Students will use critical thinking skills to respond to in-class discussion prompts about the life and work of American coal miners. (Performance Standards 1.11, 1.14)
Students will be assessed on their in-class participation through the use of predetermined discussion prompts and a rubric for participation. Students will be given the prompts before the delivery of instruction, and a rubric will be used to assess their understanding. Those students who do not orally participate will be mandated to turn in written responses to the discussion prompts in order to receive credit.

About the Students

This unit has been prepared with the particular needs of students who have high skill functionality, but who suffer from a lack of critical thinking skills. By developing lessons with a constructivist, problem-posing framework, students will be encouraged to make connections between the different elements at play across all areas of the topic. Furthermore, the emphasis on cooperative learning and presentations is intended to encourage students who often prioritize individual achievement to strengthen real-world skills such as group-based inquiry, analytical discussions, and generalizing individual findings and conclusions into a group consensus.

Methodology

This unit has been developed for students in English II, world literature, or English III, American Literature. In English II, the focus would be on the challenges that cultures face to perform very difficult and important labor, and how this labor becomes mythologized in the culture as a whole. Because many countries use coal, and all cultures must rely on certain individuals to perform dangerous and necessary tasks, this interdependence is a widely experienced human condition. Other examples of such labor across time would include polar bear hunting Inuit, 19th century whalers, and firefighters.

In an American History course, students would be able to explore the relationships between technology and industry, social history and labor history, and the complicated nature of national economic and industrial "progress." Depending on the interests of your class and your particular bent, this unit could be modified to fit individual science, history, or English classes. However, it would probably work best in an interdisciplinary team setting.

The Life Cycle of Coal: From plant life, to power plant, to power cord

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The Origins of Coal

Coal, essentially, is stored solar energy. During the Carboniferous period, earth was covered predominantly by plant life. When that period ended, the massive forests of primitive plants such as *lepidodendron* were encased in earth in anaerobic environments. Lepidodendron was a very pithy plant with a scaly bark; as such, it was largely kept erect by the pressure of water against its cellular walls. When water resources became too few, the plants collapsed, dehydrated, and died. As these giant, 175 foot-tall ferns decomposed, they retained much of their energetic capacity (in the form of carbon) while losing most of the rest of their matter (water). As centuries passed, these giant trees of the past and their kin became the fossil fuels of today. What variety of coal each became, and where it is found, is largely then a matter of plate tectonics and pressure: the plants became scattered as Pangaea fractured, leaving deposits in various places around the world. Furthermore, the geological processes accompanying these tectonic shifts exerted their own influence on the composition of the coal as well.

Coal can be found in three basic forms: lignite, bituminous coal, and anthracite. While different gradations exist within these three categories, the major difference between them is a function of pressure. Coal is a sedimentary rock; the particulate matter that results from the decomposition of plant and animal life is crushed and compacted over time to form one of these varieties. American anthracite coal is found mostly in

Western Pennsylvania, where it was forged in the pressure cooker of the Appalachian mountain chain approximately 200 million years ago. Eastern bituminous coal, found most plentifully in West Virginia and Illinois, was also formed during this time period. This contrasts greatly with western coal, found mostly in Wyoming. This coal was formed roughly 70 million years ago.6

The fact that the United States was, in its early existence as a continent, the home of a shallow inland sea full of plants probably has much to do with the vast quantities of coal that we can tout as a natural resource. Considering the fact that each foot of a coal seam "represents the accumulation of about 10,000 years of plant remains,"7 it is fascinating to imagine the prehistoric landscape of the North American continent. How many centuries of swamps and forests came and went, adding layer upon layer of biomass that would eventually leave 290 billion tons of coal: enough coal to last three centuries. For this reason, during the oil-induced energy crisis of the 1970's, the coal industry dubbed the United States "The Saudi Arabia of Coal." In fact, coal deposits cover about 13% of the surface area of the United States. That is an area larger than California and Texas combined.

Extracting Coal

Americans must thank coal for 58 percent of the United States' electrical energy generation. For the most part, the United States' coal reserves lie in West Virginia, Pennsylvania, the Ohio River Valley, and the Northern Great Plains. Thus, coal extraction has been a major industry in these areas since the Civil War Era or earlier. But how does one harvest coal? The work of a coal miner is perhaps one of the most dangerous jobs in the industrialized world.

Types of Coal Mines

There are two major types of coal mines: shaft mines and strip mines. Strip mines are exactly what they sound like. Large areas of land are "stripped," layer by layer, and the coal is removed. Sometimes known as drift mines, these mines destroy the surface of the earth, leaving either large empty pits similar to rock quarries, or unnaturally flat stretches of land. In this method, no one goes underground, and the major activities undertaken by miners are the demolition of exposed coal seams and the use of shovels and construction vehicles to accumulate and move the coal. The other method, shaft mining, is the variety most people are familiar with. A tunnel, or shaft, is bored straight into the coal seam (slope mines), and miners go into the shaft to the exposed coal (known as the face) and remove the coal with tools. Depending on the topography of the area the coal seam is found in, shafts can either descend vertically into the ground, or horizontally into the side of a hill or mountain. In shaft mines, the networks of tunnels that branch off of the main shaft can stretch for miles in every direction, following the seams of coal. Furthermore, if coal is found in several layers--as is often the case--there can be any number of "floors" in the coal mine. This can result in a series of layers that, while only four to 15 feet in thickness, can cover thousands of square miles.s.8

Mining Tools

The most basic tool for mining has long been the pickaxe. While different types of pickaxes have been used throughout the history of mining, it was long the integral part of the mining process. Before the invention of the battery operated lamp, the miner would use a candle stuck to the brim of his helmet and his pickaxe. Because of the presence of methane gas in the mines (exuded from coal), this was an extremely dangerous situation.

