

IN THE AIR

IN THE AIR

www.intheair.org

Connecting Activity #3

"In A Shroud
Of Smoke"

3-6 EDUCATION MODULE



 MISSOURI
BOTANICAL
GARDEN

Correlation with Education Standards Summary

Connecting Activity #3 “In a Shroud of Smoke”

For a narrative description of these standards please refer to the Teacher’s Guide.

National Standards

SOURCE: www.education-world.com/standards

Grades K-4:

NPH-H.K-4 .1 .2 .3 .4 .7
NL-ENG.K-12.
3 .4 .5 .6 .7 .8
NS.K-4 .6
NSS-C.K-4 .5

Grades 5-8:

NPH.5-8 .1 .3 .4 .7
NL-ENG.K-12.
3 .4 .5 .6 .7 .8
NS.5-8 .6
NSS-C.5-8 .5

Missouri Show-Me Standards

SOURCE: www.dese.mo.gov/standards

Performance Standards:

GOAL 2: 3, 4
GOAL 3: 1, 2, 6
GOAL 4: 1, 3, 4, 7

Knowledge Standards:

CA 3, 5, 6
FA 4, 5
SC 8
SS 2, 5

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IN THE AIR

Connecting Activity #3

OVERVIEW

In this lesson, students will learn how the actions of St. Louis residents in the 1930s and 40s, helped to clear their skies of smoke and influenced anti-pollution efforts across our nation.

Students will analyze historical editorial cartoons and develop their own cartoon about an environmental issue concerning the school or community.

GOALS

- To provide a historical account of a successful air pollution effort
- To highlight the important role that individuals play in air pollution

“IN A SHROUD OF SMOKE”

Recommended Grade Level:
3-6
Preparation Time:
Time is needed to make photocopies.
Presentation Time:
This activity is reading based, time required will vary. The cartoon activity will require one 50-minute class period.

OBJECTIVES

By the end of this activity, students will be able to do the following:

- Identify that individuals, businesses, and the government have a responsibility to protect the environment.
- Relate how the habits of individuals led to the reduction of pollution levels in the 1940s.
- Create a cartoon describing a local environmental issue within the community. Compare and contrast created cartoons with those published in St. Louis, Missouri about the smoke issue.

MATERIALS

Each student will need:

- Copy of the student booklet (twelve pages including the three worksheet pages)
- Paper
- Pencil

VOCABULARY

Shroud: a burial cloth used to protect the bodies of the dead before burial. It can also mean something that obscures or conceals from view.

Ringelmann Chart: a chart used to estimate the density of a plume of smoke.

Air Monitor: sensitive scientific equipment used to detect pollutants in the air. Air monitoring is usually conducted by government agencies and industries.

PROCEDURE

Note: Students may work independently or in groups for this activity.

1. Distribute student booklets and worksheets. Instruct students to read the booklet and answer the questions on the “Did You Know?” page.
2. Discuss the questions at the end of the student booklet.
3. Explain to the students the importance of thoroughly understanding a topic before designing an editorial cartoon. Ask the class to identify the components of an editorial cartoon. From their ideas make a list of desirable characteristics. Some ideas to include might be that the cartoon:
 - has a drawing and a caption
 - expresses a point of view
 - focuses on a specific topic that is timely and important.
4. Divide the class into small groups. Assign or have the groups select and discuss one of the cartoons and complete the questions on the student worksheets. Set a reasonable time limit for their discussions.
5. Have each group report its findings, and add or delete any information to their definition of a good editorial cartoon.
6. Work with students to identify a list of environmental issues in the community or in your school (suggestions for school issues may include the need for recycling, carpooling, improving air quality, or saving electricity.)
7. In their groups, students should select one of the issues and discuss how they feel about it. After a consensus has been reached, they will determine one point of view (i.e. “Our school’s recycling program is working”.) Have them write the point of view at the top of the “Cartoons With a Message” worksheet.
8. Have each group draw an editorial cartoon on the issue expressing the point of view described. Encourage a clear, lightly satirical representation of the issue, rather than emphasizing artistic talent.
9. A caption should appear below the cartoon. The caption should be different from, but reflect the point of view statement. Each member of the group will sign the cartoon.
10. Have the groups share their work.
11. Display the cartoons.

