



Air Pollution Math

Written by GEF Staff

Grades: PreK-2

Subjects: Math, Science, Social Studies, Health

Time: 30 minutes



*Standards:

Mathematics Standard 2: Understand and apply basic and advanced properties of the concepts of numbers.

Benchmark # 1: Understand that numerals are symbols used to represent quantities of real world objects.

Benchmark # 2: Count whole numbers.

Benchmark # 4: Understand basic whole number relationships (e.g., 4 is less than 10, 6 is greater than 2).

Mathematics Standard 6: Understand and apply basic and advanced concepts of statistics and data analysis.

Benchmark # 1: Collects and represents information about objects or events in simple graphs.

Benchmark # 2: Collect data from every day (real-world) situations.

Technology Standard 3: Understand the relationship among science, technology, society and the individual.

Benchmark # 3: Know that man-made materials, products, and systems can affect the environment adversely, yet there are things that can be done to circumvent this process (e.g., car pooling, hybrid cars, walking).

Geography Standard 14: Understand how human actions modify the physical environment.

Benchmark # 1: Know how people affect the environment in negative (e.g., air pollution) and positive (e.g., using alternative forms of energy) ways.

Health Standard 2: Know environmental and external factors that affect individual and community health.

Benchmark # 1: Know the sources and causes of pollution in the community.

Objectives: Students will be able to...

- Define air pollution, identify some of the causes and explain why it is a problem.
- Explain that manmade objects, materials and systems can have an effect on the natural environment.
- Interpret and analyze the data represented in simple graphic organizers (pictographs).
- Compare whole numbers using terms fewer than, greater than, equal to.
- Compose and decompose whole numbers up to 10

[Air Pollution Activity Page](#)

[Air Pollution Pictograph](#)

**Materials:**

- Copies of the Air Pollution Activity Page
- Cut outs or drawings of the four types of vehicles: car, truck, bus, airplane
- Chart paper
- Poster marker

Overview: Air pollution occurs when pollutants, which include gaseous, liquid and solid particles, are introduced into the air in sufficient enough quantities as to constitute unhealthy or harmful conditions for living organisms. Contaminates directly released into the air are referred to as primary pollutants. Carbon monoxide is an example of a primary source of air pollution. Primary pollutants that undergo a chemical change after being released into the atmosphere are referred to as secondary pollutants. Smog is an example of a secondary pollutant.

Air pollution can be the result of either natural or manmade interactions with the environment. Before the Industrial Age nature was able to cleanse itself, when naturally occurring events resulted in a pollution problem. Examples of pollutants from situations or events that naturally affect the quality of air include:

- Dust that becomes airborne in areas where the land has little or no vegetation to protect it.
- Smoke and carbon monoxide from wildfires.
- Sulfur and ash from volcanic eruptions.

Nature uses the winds to disperse the gases, the rains to wash the particulates out of the atmosphere and the plants to replace the carbon dioxide with oxygen through the process of photosynthesis.

However, with the rise of industrialization and consequently, urbanization, human interaction with the environment has advanced to such a degree that nature can no longer maintain a healthy air quality.

Humans introduce pollutants into the air primarily through the emissions from combustion fired industrial plants, refineries and motor vehicles that operate by internal combustion engines. Incinerators and stoves, both coal fired and wood burning, also are contributing factors.

Air pollution is a serious problem that concerns us all. It can be detrimental to the health of all living organisms, seriously effecting the respiratory and nervous systems. It can be harmful to the environment causing smog, acid rain, damage the ozone layer and potentially result in climate change. The major contributors to air pollution are: Carbon Monoxide, Lead, Nitrogen Dioxide, Ozone, Particulate matter and Sulfur Dioxide.

Kid's Speak: When tiny particles, drops of liquid and gases that would not normally be found in the air are released into the Earth's atmosphere we end up with air pollution. Some air pollution happens naturally. When wildfires burn, and volcanoes erupt, smoke, ash and gases are released into the air. When this happens it can be harmful to plants and animals, so nature uses the wind to move the gases, the rain to wash away the tiny particles, and the plants to release more oxygen the air. This all works very well, but sometimes it is not enough. People have made it more difficult to have clean air. The fuels they use, such as coal, oil and wood, to run their factories and power plants, to heat their homes and office buildings, and to make gasoline for their cars, trucks, buses and planes, send harmful pollution into the air. This is a serious problem for everyone.

When there is too much pollution in the air it can be very unhealthy. It can make humans and other animals sick. It can be harmful to trees and plants, making it difficult to grow crops for food. It can damage our drinking water and cause problems with the weather. This manmade pollution is too much for nature to clean up by itself. Nature needs our help to keep the air clean.

Eco-Fact: Almost 60% of all the carbon monoxide emissions in the USA are a result of exhaust from cars, trucks and other transportation related vehicles that rely on petroleum for combustion.



