



The Six Infamous Pollutants

Grade 5; English/Language Arts and Science

Length of Lesson:

2 hours 45 minutes - 4 hours

National Standards:

NAAEE Guidelines for Excellence in Environmental Education
Strand 2.4 Human / Environment Interactions

Georgia Performance Standards:

ELA5LSV2 - 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.

- 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.

ELA5W1 - 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.
- c. Uses traditional structures for conveying information (e.g., chronological order, cause and effect, similarity and difference, and posing and answering a question).



Complimentary Standards

S5CS6 - Students will question scientific claims and arguments effectively.

a. Support statements with facts found in books, articles, and databases, and identify the sources used.

S5P1 - Students will verify that an object is the sum of its parts.

b. Investigate how common items have parts that are too small to be seen without magnification.

Focus:

Fifth grade 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, which reinforces their knowledge of the six major pollutants.

Materials:

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

Procedure:

Step One: Teacher Preparation



Review all steps in this lesson prior to beginning. Be sure to collect all the items listed in the materials section, and make copies of hand-outs ahead of time. Please provide each student with a copy of the Assessment Rubric (attached) in the beginning of the lesson, and advise them to save all worksheets and notes to turn in for evaluation. The Student Handout (attached) contains the Pollutant Biography Worksheet, which every student will need a copy of at Step Four. This attachment also includes a Reporter's Notepad, for taking notes on presentations at Step Six. Each notepad page has space for notes on two of the six presentations. Please provide students with three notepad pages, perhaps copied back to back with the Pollutant Biography Worksheet, to save paper.

Step Two: 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 recent, related 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 Three: Duration - 30 minutes

Ask students where air pollution comes from. List their responses on a sheet of flip chart paper or on the board, under the title: "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 an enlarged list of the Six Infamous Air Pollutants with shorthand names (make in advance - see attached poster sample). 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."

Step Four: Duration - 15 minutes

Divide the class into six groups. Distribute the attached "Infamous Pollutant Biography Worksheet" 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 EPA [pollutants](#) and [air quality](#) websites for kids, listed on the hand-out, as well as encyclopedias or other resources, to answer the questions 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 type of 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). Explain that each person in a group will play a part of whichever pollutant that group was assigned; each person will speak at the press conference presentation and tell part of the pollutant's life story (based on information from the Student Handout – Infamous Pollutant Biography Worksheet- see attached); and each person in a group should be prepared to answer questions from the "press." The rest of the class will take notes and ask questions, acting as members of the press. Tell students that the groups may use props, special effects, or simple costumes to make the invisible pollutant visible and interesting to others. Mention that props also make good memory devices and help keep a presentation on track. Tell students that each group should have a main point or focus of its presentation, instead of just reciting a list of facts. For instance, a pollutant group could emphasize that their pollutant kills kids, or is the most dangerous, or had a difficult childhood, is not very threatening at all~ and explain how or why. A sample student presentation is included at the end of this document. Please make sure students are referring to the Assessment Rubric while preparing their presentations.



Step Five: Duration 45 – 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. Emphasize that each member of the group must participate in the presentation, and that each person must fill out his own version of the Infamous Pollutant Biography handout, even if group members collaborate on the research. Allow time for the groups to plan and practice their presentations, after research is complete.

Step Six: Duration – 45 minutes

After students have completed their research and prepared their presentations, set up the classroom for the press conference. Provide a central area for the presenters and an audience area for the rest of the students, who will be acting as reporters. Distribute the Reporter's Notepad (attached in the Student Handout: each student will need **three** note pages) 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 not be familiar with a press conference format, the teacher will serve as moderator, introducing each Pollutant group, inviting the presentation to start, 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 presentation and interview session to approximately 5 - 10 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.

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 three of the six major air pollutants and write an article for the "Air Quality Journal" using notes from their Infamous Pollutant Biography



Worksheet and Reporter's Notepad (press conference notes). The article must be at least three paragraphs long, describing where the pollutants come from and how they are caused, their effects on living things, and what can be done about them. In addition to telling about each pollutant, the article must compare the three pollutants, pointing out similarities and differences, and must make a main point (such as which pollutant is worst, which affects students in your community most, or which presents a problem students have the power to help solve). The article will differ in point of view from the press conference presentations, which were conducted "in character." For purposes of this article, students should write as junior scientists. Please refer students to their copies of the Assessment Rubric for additional information on criteria for this assignment. The articles may be started in class and continued as a homework assignment. After they are submitted, 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. Please remind students that their Pollution Biography Worksheets and Reporter's Notepads should also be turned in, along with the self-assessment on the Assessment Rubric.

Step Seven: 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 three rows of three; six 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.

Step Eight: 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 three of the six major air pollutants and write an article for the "Air Quality Journal." The article must be at least three 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.

Assessment:

At the end of the lesson, students will turn in all work products, including the Pollutant Biography Worksheet, Press Conference Reporter's Notes, and Air Quality Journal article, for assessment. In addition, the teacher will observe and assess research methods and group presentations. Criteria for evaluating all student work is included in the Assessment Rubric. The rubric also includes a Self-Assessment checklist. Please distribute a copy of rubric to each student at the beginning of this lesson.



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!

Student Work Sample:

Infamous Pollutant Biography

Name of Pollutant: **Nitrogen Oxides** (Dr. Nox)

1) What do you look like?

There are actually lots of nitrogen oxides in my family. I am colorless and you can't smell me either. But there are some in my family that look kind of red-brown when they hang over cities. (* Student might sprinkle red-brown dust to illustrate or show a picture with red-brown hanging over a city.)

2) Where do you come from?

I come from things that burn fuel – like cars (* Student might show picture of cars or tailpipes and/or make the sound of a car engine revving). I also come from factories (show a picture of smokestack) and from utilities like electric power plants (student might flash the classroom lights.)

3) Where do you hang out?

I'm a traveler – I blow on the wind (student blows or waves a large cloth). I like to hang out over cities, but I can spread far and wide.



4) What problems do you cause for humans and other living things?

Lots! I can mix with other things called volatile compounds and heat and sunlight to make ozone and that can damage human lungs. (Student holds picture of lungs.) I can also mix with particles and cause problems to the lungs.

I can mix with sulfur dioxide and make acid rain. (Sound of rain or picture of rain) That can make damage crops and fish and other things in the water.

I can also add extra nitrogen to the water and that messes up lakes and streams. (Hold up bottle of water or show picture of lake.)

Some of my family members work on global warming - -making the earth heat up. And that changes the whole climate everywhere (act out feeling very hot or show picture of global warming)

I can also mix with other things and make poison! (Show skull and cross bones.) And sometimes I make it hard for people to see things clearly because I block the sunlight (squint).

5) What are humans doing to stop you from doing more harm?

They made a law called the Clean Air Act to try to stop the factories and the electric companies from making so much of me. They're trying to make cleaner burning fuel for cars (quieter sound of engine revving). And some humans aren't driving cars as much – they ride buses, walk to places, or ride bikes. (Act out walking and biking). But right now, I'm still pretty powerful! (Show muscles.)