DISCUSSION QUESTION

- What kind of air quality issues are present today?
- What kind of changes are needed to improve the air?
- Do you think it is necessary for people to care about an issue in order to change it?
- Do editorial cartoons influence public opinion, or do they reflect it?

CONCLUSION

Many St. Louisans did not believe that smoke could be cleared from their skies. Just as in other large cities the problem was too big. They reasoned it was the big polluters who were causing the problem. A law was passed controlling the smoke produced by the big polluters. Many people thought that action alone would be enough to take care of the smoke. They believed that pollution coming from their individual homes was such a small amount that it did not contribute a great deal to the problem. On Black Tuesday the people of St. Louis discovered they were wrong. The smoke was so bad that it changed the way people thought about the pollution they made. This change in attitude and resulting behaviors successfully cleared the skies of smoke as was chronicled in the editorial cartoons of the time.

EXTENSIONS

Conduct a pollution prevention project in your school.

To learn more about an air monitoring project in St. Louis, see—
<http://www.stlcap.org>

SOURCES

Fitzpatrick Collection
State Historical Society of Missouri, Columbia

Kansas City Star

St. Louis Globe-Democrat Archives, Mercantile Collection
- University of Missouri, St. Louis - Thomas Jefferson Library

Tucker Papers
Special Collections
Washington University St. Louis

Oscar Hugh Allison. Raymond R. Tucker: The Smoke Elimination Years 1934-1950
Thesis, St. Louis University, 1978.

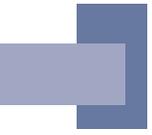
Common Fields: An Environmental History of St. Louis

Andrew Hurley, Ed.

“Struggle for Smoke Control in St. Louis” Joel A. Tarr and Carl Zimring
St. Louis: Missouri Historical Society Press, 1997.

City of St. Louis Air Pollution Control

St. Louis Community Air Project



IN A SHROUD OF SMOKE

STUDENT BOOKLET



The Spirit of St. Louis - by Lee Hines

FROM THE St. Louis Globe-Democrat Archives, ST. LOUIS MERCANTILE LIBRARY AT THE UNIVERSITY OF MISSOURI-ST. LOUIS

A TOWN ALONG THE RIVER

The location of St. Louis, Missouri, on the western bank of the Mississippi River was ideal for business and industry. In the 1800s, St. Louis became the center for transporting goods across the country, first by the rivers, then later by railroads and roadways. The location was good for business, and water and fuel were cheap and abundant as well.



Just across the river, Illinois coal mines produced large amounts of bituminous, or soft coal. This soft coal was inexpensive and easy to buy. It was used in St. Louis to fuel furnaces to heat homes, power business, drive trains, and run the large flat barges that carried goods on the rivers.

As the city grew so did the pollution. The thick, dark smoke that plagued the region was from burning soft coal. Many times throughout the city's history a public outcry rose to get rid of the smoke but very little was done. Air pollution from coal smoke was a problem in all large industrial cities across the world.

In 1933, Bernard L. Dickmann, the Mayor of St. Louis, created a citizen smoke committee to clear the city's air. Some smoke laws were already in effect limiting the amount of smoke a business could make but there was little enforcement. At one point only one inspector was in charge of 150,000 smokestacks. Realizing the large task of clearing the air, Mayor Dickmann appointed his personal secretary, Raymond Tucker, to head the effort.