The lack of light and presence of methane limited the size of mines until the invention of the safety lamp in

1815. This lamp allowed for the dissipation of the temperature around the burning wick of the lamp, which kept the methane gas from reaching its flash point. However, when methane was present, the flame changed colors. This served as a useful warning for miners. Another benefit of the lamp was that it could detect carbon monoxide--fatal to miners because it could cause asphyxiation. When a miner wanted to check for one of these two lethal gases, he would put the lamp on a pole and extend it into the shaft before him. If the lamp changed blue, he knew methane was present, and took the necessary steps to remain safe: either hurry out of the mine, or pump in air to dissipate the methane. This was necessary because if the methane mixed with coal dust, it could explode. (The dangers of coal dust will be explored with an all-too-real example later in this paper.) If carbon monoxide was present, the miner would know because he would put the lamp close to the floor of the shaft where this gas accumulated, and it would go out.

As time passed, and technology improved, the tools available to miners improved. In fact, the use of coal allowed steam engines to become much more effective means of performing work, and therefore improved the means of extracting coal. Two illustrations of these symbiotic technological developments were the mine pump and the pneumatic drill. Because most mines are below the water table, moisture seepage could render a mine unusable. The steam engine-powered pump enabled the miners to pump greater quantities of water from mines at a greater depth than the use of humans or beasts of burden, thus improving the profitability of mining (machines being cheaper than people), and the strength of the pump. Also, by using pneumatic drills, miners were more productive. Using a pickaxe while lying on ones back, chipping away at the ceiling of a mine, was slow, dangerous work. Using the pneumatic drill made this work faster and less awkward.

The most dangerous tool used in coal mines was dynamite. In order to speed the process of extracting coal, miners used dynamite to loosen coal from the face. However, the obvious dangers of using explosives while in a flammable room led to the cautious use of dynamite. Oddly, it was not the coal face that posed an explosion danger, but the dust. Coal lumps do not explode because they don’t have enough surface area to do so; the temperatures necessary to ignite the coal face aren’t present enough to burn the face itself when there is a detonation. However, the coal dust is an entirely different matter. Once the coal is suspended in the air in particulate form, it is highly flammable and explosive. In fact, this is the preferred manner of burning coal in power plants today--as dust. Coal miners had to cover the mine floor, walls, and ceilings with a solution of rock dust and moisture in order to dilute the coal dust to the point of safety.

New Technologies in Mining

In the 1930’s, mining became more and more mechanized. While this led to some safety increases, it had the related consequences of making miners less necessary, driving down wages and reducing jobs. As a result, miners were forced to either find jobs that paid substantially less, or to deal with workplace pressures that made the ability to replace them much more dangerous. For example, if a mine operator did not want to modernize his equipment because of high capitalization costs, he could keep miners under control with the threat of replacing them with other miners or machines. This was a challenge for miners in the first half of the twentieth century. One can also speculate that, because the United Mine Workers were so effective in lobbying to improve the conditions of their labor, they accelerated the loss of much of their power by forcing companies’ hands in developing mechanized mining to minimize human loss in mine accidents and financial loss in wages, breaks in productivity due to strikes, and other financial outlays such as wage increases.

Coal-Driven Power Generation

Currently, coal is most useful for generating electrical energy. As previously stated, coal is burnt to generate approximately 58 percent of the United States’ electrical energy. Those states that do not use coal to

generate electricity divide their production between the three next-largest producers of electricity: oil, natural gas (our other two fossil fuels), and nuclear power. One ton of coal, however, produces four times as many British Thermal Units (BTUs) as the next productive fuel. It can produce 24,050,000 BTUs per ton, while fuel oil only produces 6,287,000 BTUs. This fact further underscores the United States' potential energy advantage over other nations, and further highlights the reasons for reticence to embrace climate change treaties such as the Kyoto Protocols.

Coal fired power plants are basically very efficient steam engines. The coal is delivered to the power plant and dumped into a hopper. It is pulverized into coal dust--the same dust so dangerous to the miners--and mixed with air and blown into the boiler for combustion. The coal then combusts, generating extreme heat that superheats pipes lining the perimeter of the boiler. The water flowing through these pipes converts to highly pressurized steam, which shoots through the blades of a turbine, generating the rotation necessary to turn a generator and create a current. After passing through the turbine and losing much of its energy, the steam condenses into water in a condenser tank and begins the process over again. The water in the condenser is released from the plant.t.9

The basic elements of this process have not changed in decades. However, the issues that arise from the use of coal have focused much attention on improving the efficiency and reducing the environmental costs of each of the separate steps in this process. For, if coal is to remain a viable source of energy, it is imperative that it clean up its act.

Coal and Environmental Concerns

Air Quality Pollution Resulting from Coal Consumption and its Costs

The political power of coal and its masters is both a blessing and a curse. Both England (the first nation to utilize coal as its primary energy source) and the United States rose to world dominance on the back of a coal-powered economy. King Coal, as it has been known at times in its history, was the provider of blessed industrial might to the many, and industrial woe to those who had to remove it from the ground for a living. However, contemporary environmental concerns have lent King Coal a new mantle: chief polluter and environmental bogeyman.

