



The Six Infamous Air Pollutants

Students work in groups to research and “get to know” the six major air pollutants. Students present information in creative ways to make an invisible and intangible entity (air pollution) a bit more visible and real to them through a “Meet the Pollutants” Press Conference. Students also play a game, similar to tic-tac-toe, that reinforces their knowledge of the six major pollutants. A Teacher Resource Manual and other resources are included. This is the first lesson in the "Air Quality and Transportation" unit. (Environmental Education)

<i>Education Committee</i>	<i>The Clean Air Campaign</i>	<i>Fulton</i>	<i>EEinGEORGIA.org</i>
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Primary Learning Outcomes

What are the six major air pollutants? What are the sources of the six major air pollutants? How do the six major air pollutants affect living things? What can be done about air pollution? By talking and writing, how can I tell people about air pollution?

Additional Learning Outcomes

How do I use the Internet or other sources to research information about air pollution?

Assessed GPS Standards:

Grade: 8

Science Standards

S8P1b: Students will examine the scientific view of the nature of matter.

- b. Describe the difference between pure substances (elements and compounds) and mixtures.

English Standards:

ELA8LSV1b,c: The student participates in student-to-teacher, student-to-student, and group verbal interactions. The student

- b. Asks relevant questions.
- c. Responds to questions with appropriate information.

ELA5LSV1b,c,l: The student participates in student-to-teacher, student-to-student, and group verbal interactions. The student

- b. Asks relevant questions.
- c. Responds to questions with appropriate information.
- l. Clarifies, illustrates, or expands on a response when asked to do so; asks classmates for similar expansions.

ELA5LSV2 (presentations) a-f: The student listens to and views various forms of text and media in order to gather and share information, persuade others, and express and understand ideas.

Critical Component: When delivering or responding to presentations, the student:

- a. Shapes information to achieve a particular purpose and to appeal to the interests and background knowledge of audience members.
- b. Uses notes, multimedia, or other memory aids to structure the presentation.
- c. Engages the audience with appropriate verbal cues and eye contact.
- d. Projects a sense of individuality and personality in selecting and organizing content and in delivery.
- e. Shapes content and organization according to criteria for importance and impact rather than according to availability of information in resource materials.
- f. Uses technology or other memory aids to structure the presentation.

ELA5W1b: The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals a satisfying closure. The student

- a. Selects a focus, an organizational structure, and a point of view based on purpose, genre expectations, audience, length, and format requirements.
- b. Writes texts of a length appropriate to address the topic or tell the story.

ELA5W2 (info. text)d: The student demonstrates competence in a variety of genres.

- d. Includes appropriate facts and details.

ELAW1: NO SUCH STANDARD LISTED ON THE WEB

Non-Assessed GPS Standards:

Grade: 5

Science Standards:

S5CS5d: Students will communicate scientific ideas and activities clearly.

- d. Locate scientific information in reference books, back issues of newspapers and magazines, CD-ROMs, and computer databases.

Social Studies Standards:

Information Processing Skills

Procedures/Activities

Step: 1 Duration: Teacher Preparation

The Clean Air Campaign is pleased to provide Georgia standards-based air quality unit plans for the 4th through 8th grades. We hope that you will implement the following 5th grade lesson plan and offer your feedback. Teacher input and suggestions will be reviewed and incorporated into future updates of this lesson plan. We look forward to hearing from you at schools@cleanaircampaign.com.

Teacher Preparation - Review the Teacher Resource Manual and all steps in this lesson prior to beginning so that you will know what to prepare in advance for your class. The Teacher Resource Manual provides background information on the lesson topic and other lesson resources. Be sure to collect all the items listed in the materials section, and to make hand-outs (as indicated throughout the lesson) ahead of time. Note: This lesson is the first in a unit focusing on air quality and transportation. In the unit, students explore how vehicles contribute to the problem of air pollution in metro Atlanta and around Georgia. Lessons in this unit, listed in the order in which they should be taught, are: 1. The Six Infamous Air Pollutants, 2. Traffic Jams, and 3. Green Vehicles. A description of each lesson is located in the Teacher Resource Manual.

Web Resources for Step 1

Title: 5th Grade Teacher Resource Manual

URL: http://eeingeorgia.org/content/ee/docs/5th_CAC_Manual.doc

Annotation: The Teacher's Resource Manual provides background information on the lesson topic and other lesson resources.

Title: The Clean Air Campaign

URL: <http://www.cleanaircampaign.com>

Annotation: The Clean Air Campaign offers a variety of voluntary programs and services, including free employer assistance, public information, and children's education resources that may be useful additional resources for this lesson plan.

Step: 2 Duration: 10 minutes

Write the words "Air Quality" on the board and ask students what they think those words mean. Ask students whether they think the quality of the air in their area is good or bad. How do they know? What evidence is there of air pollution? Have students ever experienced burning eyes or shortness of breath on polluted days? What time of the year does the air seem dirtiest? Tell students that the issue of "air quality;" – how good or bad the air is -- is often in the news in Georgia. (Show news articles if available.) Ask students why there is so much talk about "air quality" guide them to identify the importance of air for living things. Explain that bad air can contribute to a variety of illnesses such as asthma and cancer. Explain that even though air is so very important, and we should know what's going in and out of our lungs, it's sometimes hard to grasp because you usually can't see it, hear it, smell it, touch it, or taste it. It will be the students' challenge to make invisible air and air pollutants visible and interesting to learn about.

Step: 3 Duration: 10 minutes

Ask students where air pollution comes from. List their responses on a sheet of flip chart paper entitled "Sources of Air Pollution." Answers may include: cars, trucks, airplanes, power plants, big factories, fireplaces, and gas stations. Then ask students to identify what air pollution is actually made of; if students can name any of the six major pollutants, applaud them for knowing what so many people don't know about the air they are breathing. Show students another sheet of flip chart paper (pre-made by teacher) with a list of the Six Infamous Air Pollutants with shorthand names (see sample attached). Tell them that there are more pollutants, but that these are the "biggies" and they should be infamous, but many people don't know anything about them. Tell them that it will be their job to find out to find out as much as they can about the pollutants and be able to share that information with others and make the pollutants "infamous."

Attachments for Step 3

Title: Six Infamous Pollutants Poster **FileName:** [Six Infamous Air Pollutants poster.doc](#)

Description: Lists the Six Infamous Pollutants and their chemical symbols; to be enlarged into poster size.

Step: 4 Duration: 15 minutes

Divide the class into 6 groups. Distribute the attached “Infamous Pollutant Biography” hand-out to each group. Assign one pollutant to each group. Challenge the students to treat the Pollutant as an infamous character about whom they are putting together a biographical sketch. Tell them to use the websites provided on the hand-out, encyclopedias, or other resources to answer the questions on the hand-out and get to know their Pollutant very well. Explain that groups will be preparing this biographical information for a “Meet the Pollutants” Press Conference in which each pollutant will be interviewed to find out what they are all about (explain that infamous people often hold press conferences and answer questions by reporters). Each group should choose one person to “be” the pollutant and answer questions from the press. However, the other members of the group should also be involved in presenting the information. Each group should develop materials that can make the invisible pollutant visible and interesting to others – they may use visual art, drama, music, etc. but it **MUST** aid in explaining the scientific facts about the Pollutant. A description of a sample student presentation is attached.

Web Resources for Step 4

Title: Environmental Protection Agency

URL: <http://www.epa.gov/air/urbanair/6poll.html>

Annotation: This site describes the six major air pollutants. The website address is also included in the Infamous Pollutant Biography attached to this step.

Title: Environmental Protection Agency Air Quality Index for Kids

URL: http://www.airnow.gov/index.cfm?action=aqkids_new.main

Annotation: Contains information about air pollution and its health effects, written for kids; includes information on ozone and particulate matter. The website address is listed on the Infamous Pollutants Biography attached to this step.

Attachments for Step 4

Title: Infamous Pollutant Biography - Student Sample **FileName:**

[Infamous Pollutant Biography - Student Sample.doc](#)

Description: Provides an example of how a student might answer the biographical questions on the Infamous Pollutant Biography hand-put; also provides examples of creative ideas for making a visual representation of the pollutant.

Title: Infamous Pollutant Biography **FileName:** [Infamous Pollutant Biography.doc](#)

Description: Provides an outline for gathering and organizing information about one of the six major air pollutants. This attachment contains addresses to the two EPA website resources above.

Step: 5 Duration: 45 to 90 minutes over two days

As students research and develop materials, circulate and assist them as needed. Encourage them to be creative yet scientifically accurate. Ensure that there is a designated person to “personify” the pollutant, but also that each member of the group participates in some meaningful way.

Step: 6 Duration: 45 minutes

After students have done their research and prepared their materials, set up classroom as a press conference, with a central area for the interviewee and presenters, and an audience area for the rest of the class who will act as reporters. Distribute the “Meet the Pollutants Press Conference” hand-out (attached) and explain that the “reporters” will ask questions, but they must also take good notes; they will be using their notes later. Because students may or may not be familiar with a press conference format, the teacher will serve as moderator, introducing each Pollutant, asking the first question, and guiding the audience to ask subsequent questions. You might want to add some humor by calling the Pollutants by names, such as Ms. CO (carbon monoxide), Mr. Pib (Lead), or Dr. Nox (nitrogen oxide). Limit each pollutant’s entire interview session to approximately 5 minutes. After each session, be sure to applaud the presenters and briefly highlight the important points relating to the source of the pollutant, its effects on living things, and what can be done about it. Congratulate the entire class on an exciting press conference and their ability to make invisible things that are hard to grasp much more visible and understandable.

Attachments for Step 6

Title: Meet the Pollutants Press Conference - Reporter's Notes

FileName: [Meet the Pollutants Press Conference - Reporter's Notes - 5-04DS.doc](#)

Description: Provides an outline for student note-taking during the “Meet the Pollutants Press Conference” Activity.

Step: 7 Duration: 30 minutes (optional)

Tell students they are now going to play a game that will help them get to know all of the Six Infamous Air Pollutants better. This Tic Tac Toe game is similar the “Hollywood Squares” game on T.V. Nine students are seated in the middle of the classroom in 3 rows of 3; 6 are the Infamous Pollutant personalities from above

(you may want to have a different student represent the pollutant), one is Ms./Mr. Earth, one is Ms./ Mr. Dir. T. Air, and another is Dr. Haze. The remainder of the students are divided into two teams, one "X" and the other "O". A student or the teacher may serve as the "Game Show Host." A player from the X team chooses one of the "celebrities" to answer a question. The host reads a question from an X card and the "celebrity" answers, giving either a correct or an incorrect answer. The X player must decide if the answer given by the celebrity is correct or incorrect; if s/he is accurate, the X team wins the square and the host gives an X card to the celebrity to hold. This is repeated with the O team and continued until one team makes a Tic Tac Toe or the board is filled. OR If the class works better in smaller groups, divide the class into multiple teams of two students each. Give each team of two a Tic-Tac-Toe Game Board card, "X" and "O" Game Pieces, and "X" and "O" Question cards. Have students cut out the questions and game pieces. (You may wish to laminate the game cards, pieces and game board card for future use and store in a plastic baggie.) Tell them the game is played like Tic-Tac-Toe except they must answer a question correctly before they can claim a space. The "X" player asks questions from the "X" Question card (s) of the "O" player. Similarly, the "O" player asks the "X" player questions off the "O" Question card (s). A player can only place his/her piece on the Game Board card when (he/she) answer(s) the question correctly. Game board, pieces, and questions are attached. Note: This step may be skipped if time is limited or students do not need the reinforcement.

Attachments for Step 7

Title: Game Pieces - O **FileName:** [Game Pieces - O.doc](#)

Description: Markers used in Tic-Tac-Toe game.

Title: Game Pieces - X **FileName:** [Game Pieces - X.doc](#)

Description: Markers used in Tic-Tac-Toe game.

Title: O Question Cards **FileName:** [O Question Cards.doc](#)

Description: These are the questions to be asked of the "O" player in Hollywood Squares or Tic Tac Toe game. Also contains the answers.

Title: Tic Tac Toe Board **FileName:** [Tic Tac Toe Board.doc](#)

Description: A game board for use in the two-player Tic-Tac-Toe game that reinforces knowledge of the Six "Infamous" Pollutants.