Mr. Tucker's first task was to determine where the smoke was coming from and what had been done in previous years to eliminate it. Coal smoke came from various sources. Fifty percent of the soft coal burned in the city was used by large businesses and factories. The other fifty percent was used to heat households and small businesses. Early efforts to get smoke under control in St. Louis had focused on education. Organizations sponsored "Firing Schools" that taught people how to build cleaner fires. These efforts had almost no impact on the smoke.

Mr. Tucker and the smoke committee realized that education was not enough. If smoke was to be eliminated, the city would need to control the fuel people used. Mr. Tucker believed that the best solution was to switch to cleaner fuels such as gas or oil, or a fuel called coke, which was made from coal. This was not practical because these smokeless fuels were more expensive and not available in large enough quantities to supply the entire city.

Anthracite coal, mined in other states, contained more energy and burned cleaner than the soft bituminous coal mined in Illinois, but it was more expensive than the Illinois coal and most people did not want to pay a higher cost.

The smoke committee looked at ways to make soft coal burn hotter and cleaner. Washing coal with a spray of water or air reduced the amount of sulfur and produced cleaner smoke. Sizing was also important. Making the lumps of coal smaller and all the same size helped a fire to burn hotter. The hotter a fire burned, the less smoke it produced.

The smoke committee wanted the St. Louis aldermen to pass a law that would require all coal sold in the city to be washed and sized. Some people questioned if the city should make such a law. The law would force businesses to make changes that would cost more money. Those who were against the new law were afraid that businesses would move away from St. Louis because of the new fuel requirements that would put many people out of work.

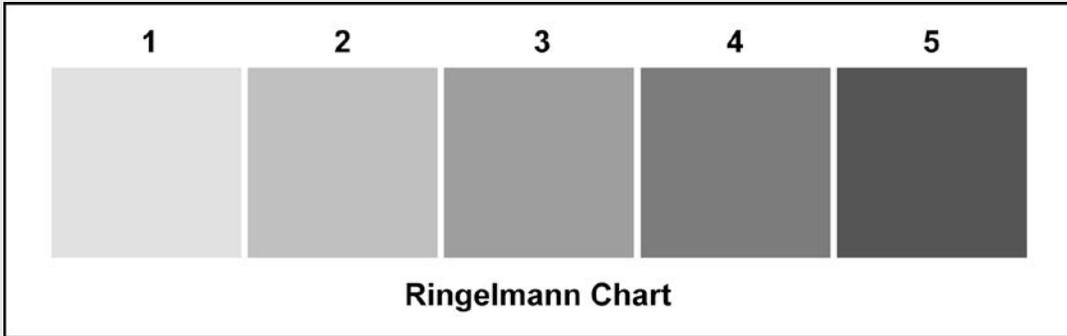
Illinois coal miners were also against the new law. They said washing coal was too expensive and a waste of time. They claimed that efforts to make their soft bituminous coal cleaner would not solve the problem of smoke. If the businesses in St. Louis stopped buying Illinois coal, the miners might lose their jobs.

In spite of the protests in 1937, the City of St. Louis passed a washing clause. This law required that all soft coal used in the city by the large businesses was to be washed and sized. Businesses were forced to use cleaner fuel or to install special equipment to burn the washed coal in a cleaner way. The law set standards for all coal sold to large businesses in the city, defined how much smoke and ash could come from a smokestack, and required inspections of industrial plants that burned coal.

The law also created the Division of Smoke Regulation. Raymond Tucker was chosen as the commissioner. He hired smoke inspectors to enforce the new laws. The smoke inspectors were professionally trained by engineers to make accurate observations of smoke coming from smokestacks. They testified in court against violators whose businesses produced too much smoke. Many people were hopeful that the new law would work, but Mr. Tucker believed that controlling large businesses wouldn't be enough to clear the air of smoke.

DID YOU KNOW?

Smoke Inspectors used a Ringelmann chart to determine the amount of smoke coming from a stack or chimney. Ringelmann charts, similar to the one below, are still used today in many communities that allow open burning.



