



„Impact of air pollution on human health” - lesson plan

Duration	1 hour
Age	15-19
Type of classes	Didactic and educational activities
Goals	<ul style="list-style-type: none"> • Students have knowledge on the impact of air pollution on human health • Students acquire data through senses • Students communicate data and information in appropriate form To acquaint children with the general subjects related to air - the phenomenon of spreading, the phenomenon of breathing and the importance of these phenomena for a human being, • To present methods of proper behaviour during days with high concentrations of pollutants in the air and an attempt to consolidate the desired habits.
Methods	Show, talk, film screening, brainstorming,
Forms of work	Individual, Group
Needed material	<ul style="list-style-type: none"> • Printed cards with lungs • A picture of tennis court • A picture of the particulates size (comparing with a hair) • A picture of the blood vessels and heart • Human body mannequin (optional) • Video device and internet connection • Dust proof masks
Evaluation methods	<ul style="list-style-type: none"> • Survey

Attention: During the lesson, it is worth using the dedicated presentation available to download from the "Clean Air" website.

The presentation consists of slides related to topics discussed during the lesson. The teacher after completing each exercise can use a slide (or slides) summarizing the given issue, to remind the most important information and to systematize the knowledge of students. The presentation also includes slides with exercises and the answers to them.

1. Respiratory system



The teacher asks the students- What's something that you do all day, every day, every minute no matter where you are? - and after a few minutes the teacher gives the students three options.

- a. Think
- b. Blink
- c. Breath (slide 2)

Most of them will answer correctly and will choose c option after that the teacher will explain that we need breathing air to be alive. The air contains oxygen, and this is essential for our organism the way that the oxygen is introduced in the organism is through the lungs, through the respiratory system. We breathe nearly 25,000 times per day, taking in nearly 10,000 liters of air

It is easy to feel your lungs just put your hand on your chest and breathe deeply you will feel your chest getting bigger.

The teacher explains how the air ends in our body -The air travels from the mouth to the lungs first through the trachea, then it is divided into two forming the bronchus, which in turn are divided into thousands, forming the bronchioles and at the end of them are the alveoli - the teacher will explain that we have about 30 000 bronchioles in each lung and it is about the same thickness as a hair.

The teacher will show a tennis court and will explain that we have about 600 million alveoli and we can cover a tennis court if we could extend all our alveoli. (slide 3)

Finally, the alveoli allow oxygen from the air to pass into our blood through ultra-narrow pipes, called capillaries, and the heart sends oxygen to the cells in our body. These capillaries are so tiny that the cells in your blood need get in single file to pass through them.

The teacher explains to students that when we are breathing we are introducing all the things that the air contains, and when we are in a polluted area the air can contain small particles such as less than 10 micrometres or even less than 2.5 micrometres (PM10 and PM 2.5) and the problem is that this particulates are so small than they can pass through the capillaries and get into your blood causing serious health problems.

Then, the teacher shows slide 4 and 5 from the presentation - for summarizing the knowledge they have gained.

2. Cardiovascular system



The teacher asks the students – Apart from breathing, what's something that you do all day, every day, every minute no matter where you are?

Yes, it is pump blood all over your body thanks to a muscle which is called heart (slide 6).

The teacher explains to the student:

The heart is responsible for pumping blood to the cells carrying oxygen and collecting waste through the arteries and veins.

The heart is a muscle located a little to the left of the middle of your chest, and it's about the size of your fist.

Your heart is like a pump or rather two pumps in one. The right side of your heart receives blood from the body and pumps it to the lungs. The left side of the heart does the exact opposite: It receives blood from the lungs and pumps it out to the body.

The movement of the blood through the heart and around the body is called circulation, the heart takes less than 60 seconds to pump blood to every cell in your body.

The heart beats about 3 billion times during an average lifetime.

If you were to lay out all of the arteries, capillaries and veins in one adult, end-to-end, they would stretch about 100,000 kilometres (slide 7).

Then, the teacher shows slide 8 from the presentation - for summarizing the knowledge they have gained.

3. Effects of air pollution on children's health and development

The teacher plays a short video (1:18 min) from World Health Organisation "Breathe Life - How air pollution impacts your body" (slide 9) after that he establishes a conversation with the students to ask them about the effects of the particles one of the main pollutant on the body.

