actions to breathe cleaner study. Citizen Science Teacher Guide.

Thank you for helping us to spread these important messages about air quality and inspiring your pupils to make healthy choices by limiting their exposure to air pollution* and reducing the impact on their health. Many people don't realise that practically every country in the world is affected by air pollution and that over 80% of people live in areas where air quality is below guidelines set by the World Health Organisation (WHO).[1] Perhaps even more shocking is that air pollution is the biggest environmental risk to health – being responsible for about one in every five deaths worldwide.[2]

Since children are one of the key vulnerable populations for air pollution identified by the WHO,[3] it is essential that we empower them to identify ways they can limit their exposure from a young age. We also hope that by teaching them about air pollution, we will help them to consider health options for themselves and others, now and as they grow.

Introduction

This lesson is designed to help you teach **pupils aged 8 to 11** years all about air quality and pollution and how to limit the health impact on them.

The lesson is **approximately 55 minutes** long; however, you can find extension ideas at the end to further engage your pupils. There is also a short homework for pupils to complete to reinforce their learning and share their small changes with their families, such as walking more or avoiding routes with more traffic.

Learning Objective: to know about the effects of air pollution and how to limit the impact on health.

Success Criteria:

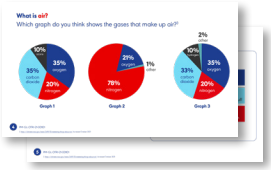
- To know what air pollution is.
- To know some of the impacts air pollution can have on health.
- To identify steps you can take to reduce your exposure to air pollution.

Lesson

Starter – 10 minutes

Slide 2: Prior to sharing the learning objective and success criteria, pose the question to your pupils - What do all mammals need to survive? This helps to start the discussion around the need for air. Reinforce that the 4 basics needs of mammals are air, food, water and shelter for protection.[4] Share that despite humans breathing about 20 breaths every minute,[5] air quality is something that is not considered enough by most.

Slide 3: Share the L.O and success criteria. Clarify any words such as pollution or exposure that pupils are unsure about.



Slide 4 and 5: Elicit from your pupils – What is air and what do we need from it? Use the graphs on slide 4 to aid the discussion. Use slide 5 to share that air is a mixture of gases – 78% nitrogen, 21% Oxygen and then 1% is other, including argon and carbon dioxide. Some of this 1% is pollution, even though it is a very small part it can still cause health and environmental problems.[6]

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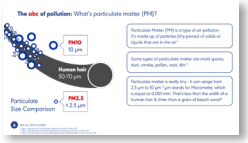
* Air pollution refers to particulate matter, which is a type of air pollution made up of tiny particles of solids and liquids that are in the air.

1. www.thecleanbreathinginstitute.com/content/dam/cf-consumer-healthcare/tcbi/master/ResourcesLP/PDFs/A5-Leaflet-Consumers-D2.pdf Accessed October 2021
2. https://www.ucl.ac.uk/news/2021/feb/fossil-fuel-air-pollution-responsible-1-5-deaths-worldwide Accessed October 2021
3. https://www.who.int/news/item/29-10-2018-more-than-90-of-the-worlds-children-breathe-toxic-air-every-day Accessed October 2021
4. https://www.bbc.co.uk/bitesize/topics/z6882hv/articles/zx38wmn Accessed October 2021
5. https://www.medicalnewstoday.com/articles/324409 Accessed October 2021
6. https://climate.nasa.gov/news/2491/10-interesting-things-about-air/ Accessed October 2021



Slide 6: Introduce pupils to the idea of particle pollution or particulate matter. This will give them an understanding of common air pollutants and its relative size.

Slide 7: Share with pupils that almost all countries in the world are affected by particulate air pollution but there are large differences in the levels of particulate pollution across the world.[1] The quality of the air we breathe depends on a fine balance between how much particulate pollution gets in the air and how fast it is cleared out.[6] Ask the pupils: What can cause particulate air pollution? You could draw a mind map as a class or use Post it notes to gather ideas.

