



# Invisible Pollutants



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*“In my lesson plan, efforts are made to create awareness about invisible pollutants and actions required towards minimizing impact. Concentration of contaminants in the environment generated by human influence has reached an alarming situation and is a big question mark on a sustainable future of our next generation. It is our last chance to impose measures to stop the release of invisible pollutants into the environment”.*

## Learning Objectives

- ✓ List visible and invisible pollutants.
- ✓ Identify the major types of invisible air pollutants.
- ✓ Describe how some invisible air pollutants affect our health.

Suitable for  
ages 6+



## Introduction

There are many different types of air pollutants, such as gases (*ammonia, carbon monoxide, sulphur dioxide, nitrous oxides, methane, and chlorofluorocarbons*), particulates (*both organic and inorganic*), and biological molecules.

Air pollution can cause diseases, allergies, and even death to humans; it can also cause harm to other living organisms such as animals and crops, and may damage the natural environment, for example: climate change, ozone depletion, acid rain habitat, and built environment degradation.

Air pollution can be caused by both human activities and natural phenomena such as volcanic activity.

## Teacher Preparation

Ensure that you have the correct amount of items for the number of your students:

### Air Pollution Catcher (Lesson 1)

- White paper plates, index cards, or card
- Scissors
- Petroleum jelly (e.g., Vaseline)
- String or yarn
- Hole puncher (optional)
- Magnifying glass or microscope
- Permanent black marker
- Disposable glove (optional)
- Ballpoint pen
- Journal or notebook

### Create acid rain in your kitchen (Lesson 2)

- Six short strips of masking tape (labels)
- Pen or permanent marker
- Three jars with lids
- Measuring cups
- A bottle of vinegar or lemon juice
- Tap water
- Three small potted plants



## Timings

Lesson 1 40-60 minutes

Lesson 2 40-60 minutes



*Time will also need to be set aside to go back a review the air pollution experiments*

## Lesson 1

### Introduction (5-10 minutes)

The teacher explains that the atmosphere is almost completely composed of invisible gaseous substances. Most major air pollutants are also invisible, meaning you cannot see or smell them. However, when large amounts of them are concentrated in areas such as cities, they can be seen as smog. Invisible air pollutants are among the most dangerous to our health.

### Air Pollution Catcher (40-50 minutes) and daily review time

An opportunity for students to take a closer look at what 'pollution' is floating around unseen in the air.

The teacher with the class decides on the areas where they would like to hang their air pollution catchers once they have been made. Students also decide on the time they will set to go back a review the results (suggested every 24hrs for one week)

Start with stringing up your catchers (paper plate/ white card) for hanging. Carefully poke (with a pen) or punch a hole in the catcher and pull the string through the hole. Make sure the string is long enough for where you plan to hang the catcher. Students are to write on each catcher the date and location where they will be hanging their catcher to help identify the location after taking the catcher down to study it.

Carefully apply a thin coat of petroleum jelly to one side of the catcher.

Hang the catchers in the locations picked by students. Record the date and areas where they have been hung in an observation journal. Make sure to inform others in the school what the catchers are for and ask them not to touch

**If placing your catchers outside of the school grounds, or near roads please remember to complete and adhere to all necessary safety precautions.**

## Lesson 2

### Introduction (5-10 minutes)

The teacher explains what acid rain is; how it is created and the impact it can have on the biotic and abiotic environment showing images

### Acid Rain Bean Plant (40-50 minutes) and weekly review time

The teacher divides the class into groups of three students. Each group is instructed to plant three bean plant seeds, each in a separate container that should be approximately the same size. Using masking tape, students are asked to label each of the plant containers: **Water only, vinegar only, vinegar-water solution.**

Samples of the three solutions: water only, vinegar only, vinegar-water mix (*1 cup vinegar to 3 cups water*), and pH test strips are given to the students. The teacher instructs the students to use the pH test strips to test the pH of the three solutions and record this result in their journals. Students are asked to predict how the plants will be affected by each solution and record their predictions in their journals. Remember to place the pots in a place where there is sunlight and temperature is not likely to fluctuate too much

Students are asked to water their seeds with 1/8 cup of the appropriate solution for each container: one plant with tap water, one with straight vinegar, and one with the vinegar-water mixture at set intervals over the course of several weeks. In their journals, students should monitor the growth of the seedling (taking cm measurements).

After 2-3 weeks: compare the plants and discuss observations. Students take into consideration the observations and results of all the groups and write in their journals a class conclusion for the experiment.

The teacher emphasizes that the invisible pollutant experiment is similar to how air pollutants contaminate the water supply resulting in acid rain, which is damaging to living plants and crops.

The teacher reminds students that they are breathing all the pollutants that the water absorbs when it becomes acid rain. How do they think their bodies react? Would any of the reactions be similar to the plants' reactions? Ask them to write their thoughts and responses in their journals.



## Extension Activities

### Air Pollution Catcher

Check students' comprehension by asking students the following questions:

- What are some common visible and invisible pollutants?
- What are the effects of particulate emissions that were found on the catcher, on human health?
- How do invisible (gaseous) pollutants affect the environment?

Students could also create posters to be placed on the school's outside walls (near the school carpark) explaining the effects of air pollution on their lives.



### Acid Rain Bean Plant

Test the reaction of different plant types. Are some plants more tolerant of the "polluted" water? Students make a bar graph showing the life span of the plants (vertical) vs. the pH of the solution (horizontal). What conclusions can you draw from the graph?

Off-gassing is the release of chemicals from non-metallic substances. Have students research to find out as many as possible ordinary everyday products and materials that are known to be off-gassing, and possibly contributing to poor air quality in homes and classrooms. For example, cabinets made from particle board or plywood, paints, plastics, and new carpets.