English version (English subtitles)

<https://www.youtube.com/watch?v=GVBey1jSG9Y&feature=youtu.be>),

The teacher explains that the pollution can cause cardiovascular effects, including heart attacks, heart failure, and strokes, which results in hospital admissions, and, in some cases, premature death. Exposure to fine particles is also likely to cause respiratory effects, including asthma attacks, reduced lung development in children, and increased respiratory symptoms such as coughing, wheezing, and shortness of breath. (EPA, Particle Pollution and Your Patients' Health) (<https://www.epa.gov/pmcourse/particle-pollution-exposure>)

Summarizing, the main consequences of air pollution for human life are:

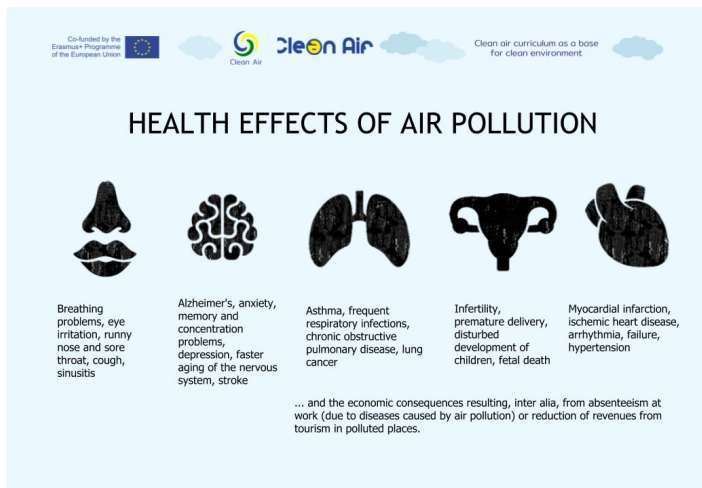
- Respiratory diseases
- Cardiovascular damage
- Fatigue, headaches and anxiety



- Irritation of eyes, nose and throat
- Damage the reproductive organs
- Harm to liver, spleen and blood
- Nervous system damage

The teacher explains that the pollutant not only causes problems on physical health but also air pollution can cause a “huge” reduction in intelligence according to the latest findings.

Teachers shows slide 10, as a summary.



The teacher explains that not all the people are affected in the same way or by the same pollutants; there are people who are more prone (slide 11), for example:

- People with asthma
- People with lung disease
- People with cardiovascular (heart) disease:
- Unborn babies (pregnant women)
- Children
- Older adults

4. AQI

You probably check the weather forecast every day. After all, it's a useful tool that helps you plan what to wear and lets you know if you need to carry an umbrella. But there's another forecast you



should be checking, too -- the AQI (Air Quality Index). It can help you plan activities that protect your health (slide 12 and 13).

Meteorologists in state and local air quality agencies develop AQI forecasts using actual air quality data, along with weather forecast information. These forecasts are then translated into a simple color-coded key that tells you how healthy or unhealthy the air is. Everyone may begin to experience health effects on a red air quality day.

You're exposed to pollution any time you breathe polluted air. But when you exercise, do hard work or other strenuous activities that increase your breathing rate, you take more pollution into your lungs.

The teacher asks the students How to know if the pollution is affecting you?

The teacher explains that there are several indicators to know the air quality and show the students how they can find the pollution forecast in the national weather agency or in the city panels (bus screen, etc., depend of the city) and which are the main indicators.

The teacher explains that another way to protect you is try to avoid polluted areas reducing the exposure.

The teacher asks How can avoid polluted areas?

Wait for a few minutes and after that the teacher explains that the first thing that we have to know are the pollution levels

The teacher again asks Where do you can be informed of pollutions levels?

After the question encourage the students to check the webpage <http://airindex.eea.europa.eu/> and search for their city.

Then the teacher explain to the students the AQI (Air Quality Index) (slide 12 and 13)

Pollutant	Index level (based on pollutant concentrations in µg/m3)				
	Good	Fair	Moderate	Poor	Very poor
Particles less than 2.5 µm (PM _{2.5})	0-10	10-20	20-25	25-50	50-800
Particles less than 10 µm (PM ₁₀)	0-20	20-35	35-50	50-100	100-1200
Nitrogen dioxide (NO ₂)	0-40	40-100	100-200	200-400	400-1000
Ozone (O ₃)	0-80	80-120	120-180	180-240	240-600
Sulphur dioxide (SO ₂)	0-100	100-200	200-350	350-500	500-1250



And if we want to know the Global ambient air pollution we can check
<http://maps.who.int/airpollution/>

5. Protect yourself from unhealthy air

The teacher asks the students how they can protect from air pollution. After a few minutes listening answers the teacher gives them some tips (slide 14)

8 Tips to Protect Yourself from Unhealthy Air

1. Limit the exposure to smog trying to avoid the most air polluted areas
2. Make an effort to stay indoors if your research shows that air pollution is high in your area
3. Do not ventilate your house when air is heavily polluted
4. Consider buying an air cleaner
5. Have a supply of professional dust proof masks on hand
6. Drivers can reduce exposure to particle pollution by keeping the vehicle ventilation setting on "recirculate" when driving on busy roads
7. Avoid smoking or going places where people are smoking or having campfires
8. Don't burn wood or trash. Burning firewood and trash are among the major sources of particle pollution in many parts of the countries

The teacher completes the lesson by showing slide 15.

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