Main task

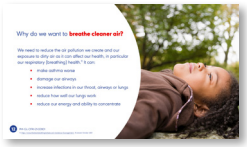
30 minutes

Slide 8: Present slide 8 and see if pupils guessed all the places particulate matter comes from.

Slide 9: Help your pupils to understand how our noses and particularly the hairs within them work to filter the air we breathe.

Slide 10 and 11: Show pupils James, Sara and Santosh's statements to stimulate conversation about which method of transport will help you to breathe the cleanest air.

According to an experiment in Sheffield traveling by car means you are exposed to the most air pollution.[7] Using slide 11, show the 2 minute long BBC video (www.bbc.co.uk/news/av/science-environment-49976247) about families from Sheffield who undertook a test to see whether kids who walk, bike or go by car breathe the most pollution on a school run. Please watch prior to showing your class and decide if it's appropriate for your pupils.



Slide 12: Ask your pupils why do we want to breathe cleaner air? Share the health risks with them.

Slide 13 and 14: It's time to turn your pupils into detectives to help 'Logan' to figure out how he can improve the quality of the air he is breathing. Use slide 13 to introduce their task. They will need a **Detective Worksheet** and to use the information on Slide 14 or you can provide them with copies of the **Detective Notes** handout. Give pupils roughly 15 minutes to find the ways Logan can improve his air quality and to write up the advice.

Slide 15: Detective debrief - bring your class back together and share their ideas. The following are the key areas of advice that should have been highlighted:

- Logan should walk / cycle or scoot to school, if he needs to go in the car then he should keep the windows up and set the air to circulate internally.[7]
- When he walks to the shop with his aunt, he should go the slightly longer way through the park.[8]
- He should meet his friends further from the factory to play.[8]
- Logan should clean his nose before he goes out to make sure it can be the best natural filter it can be.[9]

1. www.thecleanbreathinginstitute.com/content/dam/cf-consumer-healthcare/tcbi/master/ResourcesLP/PDFs/A5-Leaflet-Consumers-D2.pdf Accessed October 2021
6. https://climate.nasa.gov/news/2491/10-interesting-things-about-air/ Accessed October 2021
7. https://www.bbc.co.uk/news/av/science-environment-49976247 Accessed October 2021
8. https://www.thecleanbreathinginstitute.com/evidence/management/ Accessed October 2021
9. https://www.rhinologyonline.org/Rhinology_online_issues/manuscript_102.pdf Accessed October 20211

In his house:

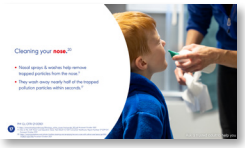
- He should make sure the extraction fan is on when cooking.[10]
- They shouldn't burn candles, particularly scented candles.[10]
- They should try not to heat the house with an open fire if possible as the smoke is a pollutant.[8]
- They should store paint and cleaning products out of the way and think about ventilation when using them.[10]
- He should make sure he cleans his nose regularly so it can work at its best filtering out any pollutants.[9]

Plenary

15 minutes

Slide 16: Challenge the pupils to decide if the three statements are true or false.

1. We can always see air pollution.[11] - False
2. Pollution has a greater effect on children.[12] - True
3. Air pollution always smells bad.[13] - False
4. The nose can trap some pollution to stop it entering the body.[14] - True
5. I don't need to clean my nose when I get home - only my hands. - False. We need to clean our noses regularly to help them do their best work.[14]



Slide 17: Share with your pupils their options for cleaning their noses and the benefits.

Slide 18: Revisit James, Sara and Santosh's statements and elicit their learning and how their thoughts have changed. Santosh is completely correct and ensure they pick up on the candles comment made by Sara.

Slide 19: Discuss that we now know how active transport (walking, cycling and scooting) helps us to breathe cleaner air, however there are other benefits. Ask the children – what are some of them?