No matter what variety of coal one uses, it is the dirtiest fossil fuel. Soft coal is replete with SO_2 , and even the hardest varieties of coal can have this noxious pollutant in large amounts. Human and animal deaths can be attributed to this compound.10 In June of 2004, the AP reported that fully one third of the United States population lived in counties (243 in total, most of which were east of the Mississippi river) in which the level of microscopic soot was above acceptable levels. In an ironic twist, the considerably smaller concentrations of SO_2 in coal found in Wyoming have made it a champion of tighter environmental controls on coal--Wyoming's coal industry benefits from any regulations that place limits on Eastern Coal. Also, the lack of coal elsewhere in the Midwest has resulted in cleaner air in the Midwest..11

Any environmentally sound policy, however, comes with significant political risks and costs. A case in point: in the 2000 presidential election, which was eventually decided by a Supreme Court decision, West Virginia voted against its strongly democratic tradition when it delivered its electoral votes to fossil-fuel friendly Republican candidate George Bush over the more environmentally conscious--and presumably anti-fossil fuel--Democrat Al Gore. As we know, the Bush presidency resulted in the deposition of Saddam Hussein in Iraq, a situation that promised to liberalize Middle Eastern oil production. However, at the time of this writing, the primary result has been instability in the world's oil markets caused by resultant political instability in Iraq and

unrelated, but exacerbating complications in the Russian oil industry. Because of coal-related decision making, coal, one could conclude, has a disproportionately far-reaching impact on America's energy destiny: perhaps a history-altering one. John Kerry, Gore's successor in running for the Democratic Party, in an effort to return the party to the White House, has made clean coal technology a key point in his plan for energy independence: a decision that could help him do well at the polls in West Virginia and Wyoming, but which may not allow Americans to breathe any easier in the long run. .

Global Warming, Nuclear Radiation, and Coal

Because coal requires combustion, it emits Carbon Dioxide (CO_2). In fact, it emits more CO_2 per kilogram of fuel than any other fossil fuel.12 Furthermore, uranium and thorium are found in significant amounts in coal. The resultant radiation from these plants, then, makes them more radioactive than nuclear power plants because these fissionable materials escape through the smokestacks of the plants. In fact, the amount of fissionable materials released through coal smokestacks could theoretically provide more energy than the amount of coal consumed!13 While there does not seem to be any immediate danger to people through this radioactive material, this further underscores the dirtiness of coal.

Cleaning Up Coal

Clean Coal Technology relies on many complicated processes, but is beyond the purview of our project here. Suffice it to say that "clean coal" in the modern era of global warming is a phrase roughly the equivalent of "safe sex" in the era of HIV/AIDS. However, the impetus for continuing to clean up coal is economic: the cleaner we can burn coal, the longer we will be able to maintain a disproportionate rate of energy consumption relative to the rest of the world. According to The Economist (Sept. 2002), "[C]lean-coal technologies fall into three categories: pre-combustion processing of coal; combustion processes that burn coal more cleanly; and post-combustion processes that scrub the exhausts." These processes are highly technical in nature, and are therefore best discovered directly from the source materials. While students would most likely be able to learn about these processes, a shared exploration of source documents would be most effective for teachers interested in these processes.

Coal History

At present, there are fewer miners than ever, but production is at its peak. For all of its advances and improvements, mining is still a very dangerous job. What does it mean, then, to be a coal miner? For the rest of this paper, we will look at the history of mining and the life of miners and their families.

Eastern Coal and the Rise of the United States as an Energy and Industrial Power

As our nation continues to struggle with its energy destiny, we can look to our own history of building a nation on the back of King Coal as we look to loose ourselves from its grip. Eastern coal was the primary engine of the rise to American industrial might in the 19th and 20th centuries. By examining the rise of eastern coal, we may find some object lessons that will help us to imagine the next American energy revolution as we continue to balance our need (desire?) to use coal.

Pennsylvania has a long history of coal mining. In 1790, coal was discovered in Schuylkill County. The first

recorded delivery of coal to Philadelphia took place in 1800. In 1812, anthracite, the hardest, most calorific, and cleanest burning form of coal--was used to fire steel mills in Philadelphia, and the economic possibilities of coal were increased greatly. Much like England before it, coal delivered the world-changing commodity of steel to America in enormous quantities. From the boilers necessary to operate industrial age mills, to the use of coal-fired foundries to create the sheets of steel necessary for American military might, coal became the linchpin to American economic might in the days before oil. After the shift to oil for most transportation-related purposes in the 200th century, however, coal remained the source of electricity generation. Without coal and coal-fired power plants, rural electrification would not have happened when it did, and the development of our entire country may have been vastly different.

When the burning of anthracite coal was mastered around 1812, it started a chain reaction of technological advances that spurred national growth. The difficulty of transporting coal overland led to canal development projects and caused coal men to become excited by the prospects of steam locomotion. Tramways were often used for coal transport, but since they operated like land-based canals, they were inefficient and made coal expensive. When the first steam locomotives became viable in the 1820's and 1830's, coal men were quick to buy into them. However, these trains were wooden, and burned wood for fuel because the technology for burning anthracite effectively was not yet developed. England, with ample reserves of bituminous coal, maintained a strategic advantage. However, when anthracite was mastered, the first domino for many economic phenomena fell.

Anthracite: The Key to the Industrial Engine

Once anthracite burning was mastered, America was not only able to match Britain's output of coal and iron, but it became the world's largest producer of coal and iron. This production was largely regional, and the Northeast outpaced in its development the South, further exacerbating rising geographic differences and tensions. At the time of the Civil War, the North had thirty-eight times the coal of the south.14 Here is another example of coal as a political power broker. One can argue whether or not coal created a country that was industrially unbalanced, or just accelerated the process. But it is clear that the north's coal-driven industrial might was a player in the Union victory. Coal miners may have added to the liberation of the very people who would be used against them when they tried to improve the conditions of their labor: freed slaves were often brought from the south to serve as strikebreaking miners. John Sayles remarkable movie *Matewan* shows the legacy of this racial tension. Set in the 1920s in Mingo County, West Virginia, the film shows a union organizer and his struggles to organize a multiracial union with striking miners and Italian and Black strikebreakers.

Because coal was the key to steel, it was the key to railroads. The transcontinental railroad would have never reached Promontory Point for its final spike had that spike not been made with coal; farming would never have become a lucrative export business without trains to transport crops to the commodities markets and to ports, and American agricultural and industrial wealth would never have become what it is today without that dirty black rock.

Coal and the Mirror of History

On the other hand, if coal had not been so effective, American urbanization would never have occurred as it did. Urban sprawl, tuberculosis, and Jacob Riis' infamous Lower East Side tenements would not have occurred had those people never followed the jobs to the coal-fired mills. Mother Jones would never have been so shocked and appalled by the conditions of child labor in Pennsylvania mills, and she never would have led her Children's Crusade. The tremendous demand for coal and its resultant riches would not have led to the concentration of power in the hands of robber barons, and American history would have been markedly

different.

Because of the high demand for coal and the dangerous nature of extracting it, mining coal promised higher wages for those willing to undertake this work. As a result, Pennsylvania and Illinois became major destinations for Irish and other European immigrants who would come to America with the promise of steady work in the mines. However, the rush to secure coal and its economic benefits led to many challenges for American Social history. Unfettered growth always comes with a human cost, and the lives of coal miners illustrate this picture quite clearly.

We have explored the processes related to coal's use, and we have looked at some of the possibilities that coal provided for the United States that led to its rise as an industrial power. However, we have yet to explore the people upon whose backs this national phenomenon was carried: the miners themselves. The average miner lived in a town owned by the mine company, and was subject to a highly centralized form of social control. Often, miners for a single mine would be composed of several different groups of immigrants: Irish, Welsh, Scandinavian, Polish, Italian, and other European groups. This alone made organization a difficult prospect. Added to that difficulty, the control of homes by the mine, the stores by the mine, and any other set of social organizations by mines left the miners with very little choice: mine under our conditions or get thrown entirely out of town. However, these conditions did not, in and of themselves, render miners impotent. Some of the greatest labor victories in American history were achieved by miners: such was the centrality of coal. But for all of their victories, they had an accompanying tragedy.

Coal and its Discontents

Here, we will briefly explore four crises in coal country that illustrate the challenges that coal's centrality in the machinery of America posed for workers who, while operating this machinery, always risked being mangled by it.

The Anthracite Strike

The Anthracite Strike of 1902 was a crucial moment in coal mining history. The strike began when John Mitchell, the president of the United Mine Workers of America, demanded a living wage for the anthracite workers in Western Pennsylvania. The strike resulted in a "coal famine"15 and a crippling energy blow to the east coast. This resulted in the involvement of President Theodore Roosevelt, who eventually brokered a deal between the union and the management of the coal fields. Historian Robert Wiebe, describing the national mood at the end of the strike, painted this picture: "The hero--Mitchell--had triumphed for organized labor, the reputation of the villains had been blackened, and the prestige of a righteous President had risen.".16 This was a watershed victory for American Labor: a president stepped in on the behalf of workers and ruled against the corporate bosses. This solidified the UMWA's position, launching it on a nearly 40-year journey as the most influential union in the country. Mary Harris "Mother" Jones devotes an entire chapter in her autobiography to the topic, and it serves as the basis for one of the lesson plans attached here.

The Centralia, Illinois Mine Explosion

The Centralia Mine Fire, and John Barlow Martin's resultant work of investigative journalism, led to the downfall of Illinois governor Dwight Green and launched Martin's career of tireless public service. The mine exploded on March 25th, 1947, but the story begins far before that. It is a tale of intersecting failings on the part of unions, individuals, and governance that resulted in the third worst mining tragedy in the United States since 1940.17

John Barlow Martin was a reporter for Harpers Magazine who was sent to cover the mine fire. His article has become a hallmark of investigative journalism which, at the time, was compared to John Hershey's *Hiroshima* for its emotional weight and quality.18 Martin worked on the piece for months; the article was published in the March, 1948 issue and took up almost the entire magazine. Martin states his purpose for writing the article unflinchingly: "Let us seek to fix responsibility for the disaster. This will raise the broader question: What is the matter with the coal industry?"19

The mine fire was really an explosion caused by years of accumulated coal dust and another blatant safety violation: using dynamite in the mine while workers were present. One fastidious mine inspector had worked tirelessly in cooperation with union workers to expose unsafe conditions in the mine, but political maneuvering at the statewide political level kept the state from acting: mine inspectors were tasked by governor Green's to raise political funds from the mine operators, and therefore neglected their duties throughout the office. Driscoll Scanlan, the inspector for Mine No. 5, while innocent of this crime of commission, was found guilty of a crime of omission: he did not shut down the ill-maintained mine, for fear that he would be fired and that a more lax inspector would replace him. As a change agent, the inspector could not bring himself to take this step. At the same time, the federal government had assumed control of the mine--along with many others--during WWII and was managing them with toothless regulations that impeded real oversight. All that the government management of the mines did, according to the miners, was to outlaw striking and remove from them the one weapon that could have saved 111 of their lives. Finally, the United Mine Workers did not act in the best interest of the miners, as John Lewis, the president, was looking out for his brother, a mine supervisor for another regional mine, was guilty of the same regulatory shortcomings as the state was in No. 5.

The article is instructive: it does help students explore, through an exquisitely written, touching account of what was wrong with the coal industry in the 1940s. Readers are able to see how the intersection of competing selfish interests and mismanagement leads to great human tragedy. Interviews with the miners and their wives provide a moving human element to the story that makes for gripping reading. In a time of national uncertainty all too close to another tragedy, this article shows students how journalism can further the search for truth and closure when confronting loss and confusion.

The Centralia, Pennsylvania Mine Fire

In February 2004, another journalist from Harpers Magazine wrote about the tragedy of a mining industry so woven into the fabric of American political society that the industry and its governmental overseers could not extricate themselves quickly enough to save mining from itself.

The Centralia mine fire, one of the greatest mine-related environmental disasters in American history, began burning in 1961 and continues to burn today. Again, we see a story of bureaucratic wrangling, budgetary challenges, and bad timing that all combine to create a failure greater than the inadequacies of the parts.

At the time the fire started, a series of debates over whose jurisdiction the fire was in (and therefore whose budget would be affected), whether or not the state had a right of action, and the responsibilities of the state to the residents of the town took so long that the fire was beyond control by the time any action was taken. From that point on, every time monies were allocated to contain the fire, the funds either ran out just before the job of containment was finished or the methods employed to fight the fire were decided on by shortsighted optimism, and ended up being counter productive. For example, one method of checking to see if the fire was burning in a certain area was to drill coring samples. The state agency read the samples as being naturally discolored, whereas an independent consultant found the discoloration to be searing. While the two sides argued, the freshly drilled coring hole fed the fire anew, and it spread. The town, once a healthy borough

of 1100, now boasts 14 residents, all of whom are being waited out by the state government; because of the advanced age of most of these 14, the wait will likely end soon.

The fire is still controversial because the mining community that was Centralia (most residents were relocated to other communities) still has members that believe that the fire is important primarily because anyone who can extinguish it will be able to access the remaining coal and turn a ready profit on its removal.20 This is but one illustration of the legacy of distrust that those who work in coal mines hold for those who own the mines themselves.

The Quecreek Miner Miracle

Coal continues to be a major force in Pennsylvania to this day; its disasters occasionally impact the American consciousness. In 2002, the Quecreek mining accident captivated America for a week, when nine miners were trapped in a tunnel when a faulty map failed to locate an abandoned, flooded mineshaft that the miners accidentally drilled into, causing a flood that trapped them.21 In this case, nearly 72 continuous hours of cable news television resulted, along with a made for television movie. CNN has devoted an entire website to the "Quecreek Miner Miracle"22 in which all nine miners survived.

This mine disaster was avoided by the ingenuity of the miners and the teamwork of the rescuers. It shows how the focused energies of a group of individuals and agencies can fix mistakes and avoid greater tragedy. Not only is it a statement about the lessons that the mining industry and regulating agencies have learned from their mistakes, but also informs students about the possibilities for good results from good governance, public support, a responsible press, and effective follow-up investigations.

Pride and Shame as Motivating Forces

As we have seen, the mining of coal is an enterprise that is arduous at best and fatal at worst. Therefore, the people who perform this dirty and dangerous work have both a heightened sense of shame for performing this dirty work and an elevated sense of pride for being able to do what so few others can. At the same time, miners all too frequently claim to be born to mining: "I'd quit tomorrow but I don't know nothing else…I'm a miner, that's all."23This seemingly contradictory social psychology has played a significant role in the coal miners' long, proud history of advocating for the improvement of the conditions of their lives and labor. This, in turn led to the development of a rich folk history of those who worked the coal mines. This has led to many works of literature worth discussing briefly here.

Coal Culture: A Brief Review of Texts

Because of the varying levels of high school students and the varying availability of texts, there are many opportunities for teachers to incorporate fiction and nonfiction texts into a unit to help foster a closer connection between students and the experiences of coal miners. What follows is an introduction to some possible texts. By no means exhaustive, this selection does have texts that meet the needs of various learners, as some young adult literature is included alongside more difficult classical texts.

Novels about Coal Country

D.H. Lawrence, Sons and Lovers

Lawrence's novel, while thematically more about emotional closeness and the pressures it can create, is set in British Coal country. The first chapter, however, gives a strong impression of the life of a coal miner's wife, especially an outsider who comes into the culture. Because (presumably) students will not be from coal mining families, they should find the protagonist of the first chapter, Mrs. Morel, easy to relate to. It should provide students with some thought-provoking material for class discussions about coal miner's wives.

A.J. Cronin, The Citadel

Like Lawrence's Novel, *The Citadel* has a main character who confronts the life of miners as an outsider. The protagonist is an idealistic young doctor who resolves to "make a difference" by tending to the needs of a mining town. He invariably faces consternation in dealing with the "thick culture" of the mining communities, and eventually does leave. The descriptions of the mining town in part one are very well painted for the reader, and many good passages are available for sharing in class.

Susan Campbell Bartoletti, A Coal Miner's Bride

This is a young adult novel, suitable for grades 4-8. The protagonist, a Polish 13 year old, is an arranged bride who must learn to live in a Pennsylvania coal town with a less-than-ideal husband. Then, when he dies in a mining accident, she must start life over again in this coal town. The accessibility of the prose and the age of the protagonist make this a good choice for 10th grade students or lower; literature circles would be a good option with this text.

Explorations of Coal Country

Susan Campbell Bartoletti, Growing Up In Coal Country

School Library Journal finds that this book makes 1890's mining town life a "surprisingly compelling topic for today's young people." Liberal use of authentic, first-hand documents and references to plenty of adult characters such as Mother Jones makes this text ideally suited to either read-aloud or small group settings. This text is a strong candidate for background- building activities.

Mary Harris "Mother" Jones: Autobiography of Mother Jones

For teachers who like to use first hand documents to extend meaning, using this book alongside a more traditional discussion of the efforts of Mother Jones to organize practically the entire piedmont and Appalachian regions of the country would be very enjoyable for students. Her conversational prose and union organizer's gift for speaking come across in this very accessible, quickly-paced text. I found the chapter describing the 1902 Anthracite Strike to be very useful as a counterpoint to historical texts about the incident.

John Barlow Martin, "The Blast in Centralia No. 5," Harpers Magazine, March 1948

As a classical piece of investigative journalism, this text is wonderful for inquiry-based learning. See the lesson

plan below for a possible application of this classical journalistic text.

Jeff Teitz, “The Great Centralia Coal Fire,” Harpers Magazine, February 2004

Described in detail above, this is an excellent teaching text for investigative journalism. This text would be both engaging enough to mature readers to keep them interested in the fate of the town, and difficult enough to exceed the challenge posed by any standardized test passages. This makes it an excellent choice for an authentic assessment. Again, I recommend using this in a small group reading setting.

