



„What pollutes the air” - lesson plan

Duration	1 hour
Age	10 - 14
Type of classes	Didactic and educational activities
Goal	<ul style="list-style-type: none"> ● 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 familiarize children with the basics of the problem of air pollution and the prevalence of its occurrence, also in rural areas, ● To acquaint children with the causes of poor air quality and the harmfulness of burning coal and wood,
Methods	Show, talk, film screening, brainstorming, didactic games
Forms of work	Individual, collective
Needed materials	<ul style="list-style-type: none"> ● 8 balloons, on each of them one of the letters: S, M, O, K, E, F, O, G, written with an indelible plastic pen, ● a large glass bowl with a flat bottom and a glass lid, ● a car, a house with a chimney and a man figurines, ● spiral for mosquitoes / incense, ● printed cards with the puzzle, ● printed cards with a table of permissible levels and a calendar of measurements, ● a large card with a table of acceptable levels to be hung on the board.

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. What is smog? - air pollution in rural areas



- a) The teacher does not present the subject of the lesson immediately, but asks the students to guess it.
- b) The teacher chooses 8 volunteers who s/he handles balloons to. On each of them one letter is written: S, M, O, K, E, F, O, G.
- c) Students have to arrange two words using balloons, setting themselves in the right order in front of the class (harder version) or the teacher immediately puts them in the right order (easier version) and asks them to translate the words.
- d) The students explain that the words are SMOKE and FOG. If necessary, the teacher helps in translating.
- e) The teacher asks what these two words are associated with, then pierces the four middle balloons, and the rest form the inscription SMOG.
- f) The teacher explains that SMOG will be the subject of today's lesson, and it was made of these two words, because smog is a combination of significant air pollution and adverse weather conditions.

The teacher shows slide 2 and 3 as a summary.

2. How does the smog occur? - air pollution in rural areas

- a) The teacher shows the students a bowl prepared earlier, in which there are figurines of a house with a chimney, a car and a man. He asks students to imagine that the interior of the bowl is their place.
- b) The teacher puts a spiral against mosquitoes or another smoking object in the bowl and announces to the children that they will soon learn how the area can change when all the chimneys start smoking, and cars start polluting.

ATTENTION: Before choosing a smoking item (eg a mosquito spiral), make sure that its ingredients are not toxic.

- c) Then the teacher kindles a spiral (a flame will appear, which should be extinguished - only smoke will remain) and covers the bowl.

ATTENTION: Be very careful and safe - do not leave matches / lighters within reach of children and limit their direct access to the smoke bowl.

- d) The teacher asks the children to look at the bowl and ask questions:
 - What's in the bowl now, in our village? (Air pollution, smog, smoke, dust)
 - How has our town changed because of what happened? (It is smoky, everything is worse visible)
 - Why did this happen? (Chimneys of houses and cars started to smoke, which caused strong air pollution)



- When the chimneys most often smoke - what time of the year, when is the biggest air pollution and why? (In winter, because people use boilers because they are cold)
 - How does the man who is in the bowl feel? (Very bad, it's hard for him to breathe, he inhales harmful substances)
 - What are the biggest problems in our village: cars, factories or chimneys of houses? (In the rural area, the main problem is low emissions, or fumes from domestic chimneys).
- e) The teacher picks up the cover for a very short while and asks the children if they smell something. Again, s/he emphasizes that in addition to the unpleasant smell, in the polluted air there is also a lot of compounds harmful to human health, which we inhale with the air.

Then, The teacher shows slide 4 and 5 as a summary.

3. Film screening

- a) The teacher announces to the children that they will watch the video from which they will learn more about air pollution. S/he encourages children to listen carefully because after the film they will have to decipher the puzzle prepared on its basis.
- b) The teacher displays a short, five-minute film (slide 6).

4. What pollutes the air? - puzzle

- a) The teacher gives the students cards with a puzzle, asking them to individually complete the text with words from the frame (puzzle are also on slides 7-13).
- b) Then the students exchange cards and check each other answers.
- c) After checking the text, the teacher (or selected students) read it and the students say the words they wrote. They make corrections in case of mistakes.

After this exercise, the teacher shows slides 14-17 explaining to children the main causes of air pollution. The teacher emphasizes that in rural areas it is mainly low stack emissions from household stoves, boilers and fireplaces.

5. What are the shares of sources in the emission of pollutants?

The teacher distributes printed sheets to the students, on which there is a percentage division of particulate matter emissions, benzo (a) pyrene and nitrogen oxides in Europe from various

sources.

Students' task is to match individual emission sources to appropriate percentages.

The teacher checks the students' answers (showing slide 18-19) and sums up the exercise, stressing that in the case of particulate matter and benzo(a)pyrene, the main source is emission from domestic chimneys (so-called low stack emission), while less industry and transport. In the case of nitrogen oxides, the main emitter is transport.

6. How much pollution can be in the air?

- The teacher explains that there are certain thresholds acceptable for substances in the air (permissible concentrations of pollutants in the air). They shouldn't be exceeded!
- The teacher distributes the tables and calendar of air quality measurements printed on the pages.
- Next, the teacher shows on presentation (slide 20) the levels acceptable for individual compounds and asks students to complete the missing data on their pages.

Table for the teacher:

Substance	Averaging period	Permissible / target level
PM10	24 hours	50 $\mu\text{g}/\text{m}^3$
	A year	40 $\mu\text{g}/\text{m}^3$
PM2.5	A year	25 $\mu\text{g}/\text{m}^3$
Benzo(a)pyrene	A year	1 ng/m^3
NO ₂	1 hour	200 $\mu\text{g}/\text{m}^3$
	A year	40 $\mu\text{g}/\text{m}^3$
SO ₂	1 hour	350 $\mu\text{g}/\text{m}^3$
	24 hours	125 $\mu\text{g}/\text{m}^3$

Table for students:

Substance	Averaging period	Permissible / target level
PM10	24 hours	
	A year	



PM2.5	A year	
Benzo(a)pyrene	A year	
NO ₂	1 hour	
	A year	
SO ₂	1 hour	
	24 hours	

- d) After completing the table with the admissible levels, the teacher students the students where exactly they can check the air quality and instructs them to record the daily concentrations of PM10 at the nearest station over the next week.
- e) During the next lesson, students analyze the results, calculate the percentage of the norm and check if the admissible levels have been exceeded. Together with the teacher, they draw conclusions about air quality in their area.

Date	PM10 mean daily concentration	Percent of the norm

The teacher completes the lesson by showing slide 21.

The European Commission’s support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein