SUSTAIN

Sustain/Biodiversity Education for Sustainable Development

AIR POLLUTION

LESSON PLAN

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This Lesson Plan is part of the project ***Sustain: Biodiversity Education for Sustainable Development***. This project is financed by the European Union, under the Erasmus+ program. The project aims to promote education on biodiversity loss and to analyze the relation between air pollution and biodiversity loss.

This Lesson Plan is created to teach the topic of ***Air Pollution***, along with two more, *The effect of air pollution to plants and the role of technology* and *The Effect of Pollution on Animals and Ecosystems.* These Lesson Plans will contribute to the overall mission of assisting students in realizing the enormous impact of air pollution in their lives and initiate actions for changing this situation and protecting Earth's ecosystems.

This document serves as a valuable resource for teachers, offering a range of **extracurricular activities** to be taught in a **flexible style**. Within these pages, you will find a variety of engaging exercises. Some are structured as standalone lessons, while others are intended to supplement and enhance the teacher's instructional approach, allowing for **adaptability and freedom of choice**.

This serves as a **foundation that can be customized** by the teacher to suit their teaching hours and the specific age of their class. While the primary focus of this project is school students between 9 and 12 years old, the teacher has the flexibility to tailor certain activities to cater to the **precise requirements of their students' age group**.

Apart from these Lesson Plans, the teacher will also receive the ***Sustain Teacher's Manual***, which introduces the topic of biodiversity loss and its connection to air pollution causes to them so they can transmit this knowledge to their students more effectively.

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LEARNING GOALS AND OBJECTIVES

This section collects the learning goals and objectives of the proposed sessions as a whole. This also includes the materials that will be needed for all the activities and the assessment methods that the teacher will use.

LEARNING GOALS

- Gain an understanding of what air pollution is, its sources, and its impact on human health and the environment.
- Identify the major causes of air pollution and understand how they contribute to poor air quality. They should also be able to explain the effects of air pollution on human health and the environment.
- Recognize and differentiate between different types of air pollutants, such as particulate matter, ozone, and carbon monoxide.
- Analyze data related to air quality, including data from air quality monitoring stations and pollutant emission inventories.
- Propose and evaluate different solutions for reducing air pollution, such as promoting clean energy sources, reducing vehicle emissions, and planting more trees.
- Raise awareness of the personal actions they can take to reduce air pollution, such as reducing energy consumption, using public transportation, and supporting policies that reduce emissions.
- Understand the 6 Rs of sustainability (Rethink, Refuse, Reduce, Re-use, Repair, Recycle) and its importance to fight against air pollution, contribute to preserve our biodiversity and to combat environmental challenges to make a positive impact.

LEARNING OBJECTIVES

- Students will be able to define air pollution and its causes
- Students will understand the effects of air pollution on human health and the environment
- Students will learn about ways to reduce air pollution and promote clean air

MATERIALS

- Whiteboard or chart paper
- Markers
- Handouts on air pollution and its effects
- Access to internet and video resources on air pollution
- Minecraft worlds and activities

ASSESSMENT

- Give a short quiz to assess students' understanding of air pollution and its effects.
- Have students write a reflection on what they can do to reduce air pollution in their own lives and communities taking in account the 6Rs of sustainability.

LESSON PROCEDURES

In this section a formal structure for full lessons can be found. These can be taught consecutively or in the order that the teacher deems appropriate. Some aspects of these sessions can be adapted depending on the teaching style or exact age group of the class.

ACTIVITY 1
AIR POLLUTION

INTRODUCTION (10 MINUTES)

- Start by asking students if they know what air pollution is. Write their responses on the board.
- Define air pollution as the presence of harmful substances in the air that we breathe.
- Explain that air pollution can come from natural sources like dust storms and wildfires, but it is mostly caused by human activities such as transportation, industry, and energy production.
- Explain the concept of the 6Rs of sustainability

ACTIVITY (30 MINUTES)

- Use a combination of videos, images, and handouts to explain the different types of air pollution and their effects on human health and the environment.
- Discuss how air pollution can cause respiratory problems, heart disease, and other health issues. Also, explain how it can damage crops, forests, and bodies of water.
- Brainstorm on ways to reduce air pollution and promote clean air. Encourage them to think about changes they can make in their own lives, as well as larger policy changes that can be made at the community or government level. Give examples related with the 6Rs of sustainability.

CONCLUSION (10 MINUTES)

- Summarize the key points of the lesson and ask students to share one thing they learned about air pollution.
- Encourage students to take action to reduce air pollution in their own lives and communities.