A Ringelmann score tells how much light is blocked by the smoke.

A score of five would mean that 100% of the light is blocked and cannot be seen through the smoke.

1 = 20%	4 = 80%
2 = 40%	5 = 100%
3 = 60%	

Pretend you are a smoke inspector. Using the Ringelmann Chart, score the smoke coming from the smokestacks.



Photo Courtesy of City of St. Louis Air Pollution Control

My score for the left smokestack

This smoke blocks _____% of the light

My score for the right smokestack

This smoke blocks _____% of the light

In 1938, one year after the washing clause was implemented, a report determined that the new law had reduced the amount of pollution coming from commercial smokestacks by two-thirds.

In spite of this encouraging news, many people did not believe that the plan was working. The air they saw and breathed was still thick with black smoke.

The problem was that the new law did not apply to small users of coal such as households and small businesses. The city council refused to make more laws that would be unpopular with voters. All that Mr. Tucker could do was to encourage households to switch to cleaner burning fuels voluntarily. He wrote letters to the papers and made radio broadcasts promoting the benefits of using washed coal, mechanical stokers, and smokeless fuels. But it did no good.

The washed coal and mechanical stokers were expensive and most people believed they were not an effective way to reduce the smoke. Thick, black smoke was an inescapable condition of city living. No city anywhere had ever solved this problem. Mr. Tucker knew that nothing would change in St. Louis until people believed that having cleaner air was more important than the cost of coal.

On Tuesday, November 28, 1939, they believed.

Smoke Blacks Out St. Louis



Underneath the cloud of smoke it was dark as night. This photo was taken during the Black Tuesday smoke episode of 1939.

(Photo: Mercantile Library Collection - University of Missouri, St. Louis - Thomas Jefferson Library)

On Tuesday, November 28, 1939, a cloud of thick black smoke engulfed the city of St. Louis. While it was common in the winter for smoke from stoves and furnaces to hover over the city, nothing prepared residents for this episode of pollution. It was the worst anyone had ever seen. This event became known as Black Tuesday. In the following four weeks, the thick dark smoke was present nine days. If the smoke was to be cleared from the skies, the habits of over 1,000,000 people would have to change.

Only a few residents of St. Louis were using smokeless fuels such as gas or fuel oil for heat. Ninety-seven percent of the homes used coal as their heating fuel.

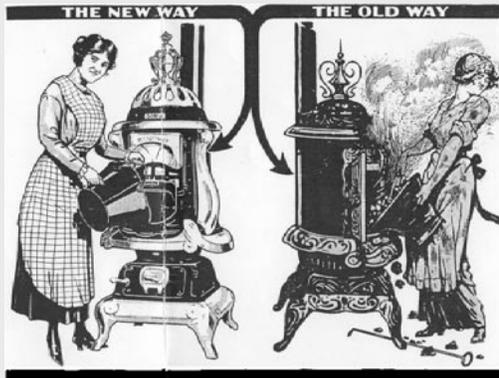
The next challenge was securing one million tons of cleaner coal for the next heating season at a price people could afford.

Semi-anthracite coal, mined in Arkansas and other states, was of a higher quality than the Illinois bituminous coal. It burned hotter and cleaner. Tucker believed that this coal could be part of the answer to cleaner air. The problem was the price. The coal was more expensive and it also cost money to transport to St. Louis.



Coal stoves could be vented through a fireplace. Stoves were becoming a thing of the past as people installed central heating systems.

The new coal was needed before the weather turned cold. Tucker worked furiously throughout the spring and summer of 1940 to make smart business deals with the government, railroads, and the mining companies to reduce the price of the cleaner coal. With the price reductions the coal was still more expensive and no one knew if the plan would work.



All coal stoves and most furnaces were hand stoked, the fuel was added to the fire by hand, and required constant attention. Ashes, soot, and glassy rocky chunks of debris called clinkers, had to be removed from the firebox in order for the stove or furnace to operate efficiently. Coal would be added to the fire throughout the day and banked at night.

