Wanted: A Breath of Fresh Air

Overview of Lesson Plan:
In this lesson, students examine the causes and effects of air pollution, as well as ways in which various industries and government organizations are aiming to control it. Students first use the Internet to answer a series of questions about air pollution and to compile a list of related Web sites, and then use these Web sites to create informative posters about specific air pollution topics.

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Suggested Time Allowance: 45 minutes- 1 hour

Objectives:
Students will:
1. Identify some of the causes of pollution in their community and discuss how these types of pollution directly and indirectly affect them.
2. Examine how the automobile industry and legislation are helping improve the air quality in California by reading and discussing "Clearing the Air In the Land of Smog."
3. Determine causes and effects of air pollution, as well as ways in which various groups are aiming to control it, by finding related Web sites on the Internet.
4. Create informative posters about various air pollution topics using research from the Internet.

Resources / Materials:
-student journals
-paper
-pens/pencils
-classroom blackboard
-copies of "Clearing the Air In the Land of Smog" (one per student)
-computers with Internet access (at least one per every three students)

Activities / Procedures:
1. WARM-UP/DO-NOW: In their journals, students respond to the following question (written on the board prior to class): What are some of the causes of pollution in your community? Students then share their answers and discuss how these types of pollution directly and indirectly affect them.

2. Read and discuss "Clearing the Air In the Land of Smog," focusing on the following questions:
a. How has air pollution affected the people of California, and what are the main causes of this problem in that state?
b. Who is on each of the two "sides" of the pollution debate, and what industries or organizations support each side?
c. What new technology has been devised to cut down the amounts of dangerous emissions from cars, and how does each piece of technology function?
d. What legislation has been enacted to control air pollutants, and how effective has it been?
e. What "loophole" did California "create" to counter the first set of low-emission vehicle standards, and what is being done about this problem?
f. How are auto makers affected, both positively and negatively, by new emission standards?
g. What issues arise in determining whether air pollution legislation should be enacted on a federal level?
h. What positive effects have different pieces of legislation had on reducing harmful emissions from cars and in turn improving air quality?

3. Divide students into groups of three, and seat each group at a computer with Internet access. Students should be told that they will be going on an Internet scavenger hunt, each group finding one Web site that provides the answer for each of the questions below (written on the board prior to class for easy reference):

–What elements in the air are considered pollutants?
–What are some of the causes of air pollution?
–How does air pollution affect people and the environment?
–What is the name of an organization that aims to fight the causes of air pollution?
–What is the name of an organization that supports and defends the interests of those who cause air pollution?
–What type of legislation has been enacted to control air pollution?
–How is air quality measured?
When students find an appropriate Web site to answer a question, they should write down the URL (Web address) and the title of the Web site, as well as the answer to the question. Students should follow this procedure for all of the questions, answering each question with a different Web site.

4. WRAP-UP/HOMEWORK: Redivide students into seven small groups, each group assigned one of the questions from the Internet scavenger hunt on air pollution. Students then share the Web addresses of the Web sites they found for each answer with the appropriate groups (so that each new group will have a list of Web sites to use to answer their question). Each group then uses the Web addresses compiled by classmates during the Internet scavenger hunt to research their question and then create an informative poster. Each poster should include a thorough response to the question, at least one picture or graphic, and a list of the Web sites (with Web addresses) that they used for their research. Posters can then be presented to the class and displayed in the classroom.

Further Questions for Discussion:
–How would you define "pollution"?
–What is air pollution, and what causes it?
–What is the ozone layer, and how does the burning of fossil fuels affect it?
–What is the "greenhouse effect," and how does it relate to auto emissions?
–How has improved technology affected the quality of air?
–What dangers does poor air quality pose to humans?
–What programs or laws exist in your city, state or country that help reduce air pollution?
–In what ways can you help to reduce air pollution and other types of pollution?
–What ideas do you have of ways to reduce air pollution?

Evaluation / Assessment:
Students will be evaluated based on written journal response, participation in class discussion, ability to find correct answers on the Internet, appropriate compilation of Web sites, and group poster focusing on an air pollution topic.

Vocabulary:
materialize, visibility, quadrupled, respiratory, devise, emissions, disempowering, polarized, regulations, contentious, voluntarily, ceded, viable, catalytic, initiatives, hybrids, alliance, detours, loophole, dismayed, compliance, interplay, implement, uniform, fundamental

Extension Activities:
1. Choose a piece of air pollution-reducing technology discussed in the featured article (catalytic converters, cleaner gas, electric cars, fuel-cell cars) and create a "How It Works" poster that illustrates how this technology effectively reduces pollution.

2. Visit Web sites of different car manufacturers and examine what these sites say the companies are doing to reduce harmful car emissions. The Green Guide to Cars and Trucks Web site (http://www.aceee.org/greenercars/links.htm) offers a terrific list of these Web links.

3. Compare ozone levels in your state, region, or around the United States on different ozone maps over a period of time. Visit the Environmental Protection Agency's AIRNOW Web site (http://www.epa.gov/airnow/) to collect ozone maps dating back to the beginning of 1999. Then, assess

why changes in the maps may have occurred. What regions seem to show improvement? What regions seem to consistently need improvement? What is the air quality like in your region?

4. Create a Web site guide to organizations that aim to protect air quality and reduce all types of pollution. What are the mission statements of these organizations, and what do they do to uphold their mission? How can you get involved in these organizations' efforts?

5. Contact local industries via mail or telephone and investigate how they are aiming to control air pollution and other types of pollution.