Viewing Opportunities

John Sayles, Matewan

From the Internet Movie Database: “Mingo County, West Virginia, 1920. Coal miners, struggling to form a union, are up against company operators and gun thugs; Black and Italian miners, brought in by the company to break the strike, are caught between the two forces. Union activist and ex-Wobbly Joe Kenehan, sent to help organize the union, determines to bring the local, Black, and Italian groups together. Drawn from an actual incident; the characters of Sid Hatfield, Cabell Testerman, C. E. Lively, and Few Clothes Johnson were based on real people.”24

Lesson Plans

Lesson Plan One: How much coal do I use?

Rationale:

In order to touch an empathetic nerve in students, we will begin our lessons on the generation of electricity from their perspective--that of the consumer--and work backwards from there. This should help shorten the distance between the student and the coal miner. .

Objective:

Students will calculate how much coal usage they would be responsible for if they received their electrical power from a coal-fired plant by using mathematics and deductive thinking skills.

Background:

Because over half of the electricity in the United States is provided by coal-fired power plants, we will assume for the sake of argument that coal is supplying the electricity for our class. It is estimated that it takes 714 pounds of coal to power one 100 watt light bulb for 1 year (24hours a day)25. Students will use a fact sheet provided by the West Virginia Coal Fact Book about coal usage (see appendix for source) to figure out how much coal they use for several common activities during the course of a week, a month, and a year.

Procedure:

Students will follow a series of steps that will result in a complex and complete mathematical table that details the coal consumption of both themselves and a series of groups of students.

- Students will read a fact sheet from the West Virginia Coal Fact book, and choose facts about the consumption of coal by using common household items (light bulbs, computers, televisions) from a list.
- Students will then use a handout that shows them how to calculate ratios (which should be reviewed) to calculate how much coal they would be responsible for. For example, if the statement reads “It takes one pound of coal to burn one light bulb for 10 hours), students will estimate the number of hours in a day that they burn light bulbs, and the number of light bulbs, then calculate the number of pounds of coal.
- After calculating the amount of coal that students use per day for these activities, then students will continue to carry out the calculations for weeks, months, and years and enter their answers on a spreadsheet (either paper or computerized, depending on time and availability).
- Students will try and calculate how much coal is consumed by groups of students, calculating more complex extrapolations such as the number of pounds of coal consumed by male students in the class as compared to female, the total number of pounds, etc.
- At the end of our calculations, the teacher will read to the students a passage from “Coalcracker Culture” that explains that each miner in a mine used to be responsible for a certain tonnage of coal per day. We will calculate how many students that miner provides coal for in a given day.
- Finally, students will write a journal entry that answers the question: Imagine that you are a coal miner. How would you feel about the fact that you provide coal so that others can have electricity?

Assessment:

Teacher will read journal entries and assess them informally for their thoughtfulness and reflection on the ideas discussed while formulating the spreadsheets; spreadsheets will be checked for accuracy and completion.

Lesson Plan Two: How do we make coal useful?

Rationale:

In order to understand what a complex task it is to provide students with the energy they need to fulfill their own personal needs, students will devote considerable time to researching and creating a presentation about our contemporary uses for coal.

Objective:

Students will, by the end of the lesson, explain to their classmates' one of a series of procedures that coal goes through before it becomes electrical energy through the use of a group presentation.

Procedure:

Students will be tasked with explaining a process (or series of processes) that are related to the production, transportation, use, and environmental control over coal. Students will be placed in groups and given the task of creating a presentation that answers one of the following questions:

- How is coal created?
- How is coal mined from the earth?
- How is coal turned into electricity?
- How has coal burning become more efficient over time?
- How does coal mining affect the environment?

Students will be given a list of websites and paper reference materials (all of which are listed in the resource list below) to use in order to explain a predetermined (by the teacher) process to their classmates. Groups will be four to six students in size, with each student responsible for preparing and presenting a different element of the presentation.

In addition to explaining the essential elements of the process at hand (who, what, where, when, why, and how), students will also be required to answer the following questions:

- What aspect of the process you are describing is the most difficult on the people involved?
- How has the process you described changed over time? What motivated the change?
- What challenges do those who must perform this task face at the present time (Political, economic, scarcity concerns)?

Assessment:

Students will be assessed according to a checklist and a rubric. The checklist will be used to determine whether or not each of the questions posed to the students were answered, and a grade based on depth and understanding will also be assigned. A process rubric will be used to determine how well students used the time assigned for the project's completion.

Lesson Plan Three:

Objective:

Students will know how to persuade an individual to adopt a position by writing a letter to a senator asking them to pass a bill for a Coal Miner's Stamp to be printed.

Rationale:

If students can effectively argue for the printing of a coal miner's stamp, then they will have to be both compelling and knowledgeable about coal miner's sacrifices for their country and the coal miner's attitudes and beliefs. If a student can do this, then she has gained an affective appreciation of the life of a coal miner while also synthesizing information about coal miners in a useful manner. This is a culminating activity to be done after completion of other unit activities.

Procedure:

Students will have a series of steps to complete that will result in a letter that, provided the stamp measure has not already passed, will be mailed to their senators.

- Students will brainstorm a list of accomplishments for which coal miners should be honored.
- Students will formulate emotional appeals to their senator that help convince him or her to endorse the plan for the stamp.
- Students will follow a writing process including drafting, editing, and revising to write a letter to their senator.

Assessment:

Student work will be assessed on an analytical rubric for persuasive letter writing that includes qualifications for following the proper letter form.

Performance Standards Addressed in the Unit

Content Standard One: Reading and Responding

1.1Educational Experiences will assure that students describe the text by giving an initial reaction to the text describing its general content and purpose.
1.8Educational Experiences will assure that students use the structure of narrative, expository, persuasive, poetic, and visual texts to interpret and extend meaning.
1.11 Educational Experiences will assure that students identify and use main ideas and

supporting details in informational texts or elements, such as key events, main characters, and settings in narratives.
1.14 Educational Experiences will assure that students interact with others in creating, interpreting, and evaluating written, oral, and visual texts.

Content Standard Two: Producing Texts

2.2 Educational Experiences will assure that students communicate effectively in descriptive, narrative, expository, and persuasive modes.
2.4 Educational Experiences will assure that students engage in a process of generating ideas, drafting, revising, editing, and publish or presenting.
Content Standard Three: Applying English Language Conventions
3.1 Educational Experiences will assure that students proofread and edit for grammar, spelling, punctuation, and capitalization.

Content Standard Four: Exploring and Responding to Texts

4.4Educational Experiences will assure that students examine the ways readers and writers are influenced by individual, social, cultural, and historical contexts.
4.8 Educational Experiences will assure that students use literature as a resource to explore ideas and decisions, as well as political and social issues.

Annotated Bibliography

Teacher List

Aurand, Harold. *Coalcracker Culture.* Scranton: University of Scranton Press, 1993. A book that has a lot of content about the daily lives of mine workers and their families. This includes descriptions of mining towns and the mines themselves.

Fay, James. *MIT: Pappalardo Series in Mechanical Engineering* . "Energy and the Environment." Oxford: Oxford University Press,

2002. I found this text useful for hard scientific data pertaining to pollution and global warming.

Freese, Barbara. *Coal: A Human History* . Cambridge, MA: Perseus Books, 2003. This is an excellent source for general knowledge about coal. Has some very good information about the 1902 Anthracite strike that I did not find in more "scholarly" books.

Martin, John Barlow. "The Blast in Centralia No. 5: A Mine Disaster No One Stopped" In *Shaking the Foundations: 200 Years of Investigative Journalism in America* Ed. by Shapiro, Bruce New York: Nation Books, 2003. pp. 201-244. This is considered a classic text in American investigative journalism.

Tietz, Jeffrey. "The Great Centralia Coal Fire." *Harper's Magazine.* February 2004. This is a very good piece on this mine fire and its causes. Eminently readable, students should be able to grasp it.

Wiebe, Robert. "The Anthracite Coal Strike of 1902: A Record of Confusion" *Mississippi Valley Historical Review.* September 1961p. 229-251. A scholarly article, but very informative. I found this especially helpful for contextualizing Roosevelt in the broader fight for labor rights.

Zinn, Howard. *A People's History of the United States.* New York: The New Press, 1997. This is perhaps the best social history of the United States ever written. While not as detailed as the other texts listed, provides a good "survey of the century" between the Civil War (when coal was King) and the waning of coal's influence post-Korean Conflict.

Student List

D.H. Lawrence *, Sons and Lovers.* Middlesex: Penguin Books, 1913. I found it too dense for my 10th graders after the first chapter, but useful for describing the life of a coal mining couple.

A.J. Cronin *, The Citadel.* Boston: Back Bay Books, 1937. This is another text that is easily excerpted from in order to show the life of an English coal miner. I think this is more accessible than *Coalcracker Culture* , which is listed in the teacher resources.

Susan Campbell Bartoletti, *A Coal Miner's Bride.* New York: Scholastic, 2000. Another, even more accessible, young adult title related to the struggles of an outsider trying to understand the "thick culture" of coal mining.

Susan Campbell Bartoletti *, Growing Up In Coal Country.* Boston: Houghton Mifflin, 1996. This quality nonfiction text provides the factual backdrop for *A Coal Miner's Bride.*

Mary Harris "Mother" Jones *: Autobiography of* Mother Ed. Mary Field Parton. Chicago: Charles H. Kerr & Co., 1925. Perhaps the most readable text here listed; captivating for adults, should be interesting to students.

Martin, John Barlow. "The Blast in Centralia No. 5: A Mine Disaster No One Stopped" In *Shaking the Foundations: 200 Years of Investigative Journalism in America* Ed. by Shapiro, Bruce New York: Nation Books, 2003. pp. 201-244. See above.

Tietz, Jeffrey. "The Great Centralia Coal Fire." *Harper's Magazine.* February 2004. See above.

John Sayles *, Matewan,* 1987. An excellent film showing the intersection of racial and labor strife in the 1930's in West Virginia.

Websites

American Coal Foundation: Timeline of Coal in the United States. http://www.teachcoal.org/lessonplans/middle.html July 6, 2004. Briefly synopsizes the evolution of United States' coal usage.

The Hopi Tribe: *The Hopi Tribe: Tutsqua Ancestral Land* http://www.hopi.nsn.us/ancestral_land.asp July 6, 2004. This site provides interesting details about the Hopi use of coal.

G"del, Jeff. "Why We Burn Coal" CNN Online, 7/25/02 cgi.cnn.com/2002/US/07/25/mine.why.coal/ July 10, 2004. This contains a useful quote about the U.S.'s status as the "Saudi Arabia of Coal."

U.S. Geological Survey Energy Resource Surveys Program "USGS Fact Sheet FS-157-96 July 1996 Assessing the Coal Resources of the United States" Discusses, thoroughly, the state of United States' coal reserves. http://energy.usgs.gov/factsheets/nca/nca.html July 6, 2004

Coal Facts 2003 . West Virginia Coal Association PDF File. www.wvcoal.com/resources/2001coal.asp July 6, 2004. This contains interesting examples of the energy output of coal and the corresponding consumption of coal energy by household items.

Chicago Museum of Science and Industry, www.msichicago.org/exhibit/coal_mine/descent.html . Has a fantastic "virtual tour" of a coalmine.

"How a coal-fired power plant works" Canadian Clean Power Coalition www.canadiancleanpowercoalition.com/CUSTOMER/CCPC/CCPCWEBSITE.NSF. This site contains a great graphic depiction of the journey of coal through a coal-fired power plant.

AP News Report, "EPA Says 243 Counties Exceed Soot Standard." June 30th, 2004. Shows the current state of coal related pollution in the United States.