MINECRAFT ACTIVITIES

In this section a formal structure for full lessons can be found. This particular scenario, *The Polluted City*, has 6 challenges. Each challenge is designed to take up a whole session, so, including the introduction and the conclusion, 6 lessons will be employed to play this scenario. *Polluted City (1)* describes the first three challenges, while *Polluted City (2)* describes the last three. Some aspects of these sessions can be adapted depending on the teaching style or exact age group of the class.

MINECRAFT 1: THE POLLUTED CITY (1)

INTRODUCTION (10 MINUTES)

- Students turn on their computers and access to a polluted city
- Explain to students that in this Minecraft Education activity, they will embark on an adventure to learn about different ways of fighting against air pollution
- Introduce students to the concept of Recycle, Reuse and Repair

ACTIVITY (30 MINUTES)

The player finds themselves in a recycling center located in the polluted city. The pollution is caused by the citizens' actions. The player's task is to help the citizens make recycling and reducing pollution in the city. As they complete each challenge, the sky will get clearer, symbolizing the reduction of pollution.

In this scenario the player has to

- find items such as wooden planks, wool, and glass, and use them to create new items such as furniture, decorations, or buildings.
- build a repair workshop to promote repair and reduce pollution in the virtual world. The repair workshop can be built using materials such as stone bricks, iron bars, and crafting tables, and can include various repair stations for different types of items.

CONCLUSION (10 MINUTES)

- Summarize the main points of the challenge
- Ask students to reflect on what they learned and how they can apply this knowledge in their daily lives
- Encourage students to take action and enquire about how to reduce pollution

MINECRAFT 2- THE POLLUTED CITY (2)

INTRODUCTION (10 MINUTES)

- Explain to students that in this Minecraft Education activity, they will embark on an adventure to learn about finding creative ways to rethink our actions and consumption habits making conscious decisions that benefit both us and the environment and refuse unnecessary items as a powerful way to reduce waste.
- Introduce students to the concept of Rethink, Refuse and Reduce.

ACTIVITY (30 MINUTES)

The player finds themselves in a city filled with smog, and their vision is not clear. The pollution is caused by the citizens' actions. The player's task is to help the citizens make climate-wise and sustainable decisions. As they complete each challenge, the sky will get clearer, symbolizing the reduction of pollution.

The player encounters various situations where he/she must:

- choose the most climate-friendly option when purchasing something. Factors like CO2 travel footprint and the potential for reuse or repurposing are taken into consideration.
- reduce pollution by making sustainable transportation choices. He/she encounters situations where he/she must choose between a ride by car/taxi and the bike, considering factors like emissions, energy efficiency, and the potential for shared transportation.

CONCLUSION (10 MINUTES)

- Summarize the main points of the challenge
- Ask students to reflect on what they learned and how they can apply this knowledge in their daily lives
- Encourage students to take action and fight against air pollution and contribute to preserve our biodiversity asking themselves: Do I really need this? Is there a more eco-friendly alternative?

WORKSHEETS

These worksheets are additional materials for the teacher. They can be used at the end of a session or as support for a different activity related with biodiversity. The teacher has full flexibility to use these resources.

WORKSHEET 1
A CROSSWORD PUZZLE ON AIR POLLUTION

INSTRUCTIONS:

READ THE FOLLOWING AND SOLVE THE CROSSPUZZLE

Across:
2. A gas that is released by burning fossil fuels
4. The smallest type of particulate matter
5. A device that measures air pollution
6. The process by which plants use sunlight to convert carbon dioxide into oxygen.
7. A type of air pollution that forms when sunlight reacts with other pollutants.

Down:
1. The main component of smog
2. The most common air pollutant in the United States
3. A type of air pollution that comes from burning wood, leaves, and other plant materials.
4. A type of air pollution that is caused by emissions from cars and trucks.
5. A device that removes pollutants from the air

Answers:
Across: 2. Carbon monoxide, 4. PM2.5, 6. Air quality monitor, 8. Photosynthesis, 10. Ozone
Down: 1. Nitrogen dioxide, 3. Particulate matter, 5. Wood smoke, 7. Nitrogen oxides, 9. Air purifier

WORKSHEET 2
EFFECTS OF POLLUTION ON HEALTH

INSTRUCTIONS:
READ THE FOLLOWING STATEMENTS AND DECIDE IF THEY ARE TRUE OR FALSE

1. Air pollution can cause respiratory problems such as asthma and bronchitis.

2. Carbon dioxide (CO2) is a pollutant gas that contributes to global warming.

3. Fine particles in polluted air can penetrate the lungs and affect cardiovascular health.

4. Ozone in the atmosphere is beneficial and helps protect us from ultraviolet rays from the sun.

5. The burning of fossil fuels like coal and oil is a significant source of air pollution.

6. Air pollution only affects people living in urban areas and not those in rural areas.

Answers:
1. True
2. True
3. True
4. False
5. True
6. False

QUIZ

This quiz is an additional resource for the teacher. It can be used at the end of a session or as support for a different activity related with biodiversity. The teacher has full flexibility to use this exercise how and when they consider.