6. Contact your community's, city's or state's government leaders to learn about their current and future plans to improve the air quality in your area.

7. Explore the causes and effects of other forms of pollution, and learn about the legislation and organizations that strive to reduce these harmful pollutants.

Interdisciplinary Connections:
American History- Investigate legislation passed on state and national levels to control car emissions. Create a timeline illustrating changes in such laws and parallel changes in the automotive industry, such as the creation of new technologies.

Global History- Learn about how other countries view air pollution and aim to control it through legislation and technology. Why do some countries have high levels of air pollution?

Mathematics- Use the Green Guide to Cars and Trucks (http://www.aceee.org/greenercars/) to create comparative graphs illustrating fuel emission and efficiency of different cars.

Media Studies- Examine ways in which car advertisements address the issue of air pollution and discuss how their cars are "cleaner" or meet industry standards.

Other Information on the Web:
Environmental Defense Fund (http://www.edf.org/), which represents 300,000 members, combines science, economics, and law to find economically sustainable solutions to environmental problems.

California Air Resources Board (http://www.arb.ca.gov/homepage.htm) aims to promote and protect the public health, welfare and ecological resources of California through the effective and efficient reduction of air pollutants while recognizing and considering the effects on the economy of the state.

Environmental Protection Agency (http://www.epa.gov/) strives to protect human health and to safeguard the natural environment — air, water, and land — upon which life depends.

Natural Resources Defense Council (http://www.nrdc.org/nrdc/) is a national nonprofit organization dedicated to protecting the world's natural resources and ensuring a safe and healthy environment for all.

Green Guide to Cars and Trucks 1998 (http://www.aceee.org/greenercars/) ranks cars and trucks according to environmental friendliness: buyers can compare vehicles by their environmental impacts, including air pollution, global warming, and fuel efficiency.

Academic Content Standards:
Grades 6-8
- Technology Standard 3- Understands the relationships among science, technology, society, and the individual.
Benchmarks: Knows that scientific inquiry and technological design have similarities and differences;

Knows that science cannot answer all questions and technology cannot solve all human problems or meet all human needs; Knows ways in which technology has influenced the course of history; Knows that technology and science are reciprocal; Knows ways in which technology and society influence one another

- Geography Standard 8- Understands the characteristics of ecosystems on Earth's surface. Benchmark: Knows the potential impact of human activities within a given ecosystem on the carbon, nitrogen, and oxygen cycles

- Geography Standard 14- Understands how human actions modify the physical environment. Benchmarks: Understands the environmental consequences of people changing the physical environment; Understands the ways in which human-induced changes in the physical environment in one place can cause changes in other places; Understands the ways in which technology influences the human capacity to modify the physical environment; Understands the environmental consequences of both the unintended and intended outcomes of major technological changes in human history

- Geography Standard 18- Understands global development and environmental issues. Benchmarks: Understands how the interaction between physical and human systems affects current conditions on Earth; Understands the possible impact that present conditions and patterns of consumption, production and population growth might have on the future spatial organization of Earth; Knows how the quality of environments in large cities can be improved; Understands why different points of view exist regarding contemporary geographic issues

- Language Arts Standard 4- Gathers and uses information for research purposes. Benchmarks: Uses a variety of resource materials to gather information for research topics; Determines the appropriateness of an information source for a research topic; Organizes information and ideas from multiple sources in systematic ways

- Language Arts Standard 7- Demonstrates competence in the general skills and strategies for reading a variety of informational texts. Benchmarks: Applies reading skills and strategies to a variety of informational texts; Summarizes and paraphrases complex, explicit hierarchic structures in informational texts; Uses new information to adjust and extend personal knowledge base; Seeks peer help to understand information; Draws conclusions and makes inferences based on explicit and implicit information in texts; Differentiates between fact and opinion in informational texts

Grades 9-12
- Technology Standard 3- Understands the relationships among science, technology, society, and the individual.
Benchmarks: Knows that science and technology are pursued for different purposes; Knows ways in which social and economic forces influence which technologies will be developed and used; Knows that alternatives, risks, costs, and benefits must be considered when deciding on proposals to introduce new technologies or to curtail existing ones; Knows examples of advanced and emerging technologies

- Science Standard 7- Understands how species depend on one another and on the environment for survival.
Benchmark: Knows ways in which humans can modify ecosystems and cause irreversible effects

- Geography Standard 8- Understands the characteristics of ecosystems on Earth's surface. Benchmark: Knows the effects of both physical and human changes in ecosystems

- Geography Standard 14- Understands how human actions modify the physical environment. Benchmark: Understands the global impacts of human changes in the physical environment

- Geography Standard 18- Understands global development and environmental issues. Benchmarks: Understands why policies should be designed to guide the useand management of Earth's resources and to reflect multiple points of view; Understands contemporary issues in terms of Earth's physical and

human systems

- Language Arts Standard 4- Gathers and uses information for research purposes. Benchmarks: Uses a variety of news sources to gather information for research topics; Synthesizes a variety of types of visual information, including pictures and symbols, for research topics

- Language Arts Standard 7- Demonstrates competence in the general skills and strategies for reading a variety of informational texts. Benchmarks: Applies reading skills and strategies to a variety of informational texts; Scans a passage to determine whether it contains relevant information; Summarizes and paraphrases complex, implicit hierarchic structures in informational texts, including the relationships among the concepts and details in those structures; Uses new information from texts to clarify or refine understanding of academic concepts; Uses discussions with peers as a way of understanding information