



Clean Air and Happy Brain

LESSON PLAN FOR SECONDARY SCHOOLS

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This lesson plan, created for secondary school students, consists of two one-hour lessons. They aim to introduce pupils to air pollution, its causes, and its effects on health, with a specific emphasis on brain health.

Each lesson includes five sections and lasts 1 hour. Activities are designed based on an ethnographic approach that encourages students to observe, talk with others, search, make comparisons, and consider their personal experiences.

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Lesson 1

Air pollution

Lesson objectives

- Students will learn what air pollution is and what sources make the air polluted.
- They will learn about air pollution in the UK.
- They will be encouraged to think about health impacts of air pollution.



1 Thinking (10 min)

Ask your students to think of the term **pollution** and all related concepts that it brings to their mind.

Write students' answers on the board. Complete the list with the following terms:

Water pollution, land pollution, air pollution, acid precipitation, acid rain, industrial air pollution, miasma, small-particle pollution, smog.

Then let students know that they will learn about air quality and its impacts on our health in this lesson.

2 Group activity: What is air pollution? (20 min)

Split students into pairs or small groups and ask them to discuss the following questions:

- What do you know about air pollution?
- What are the causes of air pollution?



Explain to students that air pollution is the contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere. Pollutants of major public health concern include particulate matter, carbon monoxide, ozone, nitrogen dioxide, and sulfur dioxide (*WHO website*).

Burning fossil fuels such as coal, oil, natural gas, petrol, or diesel is the main cause of air pollution. Motor vehicles, industrial facilities, and forest fires are common sources of air pollution (*WHO website*).¹

Indoor air pollutants can originate from both indoor and outdoor sources. Indoor sources of pollutants include combustion (heaters, wood burners, smoking, cooking), furniture and building materials, hobbies, and cleaning activities, as well as mold, bacteria, pets, and plants. Moreover, Infiltration of outdoor traffic pollution can be especially high in homes in cities and near busy roads. Factors such as building design and material and natural and mechanical ventilation will affect the level of indoor air pollutants from indoor and outdoor sources.

Therefore, condensed neighbourhoods, industrial areas, and heavy traffic routes are more polluted.

¹ <https://www.who.int/health-topics/air-pollution>

3 **Class discussion:** **Air pollution in the UK (20 min)**

Invite students to discuss the following questions with their partners:

- Do you think the UK has air pollution or not? Why?
- Which cities in the UK do you think are more polluted? Why?
- Which areas of your town do you think are more polluted? Why?

Explain to students that air pollution is the United Kingdom's biggest environmental health threat, with outdoor pollutants estimated to contribute towards 40,000 excess premature deaths per year, costing the UK economy upwards of £20 billion (US \$25 billion) annually (*IQAir*)

Background information for teachers:

"The main cause of United Kingdom air pollution is transport. Diesel and petrol vehicles both emit pollutants including nitrogen dioxide and particulate matter, while diesel

vehicles emit slightly more of both of these than petrol vehicles. The significant role of transport in raising higher levels of air pollution in the UK was reflected in how air quality was affected during covid-19 in 2020. During the early days of the country's 'lockdown', air pollution was found to decrease significantly compared to the previous year, coinciding with greatly decreased levels of road traffic, as reported in IQAir's Covid-19 Air Quality Report.

Aside from transport in towns and cities, other major sources of air pollution in the UK include Emissions from power generation, especially fossil fuels such as coal power stations; Industry' Farming.

Rural areas of the UK have their own more prominent sources of air pollution too, and agriculture is found to contribute 88% of the UK's ammonia emissions. Ammonia gas can "over-fertilise" natural environments with too much nitrogen, and also combines with other pollutants to produce particulate matter, harming human health. Burning fuels in homes for heating or energy, such as biomass or wood burners".²

² <https://www.iqair.com/uk>



4 **The final challenge:** **Awareness of air pollution effects (10 min)**

Ask pupils to discuss the following questions with their partners and write down their answers.

- Why should we learn about air pollution?
- How does air pollution affect us?

Briefly explain to learners that we need to pay attention to air pollution and learn about it because it impacts the environment as well as our health.

Let the pupils know that they will learn about these effects in the next session.

5 **Homework**

Ask students to do the following homework and provide a 2-page written piece for the next session.



Choose two cities/towns/villages where you have been so far. They can be in the UK or out of it anywhere in the world. One of them can be the area you live in. If you have not been to any other place, you can choose your hometown and any other cities/towns/villages you would like to travel to in future.

Think and write about your experience of being there. Then describe and compare two places in terms of their air pollution. Try to answer these questions in your writing:

- Where are the cities/towns/villages located?
- What sources of air pollution do you think are available in them?
- Do you think those two places were more or less polluted in the past?

You should primarily reflect on your own experiences and understandings, although you can use online resources to boost your writing.

