



Learning About Air Pollution

Adapted from The GLOBE Program | Air Quality-Up in the Air and the Aerosols Protocol
45 MINUTES + MINIMUM 2 HOUR WAIT TIME | INDOOR AND OUTDOOR ACTIVITY | AGES 7+

SUMMARY

Students will visualize air pollution by collecting and analyzing data.

OBJECTIVES

Students will

- Collect and analyze data.
- Understand there are small particulates in the atmosphere using visual evidence.
- Define the small particles as aerosols.

MATERIALS

- instructional video (YouTube, minute 6:06-12:50)
<https://youtu.be/R1Lgc39wMj0>
- data collection handouts and pencil
- clear contact paper
- cardboard (about the size of a piece of paper)
- one die/numbered cube
- clear tape
- optional: magnifying glass
- optional: Read, What's Up in the atmosphere? (free pdf or printable online)
- optional: What's Up in the Atmosphere? coloring page

ESSENTIAL QUESTIONS

1. Can we see some air pollution?
 2. What are aerosols?
 3. How do aerosols impact wildlife?
 4. How do aerosols impact human health?
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Lesson – Learning About Air Pollution

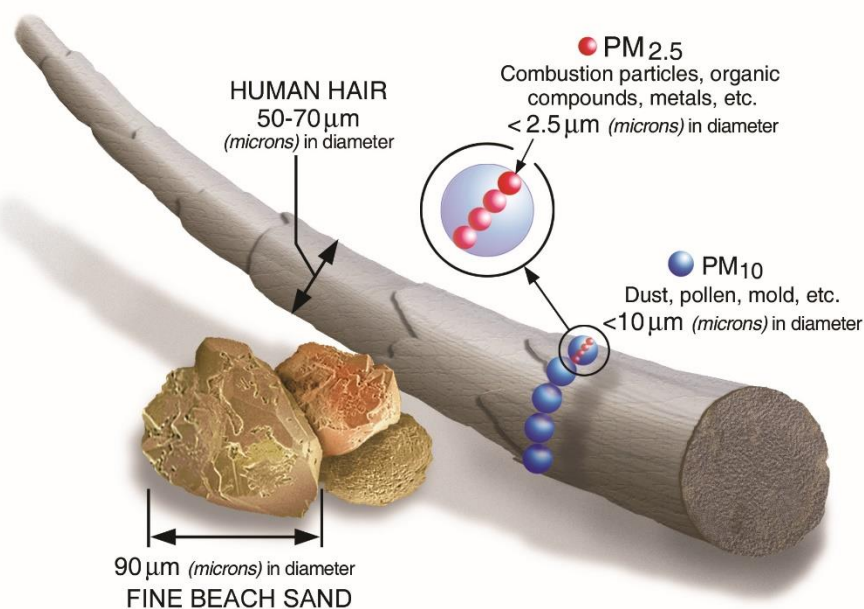
INTRODUCTION

Dust storms, forest fires, volcanic eruptions, and various other natural events emit enormous quantities of tiny particles into the atmosphere. In addition, human activities such as biomass burning, vehicular emissions, and industrial processes generate huge amounts of fine particles that are released into the atmosphere.

When these particles, which may be solid or liquid droplets, are suspended in the atmosphere, they are generally referred to as aerosols. Aerosol particles range in size from very small sub-visible up to raindrop sizes. At high altitudes and by way of our weather patterns, aerosols can travel long distances (around the world) and are long-lasting (up to a year or more). Aerosols closer to the ground travel shorter distances and don't last as long due to sedimentation and weathering.

Aerosols, particularly harmful particulates, like smoke, soot, and sulfur dioxides and nitrogen oxides (power plant pollutants), can impact respiratory health. Those who suffer from chronic respiratory diseases like asthma are more likely to experience difficulty breathing or an attack when particulates in the atmosphere are high.

The number of particles in a given volume of air (particles per cubic centimeter) is one convenient way to quantify aerosols. This activity is based on a simple method: collecting and counting aerosol particles on the visible spectrum.



[EPA](#)



Activity – Visualizing Air Pollution

PREPARATION

This activity is designed to be lead by a family member or caregiver and is not intended for a child to do alone.

Before beginning, you will need to clear a space in your home – e.g., kitchen counter or other options include dining, coffee, or card table. Then, [watch the video](#), minutes 6:06-12:50, and gather your materials.

WHAT TO DO

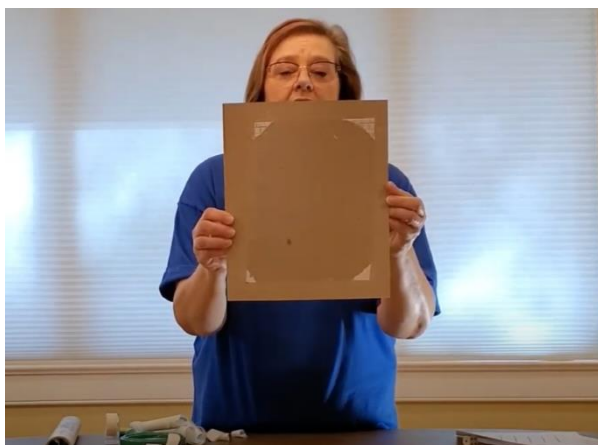
PART 1

1. Explain they will collect data on the number of tiny particles in the air around their home (or place where you are exploring).
2. Watch the video on creating your aerosol sampler grid, [watch the video](#), watch minutes 6:06-12:50. Then gather and prepare your materials.
3. Rewatch the video pausing along the way as you create your aerosol sampler.
4. Complete the weather-related questions using the handout, *Visualizing Air Pollution Data Collection Handout*. Access weather data via your local news, making observations outside, or using a weather app.



PART 2

1. Place the aerosol sampler outside on a vertical or horizontal flat surface, preferably a meter or two above ground. If it is windy, you may need to anchor the sampler.
2. Once the sampler is anchored securely, remove the protective backing from the contact paper, exposing the sampler to the outside air **for at least 2 hours**.

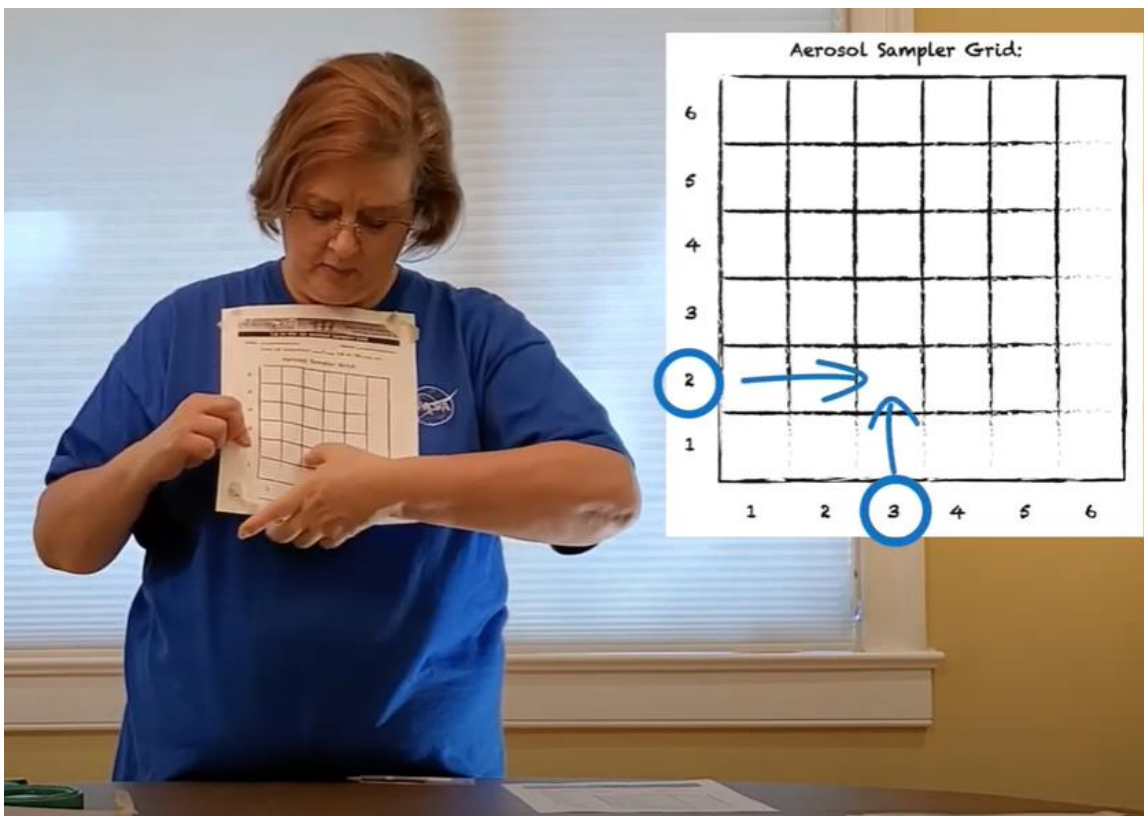




PART 3

TIP: Lay both handouts side by side.

1. After at least 2 hours, go back outside and collect the sampler. (If it has been longer than 2 hours, reevaluate the weather. Make note of any changes.) Place the sampler grid, grid side down, over the collecting surface, handout, *Aerosol Sampler Grid*, and prepare to analyze the data collected. [Review the video](#), minutes 10:15-11:20.
2. Using a dice or numbered cube, roll two times, recording both numbers. For example, if you roll a two the first time and a five the second time, then count the tiny particles or aerosols in the square in the second column, fifth row. Next, use a magnifying glass or hold the paper up to the light. Now count the number of aerosols in the square.

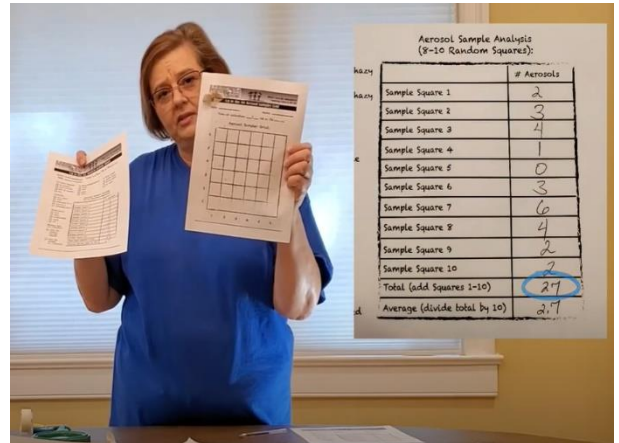




- Record the number of aerosols on the handout where you recorded weather observations, *Visualizing Air Pollution Data Collection Handout*, and make observations about what is seen in the square.

Question suggestions :

- Did the weather impact the results? *Share that conditions like wind, rain, snow, or extreme heat could cause a change in the results. These conditions affect the number of aerosols present in the air.*
- Do you think the time we left the sampler outside could change the results? *Discuss: Yes, less or more time could change the results.*
- Do you think you will find more aerosols where there are many people living or fewer people living? *Discuss: Cities, locations with large numbers of people have greater amounts of aerosols from modes of transportation like cars and buses, fireplaces, and factories. There are many sources of aerosols, including dust from meteorites and comets and smoke and ash from wildfires.*



- Repeat numbers 2 and 3 until you have counted aerosols for ten squares. Then complete the chart by adding up the totals for squares 1-5 and squares 6-10. Last, find the sum of the two calculations for the total number of aerosols for the ten randomly selected squares.

OPTIONAL

- Repeat the investigation using one of the following variables.
 - Change the length of time or number of days.
 - Create multiple samplers and place them in different locations, like in a tree versus on a window.
 - Explore if the height the sampler is anchored impacts the results.



Aerosol Sampler Grid

Date: _____ Time of collection: _____:_____ AM or PM (circle one)

1						
2						
3						
4						
5						
6						
	1	2	3	4	5	6



Visualizing Air Pollution Data Collection Handout

Date: _____ Time of collection: _____: _____ AM or PM (circle one)

Are there clouds?

- no clouds
- some clouds
- lots of clouds
- fog

Is there precipitation?

- none
- rain
- sleet
- snow

Is there wind?

- light wind
- strong wind
- no wind

Visibility

- clear
- hazy

Temperature

- cold
- chilly
- warm
- hot

Weather data was collected when the sampler was

- put outside
- collected

AEROSOL SAMPLE ANALYSIS 10 RANDOM SQUARES

	AEROSOLS #		AEROSOLS #
SQUARE 1		SQUARE 6	
SQUARE 2		SQUARE 7	
SQUARE 3		SQUARE 8	
SQUARE 4		SQUARE 9	
SQUARE 5		SQUARE 10	
TOTAL (add squares 1-5)		TOTAL (add squares 6-10)	
TOTAL (all squares)			