Many homes had central heating that used a coal fired furnace similar to this one, only smaller. In a central heating system, the heat comes from one location. It is delivered to different parts of the house by air ducts or by steam radiators.



To bank a fire, fresh coal would be piled on top of the burning coals inside of the fire box. Piling the coal in this way reduced the amount of oxygen around the individual pieces, causing the fire to burn more slowly. If a fire was banked well, it would last until morning.

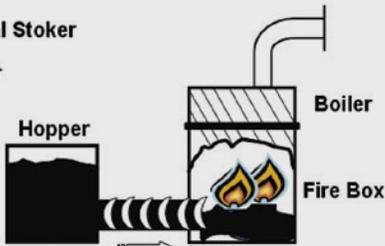
During the day, many people also over stoked their fires by putting in too much coal at one time. Banked and over stoked fires did not burn as hot as fires properly built. They wasted coal and produced more smoke.

Many stoves were designed to burn a cleaner, more expensive type of coal than what people commonly used. The less expensive coal produced more soot and smoke.



Mechanical Stoker

The hopper stores the unburned coal. A motor drives the screw.



Screw type conveyor moves coal into fire box

Using a mechanical stoker instead of stoking by hand improved the efficiency of a furnace. A stoker ran 24 hours a day so the fire would not need banking at night. A screw -type conveyer automatically fed coal into the fire at a slow and measured rate which prevented over stoking. A heating system that used a mechanical stoker burned less coal, burned hotter, and produced less smoke. People loved their mechanical stokers because they eliminated the time and mess of hand stoking.

On the first anniversary of Black Tuesday, the weather conditions were identical to those the year before. A St. Louis paper reported that people looked out their windows throughout the day, nervously waiting for the familiar thick black clouds of smoke to descend. And nothing happened. The skies were clear! For the first time, a major city had a working plan to clear the smoke. St. Louis had made history.

The key to success in clearing the air of coal smoke in St. Louis was changing the public view of pollution and providing an affordable alternative source of energy for people to use.

By the 1960s, dense smoke was mostly eliminated from cities in the United States. It was the first step to clearing our nation's air. Once the thick dark smoke was gone, people began to concentrate on other air pollutants.

Answering the concerns of citizens nationwide about air pollution, the federal government enacted laws that became the basis of the Clean Air Act and established the U.S. Environmental Protection Agency (USEPA). The USEPA's mission is to protect human health and to safeguard the natural environment — air, water, and land — upon which life depends. For more than 30 years, the USEPA as well as state and local agencies have been working for a cleaner, healthier environment for the American people.

Although you may not see it, air pollution is still a problem. Many air pollutants travel great distances to places far from where the pollution was first made, affecting the air, land, and water, and plants and animals as well. Air monitoring programs in communities across the country are measuring pollutants in the air that may harm human health. This information is helping researchers to learn more about air pollution and how to prevent it.

The St. Louis Community Air Project is one such partnership. Citizens, local government officials, and business representatives are learning more about the air pollutants in their community through a monitoring project.

Working with the U.S. EPA, state and local agencies, the project's goal is to develop a model for reducing health risks from all sources of air pollution. In the future, this model may be adopted and used by other communities.



Photo Courtesy of St. Louis Community Air Project

Discussion Questions

1. How does this account of smoke control in St. Louis demonstrate the importance of individual actions?
2. What are some sources of air pollution in your community? How do people feel about it?
3. Clearing the smoke from the skies was only a first step to cleaning the air. What are some sources of pollution today?
4. Individuals in the 1940s had to change their habits in order to improve the air. Are there behaviors that can be changed today to help protect the environment and reduce air pollution?
5. Create a cartoon to encourage a change in thinking or behavior to help solve this problem.