Title: X Question Cards **FileName:** [X Question Cards.doc](#)

Description: These are the questions asked of the X player in Hollywood Squares or Tic-Tac-Toe game. Also contains the answers.

Step: 8 Duration: 10 to 40 minutes

Tell students that many people don't know much about these Infamous Pollutants and yet they are in contact with them often. Now that the students know the pollutants well, it's time they share this important knowledge with others. Assign students to choose 3 of the 6 major air pollutants and write an article for the "Air Quality Journal." The article must be at least 3 paragraphs long, describing, at the least, where the pollutants come from, their effects on living things, and what can be done about them. Students may illustrate the article if they wish. This may be done in-class or as a homework assignment. After the editing process, bind the articles into a "magazine" and entitle it "Air Quality Journal." You may wish to add newspaper clippings and other pertinent information to the Journal as the class proceeds through the Air Quality unit.

Step: 9 Duration: Teacher Feedback

The Clean Air Campaign is pleased to provide standards-based air quality lesson plans for 4th through 8th grades. Please offer your feedback after implementing this lesson plan, as there is no substitute for real classroom experience. Send teacher name, school name and address, grade level, lesson name, comments or suggestions, and the number of students who completed the lesson to: schools@cleanaircampaign.com. Each teacher who responds will receive a Clean Air Campaign goody bag as a 'thank you.'

Materials and Equipment

1. Paper and pencil (per student)
2. Newspaper clippings about air quality issues (optional)
3. Chart paper and marker
4. "Six Infamous Pollutants" poster
5. "Infamous Pollutants Biography" hand-out (one per student)
6. "Meet the Pollutants Press Conference - Reporter's Notes" hand-out (one per student)
7. 6 computers with Internet access and/or other air pollution reference materials
8. X and O Question Cards OR Game Board, Pieces, and Questions for two-person Tic-tac-toe Six Pollutants game. (Number of boards, questions, pieces is dependent on how game will be played.) Game components should be copied on cardstock
9. A variety of art materials for presentation props
10. Cardstock and binder ring or other materials for binding the "Air Quality Journal"

Total Duration

165 to 240 minutes

Technology Connection

Students will use the Internet to research the six major air pollutants.

Assessment

Students will turn in their notes from the “Press Conference” as well as their “Air Quality Journal” article. These two documents along with teacher observation during research and presentation steps will serve as assessment of learning. A rubric is attached.

Attachments

Title: The Six Infamous Pollutants Assessment

FileName: [The Six Infamous Pollutants](#)

[Assessment Rubric.doc](#)

Description: A rubric to be used to assess student learning regarding the six major pollutants as well as verbal and written communication skills.

Extension

Have students use the EPA kids' site below to learn about the Air Quality Index and play the games that teach about Air Quality issues.

Web Resources

Title: Environmental Protection Agency Air Quality Index for Kids

URL: <http://www.epa.gov/airnow/aqikids/index.html>

Annotation: EPA site for kids; explains how to use the EPA's Air Quality Index; has short games kids can play to learn more about air quality issues.

Remediation

Accommodation

For students with exceptional needs, what changes can be made in instruction and teaching delivery to enhance student participation and learning? Each area below is a direct link to general classroom accommodations.

[Non-readers](#) [Physical Impairments](#) [Sensory Impairments](#)
[Attention/Behavior](#) [Gifted](#)

Each disability below is a direct link to general classroom accommodations specific for that disability.

[Autism](#)

[Deaf - Blind](#)

[Deaf/Hard of Hearing](#)

[Emotional and Behavioral Disorder](#)

[Mild Intellectual Disability](#)

[Orthopedic Impairment](#)

Other Health Impairments:

[Attention Deficit Disorder/Attention Deficit Hyperactivity Disorder](#)

[Tourette Syndrome](#)

[Significant Development Delay](#)

[Specific Learning Disability](#)

[Speech - Language Impairment](#)

[Traumatic Brain Injury](#)

[Visual Impairment](#)

Modification

For students with significant disabilities, what changes can be made in instruction and teaching delivery to allow students to participate in classroom instruction while working on IEP objectives and off grade level GPS standards. Below are suggested modifications correlated to the procedures of this lesson plan.