Reinforce the two top tips as these are simple actions that all pupils can do:

1) Clean your noses regularly so that your noses can be as efficient as possible when filtering the air.[15]
2) Walk on the inside of the pavement and away from the kerb to help you to breathe cleaner air![16]

Slide 20: Encourage your pupils to take action. Ask them to pick at least one person at home that they are going to share some of these facts with. Then ask some of the children to share the changes they are going to make.

Slide 21: Use this slide to discuss the homework.

8. https://www.thecleanbreathinginstitute.com/evidence/management/ Accessed October 2021
9. https://www.rhinologyonline.org/Rhinology_online_issues/manuscript_102.pdf Accessed October 20211
10. https://www.bbc.com/future/article/20200909-why-indoor-air-pollution-is-an-overlooked-problem Accessed October 202
11. https://www.teachengineering.org/lessons/view/cub_air_lesson02 Accessed October 2021
12. https://www.who.int/news/item/29-10-2018-more-than-90-of-the-worlds-children-breathe-toxic-air-every-day Accessed October 2021
13. https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution Accessed October 2021
14. https://allergyasthmanetwork.org/news/your-nose-the-ultimate-air-cleaner/ Accessed October 2021
15. https://www.rhinologyonline.org/Rhinology_online_issues/manuscript_102.pdf Accessed October 2021
16. https://www.newscientist.com/article/2104655-top-tips-to-avoid-getting-metal-pollution-in-your-brain/ Accessed October 2021

Homework

After the lesson, use the homework to task children to think about a journey they regularly travel. They will work through and think about a route that they travel regularly, such as their route to and from school each day or to a club they attend. They will consider:

- How they travel? Bike, walking, car, scooting, etc
- How busy is the route?

They will then use their learning from the lesson to identify the positive aspects with regards to the air quality on their walk and to suggest ways they can alter their route to improve the air quality along the way. They are encouraged to discuss suggestions with an adult and explain to them the reasons for their suggestions.

There is also a chart on page 2 that they can complete to help them log their changes to discover the best one.

Extension Activities for your pupils

1. Download the free **Plume Labs Air Quality app** to get live data on the air quality where you are.
2. Spread the word – how about doing an assembly to parents and the other year groups to share your tips on reducing exposure to air pollution when travelling. They could also include other ideas for parents such as switching to renewable energy suppliers.
3. Ask pupils to create messaging for the newsletter or posters to encourage parents to walk to school when possible or if not possible to turn off their engines and not idle while waiting.
4. Encourage your class to write letters to their local MP asking them to commit to reducing toxic air in the UK to the legal levels recommended by WHO (World Health Organisation.)
5. As a class you could look at the graphs created by Defra on air quality. Challenge the pupils to spot the patterns and to explain why they think that pattern occurs. This is a good activity to highlight the effects of transport and how the pollutants build up throughout the day due to human activity such as vehicle emission. https://uk-air.defra.gov.uk/latest/period_plots?POL=NO2&days=7 - Graph of hourly measurements - Defra, UK

If you want more information for your pupils or parents on cycling or scooting, why not check out the Bikeability website? You could also look to arrange a free course for your pupils in school:

https://bikeability.org.uk - Bikeability | Cycle training for everyone, delivering better, safer cycling

Curriculum Links

England

Geography

They should develop their use of geographical knowledge, understanding and skills to enhance their locational and place knowledge.

Place knowledge: understand geographical similarities and differences through the study of human and physical geography of a region of the United Kingdom.

Geographical skills and fieldwork: use fieldwork to observe, measure, record and present the human and physical features in the local area using a range of methods, including sketch maps, plans and graphs, and digital technologies.

Science

Living things and their habitats

Pupils should be taught to: recognise that environments can change and that this can sometimes pose dangers to living things

Working scientifically

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking relevant questions and using different types of scientific enquiries to answer them
- setting up simple practical enquiries, comparative and fair tests
- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
- recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- identifying differences, similarities or changes related to simple scientific ideas and processes
- using straightforward scientific evidence to answer questions or to support their findings.