A QUIZZ ON AIR POLLUTION AND 6RS

INSTRUCTIONS:
READ THE FOLLOWING QUESTIONS AND SELECT THE BEST ANSWER

1. What is air pollution?
a. The presence of harmful substances in the air we breathe.
b. The presence of harmless substances in the air we breathe.
c. The absence of any substances in the air we breathe.

2. What are some sources of air pollution?
a. Cars and trucks
b. Power plants and factories
c. Agricultural activities
d. All of the above

3. What are some health effects of air pollution?
a. Respiratory problems
b. Heart disease.
c. Cancer
d. All of the above

4. What is particulate matter?
a. Tiny particles of dust, dirt, smoke, and soot that can cause respiratory problems and other health issues.
b. A gas that forms in the atmosphere when sunlight reacts with other pollutants.
c. A gas that is produced by incomplete combustion of fuels.

5. What are some ways to reduce air pollution?
a. Use public transportation, walk, or bike whenever possible.
b. Turn off lights and electronics when you're not using them.
c. Choose renewable energy sources like solar and wind power
d. All of the above

6. Which of the following is an example of practicing the "Re-use" R?
a. Throwing away a broken toy
b. Recycling a plastic bottle
c. Donating old clothes
d. Using single-use plastic utensils

7. Which R focuses on finding ways to fix broken items instead of throwing them away?
a. Reduce
b. Re-use
c. Repair
d. Rethink

8. What is the purpose of the "Rethink" R in the 6 Rs of sustainability?
a. To encourage recycling habits
b. To discourage using single-use plastics
c. To reduce energy consumption
d. To promote conscious decision-making

Answers:
1. a
2. d
3. d
4. a
5. d
6. c
7. c
8. d

ACTIVITIES ON AIR POLLUTION

These activities are additional resources for the teacher. They can be used at the end of a session or as support for a different activity related with biodiversity. The teacher has full flexibility to carry out these exercises how and when they consider.

ACTIVITY 1

Pollution Hunt
Take your students on a walk around the school grounds or a local park. Give them a list of different pollutants to look out for, such as cigarette smoke, car exhaust, and factory emissions. Have them mark off each item on their list as they find it and discuss the different sources and effects of each pollutant.

ACTIVITY 2

Make a Pollution Catcher
Have students create their own pollution catchers by cutting out a piece of paper in the shape of a house and attaching it to a paper towel roll. Then, have them place the catcher outside near a busy road or other area with high pollution levels. After a few days, students can examine the catcher to see what types of pollutants it has trapped.

ACTIVITY 3

Debate on Air Pollution Solutions
Divide your students into groups and have them research different solutions to air pollution, such as electric cars, wind power, or stricter emissions regulations. Then, have each group present their solution and argue why it would be the most effective way to reduce air pollution. Encourage respectful debate and discussion amongst the the groups.

ACTIVITY 4

Clean Air Pledge
Have students create a pledge to take actions that will reduce air pollution, such as walking or biking to school, using reusable bags, or turning off electronics when not in use. Have them sign the pledge and display it in the classroom or around the school to remind themselves and others of their commitment to clean air.

ACTIVITY 5

Pollution Mapping
Have students use maps to identify areas in their city or town with high levels of air pollution. Then, have them research the different sources of pollution in those areas and create a plan to reduce emissions and improve air quality in those locations.

OTHER ACTIVITIES

- Have students research a specific type of air pollution and create a presentation on its causes, effects, and solutions
- Encourage students to look up figures and statistics on the impact of pollution on different diseases

VIDEO RESOURCES

These videos provide a good overview of air pollution, its causes and effects, and the 6Rs concepts.

Air Pollution | What Causes Air Pollution?
https://www.youtube.com/watch?v=fephtrPt6wk

Air Pollution 101 | National Geographic
https://www.youtube.com/watch?v=e6rglsLy1Ys

Causes and Effects of Air Pollution
https://www.youtube.com/watch?v=Yjtgu2CxtEk

The 6 Rs of Sustainability - Easy Steps for a Sustainable Lifestyle
https://www.youtube.com/watch?v=5sqdPiTGq8Q