Procedures:

Before Conducting the Lesson:

- Explain to the class that air, one of Earth's materials, is a mixture of gases that creates something like a bubble around the planet. We can't see it, but it surrounds us all the time, and without it we could not live. It is one of the basic needs for all plants and animals on Earth.
- Explain that the air we breathe has become dirty because of air pollution. Describe air pollution. (The level of detail should be dependent on the grade level taught.) Answer the following questions for the students using the info in the Kid's Speak section:
 - What is air pollution?
 - What causes it? Where does it come from?
 - Why is it a problem?
- Distribute the Air Pollution Activity Page. Use this to promote discussion, asking students if they can find anything in the picture that contributes to the air pollution problem. Possible responses include emissions from: factories, power plants, heating our homes, cars, buses, trucks and airplanes. Use the picture to draw attention to the smoke stacks, fireplaces and fumes from the vehicles to help students understand how particles and gases are released into the air.

Air Pollution Math Lesson:

1. Make a pictograph using the four types of vehicles previously mentioned: cars, buses, trucks and airplanes. Ask students to look at the Air Pollution Activity page and count the number of cars they see. Draw clouds next to the picture of the car, one cloud to represent each car. Follow the same procedure for the remaining three types of vehicles.
2. Ask students to refer to the completed pictograph to answer the following questions:
 - Which type of vehicle is there the greatest number of in the picture?
 - Which type of vehicle is there the fewest number of in the picture?
 - How many more cars are there than buses?
 - How many fewer airplanes are there than trucks?
 - How many car and trucks are there all together?
 - How many vehicles are there all together? (Use other combinations to develop more questions.)

After Conducting the Lesson:

- Ask students why they think it is important that we use vehicles which:
 - use less gasoline?
 - can go further on a tank of gas?
 - are well maintained?
- Review some of the problems air pollution can cause and brainstorm some ways people can help solve the problem.

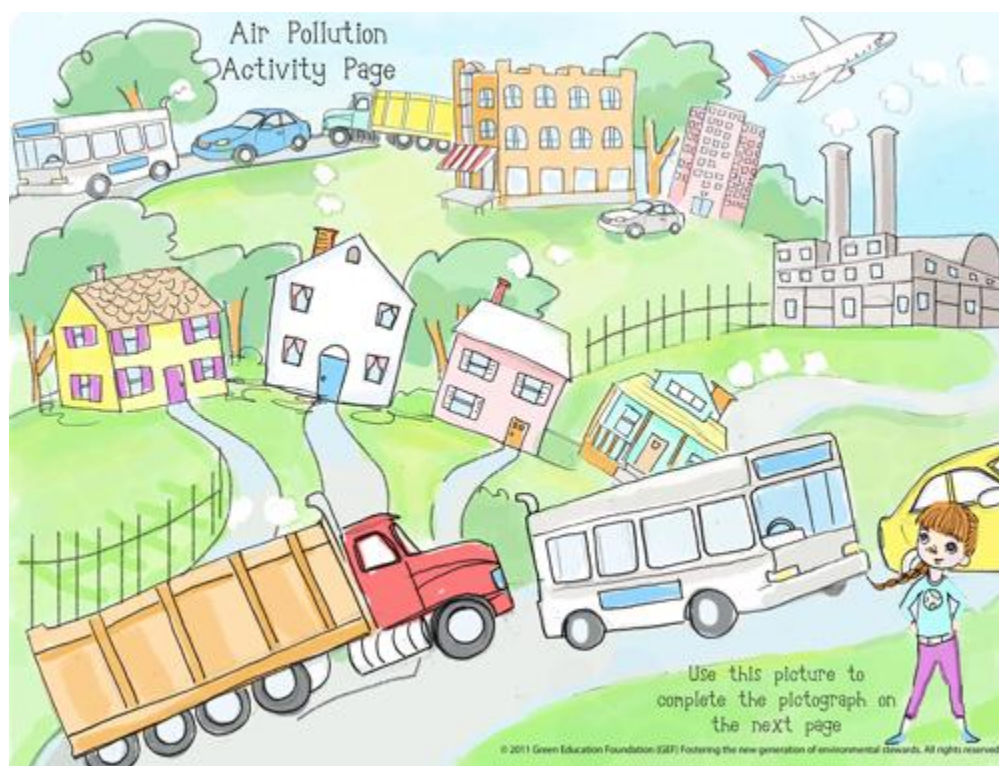
Adaptations:

- For younger students teachers may want to use toy vehicles to create a concrete graph rather than a pictograph.
- For older students teachers may want the students to generate the graph on their own, or to skip the pictograph and generate a bar graph.

**Extensions:**

- In a follow up lesson use the information illustrated in the pictograph to develop a bar graph and use the questions once again to check for understanding.
- Have students refer to the graphs to write and illustrate number sentences.
- Have students write or dictate 2-3 sentences to describe the problem illustrated in the Air Pollution Activity Page.

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