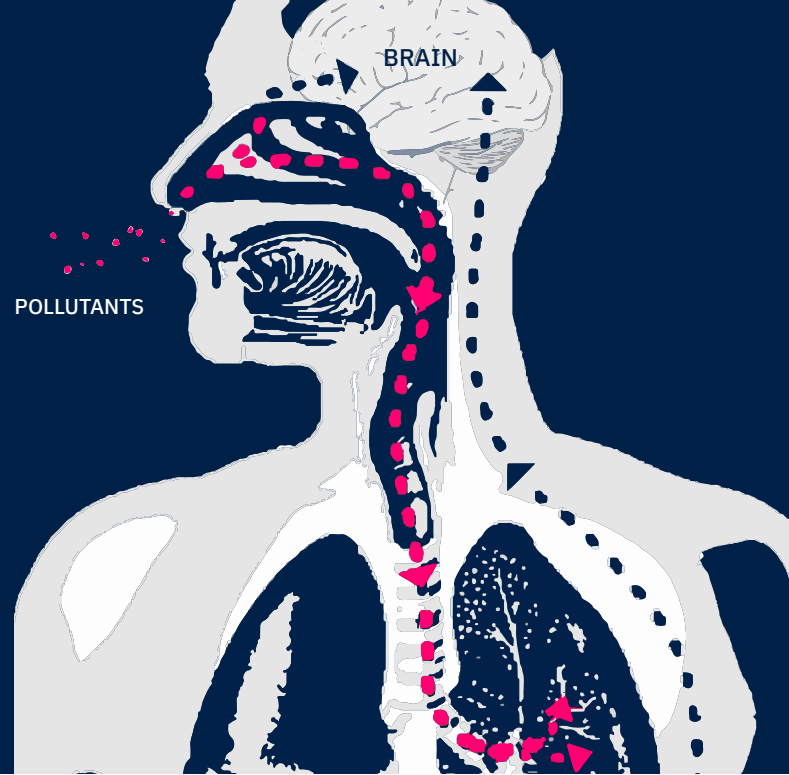
You can include pictures of those two cities/towns/villages (taken by you or downloaded from Internet).

Lesson 2

Air quality and brain health

Lesson objectives

- Pupils will learn that the quality of air is important as it affects our health.
- They will learn that air pollution impacts our brain health.



1 Thinking (10 min)

Remind the class of the last session's essential points, including air pollution, its causes, and its impacts.

Gather students' homework. Ask a few students to explain about their written pieces.

2 Class discussion: Health effects of air pollution (20 min)

Ask students the following question:

- How does air pollution impact us?

Write students' answers on the board.

Explain to students that air pollution impacts the environment and human health. People experience a wide range of health effects from being exposed to air pollution. Effects can be broken down into short-term effects and long-term effects. Short-term effects, which are temporary, include illnesses such as pneumonia or bronchitis. They also include discomforts such as irritation to the nose, throat, eyes, or skin. Air pollution can also cause headaches, dizziness, and nausea. Bad smells made by factories, garbage, or sewer systems are considered air pollution, too. These odours are less serious but still unpleasant.

2

Long-term effects of air pollution can last for years or for an entire lifetime. They can even lead to a person's death. Long-term health effects from air pollution include heart disease, lung cancer, and respiratory diseases such as emphysema. Air pollution can also cause long-term damage to people's nerves, brain, kidneys, liver, and other organs. Some scientists suspect air pollutants cause birth defects. Nearly 2.5 million people die worldwide each year from the effects of outdoor or indoor air pollution.

People react differently to different types of air pollution. Young children and older adults, whose immune systems tend to be weaker, are often more sensitive to pollution. Conditions such as asthma, heart disease, and lung disease can be made worse by exposure to air pollution. The length of exposure and amount and type of pollutants are also factors (*National Geographic*).³

Emphasise that exposure to high levels of air pollutants at critical points in our lives, particularly in early life, is detrimental to brain health across the life course and increases the risk of brain disorders.

³ <https://education.nationalgeographic.org/resource/air-pollution/>



3 Main activity: Brain functions (20 min)

Ask students to discuss the following questions with their partners.

- Do you know of any brain disorders?
- How do brain illnesses affect the body and everyday life?

Write down students' answers on the board. Then ask the class what they know about *dementia* and its common symptoms.

Explain to the learners that people living with dementia may experience memory loss, difficulty concentrating, finding it hard to carry out familiar daily tasks, such as getting confused over the correct change when shopping, struggling to follow a conversation or find the right word, being confused about time and place, mood changes and so on (NHS).⁴

⁴ <https://www.nhs.uk/conditions/dementia/symptoms/>

4 The final challenge

Remind the class that air pollution is a significant cause of dementia and that we can prevent dementia by reducing air pollution.

Then invite students to discuss the following questions with a partner:

- How do you travel to school every day?
- How long are you on the way?
- How many times a week do you get a car/ bus/ train?
- How could you contribute to reducing air pollution?

5 Homework

Ask students to do the following homework: Refer to the following websites and get familiar with their content.

- <https://www.iqair.com/>
- <https://visualisation.polimapper.co.uk/?dataSetKey=aruk-dementia-prevalence&client=alzheimersresearch>

Then answer the following questions with the help of the data available on the two websites.

- What are the most and least polluted areas in the UK?
- What are the areas with the most and least numbers of people living with dementia?
- Choose two areas and compare their air pollution status within three days as well as the dementia statistic of them



InSPIRE is a UK policy and research consortium devoted to mitigating the impact that air pollution and the exposome have on brain health (including cognitive function, mental health and dementia).

Find us online: www.inspireairbrain.org