Gabbard, Alex. *Coal Combustion: Nuclear Resource or Danger* ?. Oak Ridge National Laboratories Report. www.ornl.gov/info/ornlreview/rev26-34/text/colmain.html July 22, 2004. Has some alarming (for coal) and contextualizing (about nuclear power) information about the radioactive nature of coal deposits in the United States.

United States Mine Rescue Association. "Historical Data on Mine Disasters in the United States" http://www.usmra.com/saxsewell/historical.htm July 27, 2004. This provides data that contextualizes the Centralia, Illinois Mine Blast for the Reader. Also shows the severity of mine disasters in general.

"Centralia, Pennsylvania." http://www.offroaders.com/album/centralia/centralia.htm May 19, 2004. This site provides pictures and general information of Centralia, the "Town on Fire."

"The Miners." Pittsburg Post-Gazette Staff Writers. http://www.post-gazette.com/localnews/2002080402all9chaponep9.asp July 6, 2004. This article provides detailed information about the Quecreek mine disaster from the mine's local paper. I found this to be an excellent source for internet-based investigative reading.

"Quecreek Miner Miracle" http://www.cnn.com/SPECIALS/2002/miner.miracle/index.html July 11, 2004 Another excellent source for information about Quecreek, but from a national perspective.

"Matewan" http://www.imdb.com/title/tt0093509/ July 20, 2004. Cites the movie.

How Stuff Works: How much coal is required to run a 100-watt light bulb 24 hours a day for a year? science.howstuffworks.com/question481.htm July 20, 2004. Answers this question; has other links to coal related questions.

Notes

1. *The Hopi Tribe: Tutsqua Ancestral Land* http://www.hopi.nsn.us/ancestral_land.asp

2.American Coal Foundation: Timeline of Coal in the United States. ©2003-2004

3.ibid.

4."Why We Burn Coal" CNN Online, 7/25/02 http://cgi.cnn.com/2002/US/07/25/mine.why.coal/

5.USGS Fact Sheet FS-157-96 July 1996 Assessing the Coal Resources of the United States

6. *Coal Facts 2003* . West Virginia Coal Association PDF File.

7.Ibid.

8.Chicago Museum of Science and Industry, www.msichicago.org/exhibit/coal_mine/descent.html

9."How a coal-fired power plant works" Canadian Clean Power Coalition
www.canadiancleanpowercoalition.com/CUSTOMER/CCPC/CCPCWEBSITE.NSF

10.Freese, Barbara. *Coal: A Human History* . Perseus Books, p. 167.

11.AP News Report, June 30th, 2004.

12.Fay, James. *Energy and the Environment* . p. 267.

13.Gabbard, Alex. *Coal Combustion: Nuclear Resource or Danger* ?. Oak Ridge National Laboratories Report.
www.ornl.gov/info/ornlreview/rev26-34/text/colmain.html

14.Freese, Barbara. *Coal: A Human History* . Perseus Books, p. 127.

15.Mississippi Valley Historical Review Volume Number: 48 Date of Publication: September 1961 Pages: p. 229-251

16.Wiebe, Robert. "The Anthracite Coal Strike of 1902: A Record of Confusion" *Mississippi Valley Historical Review* September 1961p. 229-251

17.http://www.usmra.com/saxsewell/historical.htm

18.Shapiro, Bruce. *Shaking the Foundations.* Nation Books, 2003. pp. 201-244

19.Ibid., 205

20.http://www.offroaders.com/album/centralia/centralia.htm

21.http://www.post-gazette.com/localnews/2002080402all9chaponep9.asp

22.http://www.cnn.com/SPECIALS/2002/miner.miracle/index.html

23.Shapiro, Bruce, 206

24.www.imdb.com search for “Matewan”

25.How Stuff Works: How much coal is required to run a 100-watt light bulb 24 hours a day for a year? science.howstuffworks.com/question481.htm

Coal mining is the process of extracting coal from the ground. Coal is valued for its energy content and since the 1880s, has been widely used to generate electricity. Steel and cement industries use coal as a fuel for extraction of iron from iron ore and for cement production. In the United Kingdom and South Africa, a coal mine and its structures are a colliery, a coal mine is a 'pit', and the above-ground structures are a 'pit head'. In Australia, "colliery" generally refers to an underground coal The history of Coal mining goes back thousands of years, with early mines documented in ancient China, the Roman Empire and other early historical economies. It became important in the Industrial Revolution of the 19th and 20th centuries, when it was primarily used to power steam engines, heat buildings and generate electricity. Coal mining continues as an important economic activity today, but has begun to decline due to the strong contribution coal plays in global warming and environmental issues Students calculate how much coal they use based on their electric power usage. In this environmental science lesson, students trace the history of coal mining in US.Â In this environmental science lesson, students trace the history of coal mining in US. They write a letter to USPS to encourage them to create coal mining stamps. 77 Views 109 Downloads. Concepts. Significance: The American coal industry relied heavily on immigrant labor during the late nineteenth and early twentieth centuries. Immigrant miners exerted a powerful and pervasive influence upon life in coal mining towns and figured prominently in early organized labor movements. Used as a source of fuel and warmth since ancient times, coal was first mined in the United States in mid-eighteenth century Virginia and was mined on a large scale in the Appalachian Mountains of Virginia and Pennsylvania starting in the midnineteenth century. After removing the coal from the ground, the miners may send it to a preparation plant near the mining site. The plant cleans and processes coal to remove rocks, dirt, ash, sulfur, and other unwanted materials. This process increases the heating value of the coal. Transporting coal. Coal can be transported from mines and processing plants to consumers in several different ways: Conveyors, trams, and trucks move coal around mines, short distances from mines to consumers close to the mines, or to other modes of long-distance transportation. Trains transport nearly 70% of coal deliveries in the U