Why Learn About St. Louis? _____

It's true other serious and more dramatic episodes in the history of air pollution have occurred. However, St. Louis is unique in that it was individual actions on the part of private citizens that were responsible for most of the pollution from coal smoke and for taking the actions necessary to clear the air.

To find out what you can do to lessen pollution in your community, check out the following sources of information.

<http://www.epa.gov/kids>.

For more information about air monitoring projects and the St. Louis Community Air Partnership, see <http://www.stlcap.org>.

If you would like to learn more about renewable energy, see <http://www.eren.doe.gov>.

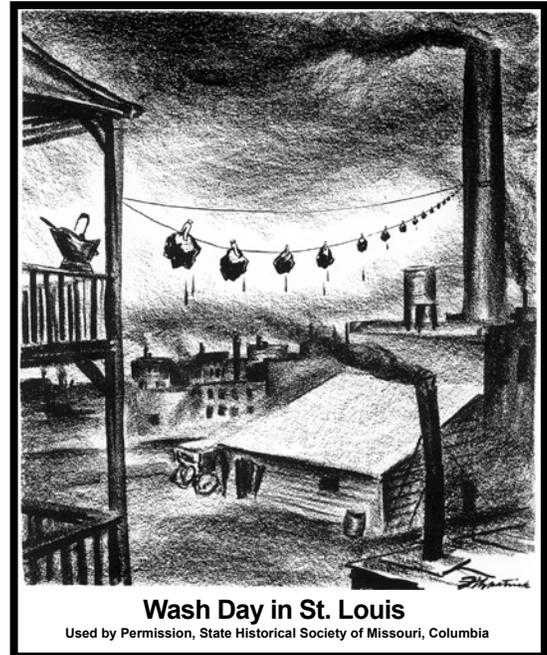
Play this game to learn more about reducing smog in your city, see <http://www.smogcity.com>

Cartoons With A Message

CARTOON #1



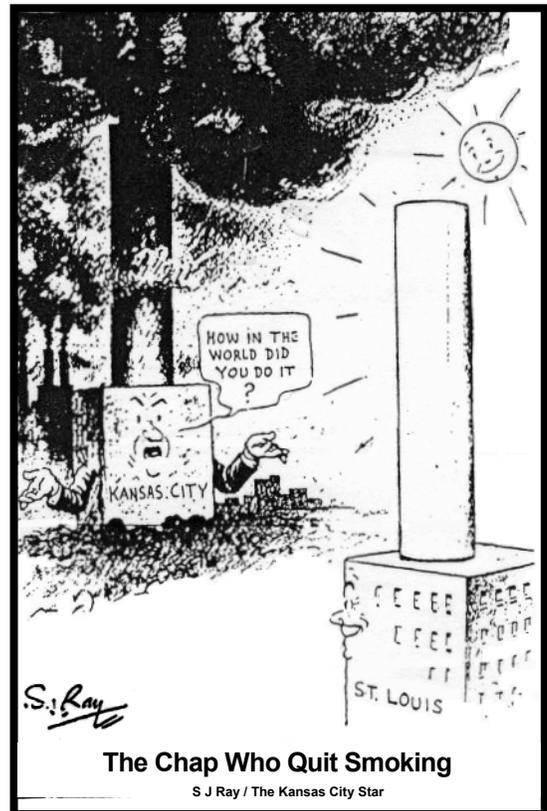
CARTOON #2



CARTOON #3



CARTOON #4





Record which cartoon you will be discussing.

Cartoon # _____

Group members: _____

Study your cartoon. Answer the following questions:

1. How would you describe the cartoon?

2. What community issue is represented?

3. What is the opinion or point of view of the cartoonist on this issue?

4. Look at the drawing and the caption. What has the cartoonist done to communicate his or her message?

Cartoons With A Message

In the large box below, create your own cartoon about an environmental issue at your school or in your community. In the smaller box at the bottom, write a caption for your cartoon. Be sure to sign and date your work.

Point of View Statement

