Air Quality Index

Grade 9-12

Length of Lesson:
One to three class periods, plus time for collection of data for Particulate Pollution Activity

Standards:
Georgia Science Standards:

- SEV2. Students will demonstrate an understanding that the Earth is one interconnected system.
- SEV3. Students will describe stability and change in ecosystems.
- SEV4. Students will understand and describe availability, allocation, and conservation of energy and other resources.
- SEV5. Students will recognize that human beings are part of the global ecosystem and will evaluate the effects of human activities and technology on ecosystems.
- SEC5. Students will assess the impact of human activities on the natural world, and research how ecological theory can address current issues facing our society, locally and globally.
- SM5 Students will differentiate the climates of Earth, how climate changes through time, and the theories regarding current climate change.

https://www.georgiastandards.org/Standards/Pages/BrowseStandards/ScienceStandards9-12.aspx

National Science Standards Addressed:

- **Content Standard**: **NS.9-12.1 Science as Inquiry**
  As a result of their activities in grades 9-12, all students should develop
  - Abilities necessary to do scientific inquiry
  - Understandings about scientific inquiry
- **Content Standard: NS.9-12.5 Science and Technology**
  As a result of their activities in grades 9-12, all students should develop
  - Abilities of technological design
  - Understandings about science and technology
- **Content Standard: NS. 9-12.6 Personal and Social Perspectives**

This lesson plan is available thanks to a grant from The Harland Foundation.

As a result of their activities in grades 9-12, all students should develop an understanding of

- Personal and community Health
- Population growth
- Natural resources
- Environmental quality
- Natural and human-induced hazards
- Science and technology in local, national, and global challenges

http://www.education-world.com/standards/national/index.shtml

National Technology Standards Addressed:

- **Content Standard: NT.K-12-5 Technology Research Tools**
  - Students use technology to locate, evaluate, and collect information from a variety of sources
- **Content Standard: NT.K-12-6 Technology Problem-Solving and Decision-Making Tools**
  - Students use technology resources for solving problems and making informed decisions.

North American Association for Environmental Education (NAAEE): Guidelines for Learning Addressed:

- Strand 1 Questioning, Analysis, and Interpretation Skills
- Strand 2 Knowledge of Environmental Processes and Systems
- Strand 3 Skills for Understanding and Addressing Environmental Issues
- Strand 4 Personal and Civic Responsibility

http://www.naaee.org/programs-and-initiatives/guidelines-for-excellence/materials-guidelines/learner-guidelines-strands

Focus:
This lesson focuses on the Air Quality Index: what pollutants are monitored, how it is calculated, the AQI chart and reporting, and what the AQI levels mean for public health.

Description:
Students will watch a PowerPoint presentation detailing the Air Quality Index.

Materials:

- PowerPoint presentation: “Air Quality Index. How Healthy is the Air You Breathe?”
- Materials below for “Particulate Pollution Activity”
- Microscope slides (Two per location to be studied or one slide plus one cover slip)
- Markers
- Rulers in mm
- Masking tape
- Self-adhesive labels
- Microscopes or magnifying glasses
- Petroleum jelly or double-sided tape

Vocabulary:

- Air pollution
- Air Quality Index
- Standards
- Particulates
- Ground-level ozone
- Carbon monoxide
- Sulfur dioxide
- Nitrogen dioxide
- Air quality standard
- Environmental Protection Agency (EPA)

Background:

Air pollution is often colorless or odorless, so it must be monitored through specific means in order to protect the public, animals, vegetation, materials and buildings. The EPA’s ‘Air Quality Index’ is a tool for monitoring 5 major air pollutants, determining a level of hazard, and disseminating that information to the public, governmental agencies, and industry/commerce. See below for more detailed background information.

Web sites:

AQI Brochure and information:
http://airnow.gov/index.cfm?action=aqibroch.index

AQI calculator:

http://airnow.gov/index.cfm?action=aqi.conc_aqi_calc

See page 9 at the following link for an interesting graphical diagram of AQI; page 16-18 of the pdf includes the equation used to calculate AQI for an individual pollutant:
http://www.epa.gov/airnow/aqi_tech_assistance.pdf

AIRNow- FAQ about AQI calculations and maps
http://airnow.gov/index.cfm?action=airnow.faq

Procedure:

1. Warm-up
2. Show PowerPoint presentation: "Air Quality Index. How Healthy is the Air You Breathe?"
3. Complete Activity and/or extension

Warm-up:

1. Write on the board: "How Healthy is the Air You Breathe?"

2. Ask students how they would answer the question, and how they know their answer. Ask if they think this information is important to the public, government, or industry/commerce.

3. After brief discussion, ask how a scientist would judge how healthy the air is- the answer should be with empirical observations, such as monitoring data from the atmosphere, or health data from people.

4. Introduce AQI topic as a tool developed to help us understand the health of the air we breathe. It uses monitoring data to help us understand the risk of certain health concerns from the air we breathe daily.

Activity One:
PowerPoint presentation: "Air Quality Index. How Healthy is the Air You Breathe?"

Activity Two:
Particulate Pollution Activity

Extension One:
Smog City 2
Students will extend the ideas learned in this lesson by using an interactive air pollution simulator to see how individual choices, land use, and environmental factors may affect the air we breathe. The simulation may be used by individual students with computer access, small groups, or as a class.
http://www.smogcity2.org/

Extension Two:
Divide students into five groups, with each group focusing on just one of the AQI monitored pollutants. Have each group take pictures of everyday activities (or find pictures on the Internet or in magazines) and make a poster for their assigned pollutant. What activities contribute to each pollutant?

Assessment:
- Participation in class discussion and class activities
- Completion of Particulate Pollution Activity Lab Report

References:
http://www.air.dnr.state.ga.us/information/aqi.html
http://airnow.gov/
http://airnow.gov/index.cfm?action=aqi_toolkit.main
http://www.epa.gov/ne/students/teacher/aire.html

Follow-Up:
After you have taught this lesson plan, please tell the Clean Air Schools program about your efforts in a brief, 60-second online survey at CleanAirCampaign.org. The information you provide is invaluable in helping this non-profit education program direct its resources to improving these lesson plans and creating new materials for your students. Thanks!

This lesson plan is available thanks to a grant from The Harland Foundation.

This lesson plan is available thanks to a grant from The Harland Foundation.

The Clean Air Schools program is helping educate future leaders about air quality and transportation. Learn more at CleanAirCampaign.org.

12/21/2009