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments

Animals including humans

Pupils should be taught to: recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function

PSHE

Physical health and mental wellbeing: The aim of teaching pupils about physical health and mental wellbeing is to give them the information that they need to make good decisions about their own health and wellbeing. It should enable them to recognise what is normal and what is an issue in themselves and others and, when issues arise, know how to seek support as early as possible from appropriate sources.

Teachers should go on to talk about the steps pupils can take to protect and support their own and others' health and wellbeing, including simple self-care techniques, personal hygiene, prevention of health and wellbeing problems and basic first aid.

Scotland

Sciences

Planet Earth

They should develop their use of geographical I can analyse how lifestyles can impact on the environment and Earth's resources and can make suggestions about how to live in a more sustainable way.

Body systems and cells

I can analyse how lifestyles can impact on the environment and Earth's resources and can make suggestions about how to live in a more

Social Sciences

People, place and environment

I can discuss the environmental impact of human activity and suggest ways in which we can live in a more environmentallyresponsible way.

Having explored the ways journeys can be made, I can consider the advantages and disadvantages of different forms of transport, discussing their impact on the environment.

Technologies

Digital Literacy

I can extend and enhance my knowledge of digital technologies to collect, analyse ideas, relevant information and organise these in an appropriate way.

I can use digital technologies to search, access and retrieve information and am aware that not all of this information will be credible.

I can analyse how lifestyles can impact on the environment and Earth's resources and can make suggestions about how to live in a more sustainable way.

I can make suggestions as to how individuals and organisations may use technologies to support sustainability and reduce the impact on our environment.

Health and wellbeing across learning

Physical wellbeing

I am developing my understanding of the human body and can use this knowledge to maintain and improve my wellbeing and health.

I am learning to assess and manage risk, to protect myself and others, and to reduce the potential for harm when possible.

I know and can demonstrate how to travel safely

Wales

Geography

Locating places, environments and patterns

Use maps, imagery and ICT to find and present locational information

Understanding places, environments and processes

Identify similarities and differences to describe, compare and contrast places and environments

Describe the causes and consequences of how places and environments change

Range

Pupils develop their geographical skills, knowledge and understanding through learning about places, environments and issues. Pupils should be given opportunities:

- to study living in my world: caring for places and environments and the importance of being a global citizen.
- carry out fieldwork to observe and investigate real places and processes.
- measure, collect and record data through carrying out practical investigations and fieldwork, and using secondary sources.

Sustainable Development and Global Citizenship - Health

Learners should be given opportunities to:

- care for their own health and the health of others
- recognise their responsibilities to keep themselves and others safe
- appreciate the importance of family and community when making health choices and to understand:
- the basic ingredients of a healthy lifestyle
- the impacts of environment on health and wellbeing

Science - Developing

Pupils follow the planned approach/method, revise it where necessary, and where appropriate:

1. use apparatus and equipment correctly and safely
2. make careful observations and accurate measurements, using digital and ICT equipment at times
3. check observations and measurements by repeating them in order to collect reliable data
4. make comparisons and identify and describe trends or patterns in data and information

PSE

Health and emotional well-being

Learners should be given opportunities to:

- take increasing responsibility for keeping the mind and body safe and healthy

PSE Sustainable development and global citizenship

Learners should be given opportunities to understand:

- how the environment can be affected by the decisions we make individually and collectively
- that local actions have global effects because of connections between places and people

N. Ireland

The World Around Us - Interdependence

Pupils should be enabled to explore:

- how they and others interact in the world;
- interdependence of people and the environment and how this has been accelerated over time by advances in transport and communications;
- the effect of people on the natural and built environment over time.

The World Around Us - Place

Positive and negative effects of natural and human events upon a place over time.

PDMU - Personal Understanding And Health

Pupils should be enabled to explore how to sustain their health, growth and well-being and coping safely and efficiently with their environment.

PDMU - Mutual Understanding In The Local And Wider Community

Pupils should be enabled to explore playing an active and meaningful part in the life of the community and being concerned about the wider environment.