



*Sustain/Biodiversity Education
for Sustainable Development*

THE EFFECT OF AIR POLLUTION TO PLANTS AND
THE ROLE OF TECHNOLOGY

LESSON PLAN

Authored by: Mundus

Project Number: 2021-05-KA220-SCH-372B9E69



Co-funded by
the European Union

Project number: 2021-1-ES01-KA220-SCH-000027705



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 ***The effect of air pollution to plants and the role of technology***, along with two more, *Air Pollution* 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.



Co-funded by the
Erasmus+ Programme
of the European Union

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

- Understanding the different types of pollution: Students should be able to identify different types of pollution such as air, water, and soil pollution and understand how they affect plants
- Knowledge of the effects of pollution on plants: Students should be able to understand the effects of pollution on plants, such as reduced growth, changes in plant structure, and decreased photosynthesis
- Understanding the impact of human activities on the environment: Students should be able to understand how human activities, such as industrialization, urbanization, and deforestation, have led to pollution and how it has affected the plant's ability to survive and grow
- Identifying ways to use technology to preserve the environment: Students should be able to identify ways use technology to reduce pollution, protect the environment and look after plants
- Developing critical thinking skills: Students should be able to analyze data and make informed decisions about how to reduce pollution and protect plants and their habitats

LEARNING OBJECTIVES

- Students will understand the effects of pollution on plant growth and development.
- Students will learn how pollution can be harmful to plants and how it can affect the overall ecosystem.
- Students will brainstorm ways to use technology to reduce pollution to protect plants and the environment.

MATERIALS

- Pencils and paper
- Plant seeds (bean or pea seeds work well)
- Soil
- Plastic cups or small pots
- Access to polluted and non-polluted environments (can be simulated in the classroom)
- Access to resources on pollution and its effects on the environment
- Minecraft worlds and activities

ASSESSMENT

- Students will be assessed based on their participation in the activities and class discussions
- Students will be evaluated on their ability to record observations and draw conclusions about the effects of pollution on plant growth and development
- Students will be evaluated on their ability to brainstorm solutions for reducing pollution and protecting plants and the environment

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

POLLUTION AND PLANT GROWTH

INTRODUCTION (10 MINUTES)

- Begin the lesson by asking students what they know about pollution and its effects on the environment
- Engage students in a discussion about plants and their importance in our ecosystem
- Explain to students that they will be learning about the effects of pollution on plants and how they can help protect them using technology

ACTIVITY (30 MINUTES)

- Divide the class into small groups and give each group a set of plant seeds, soil, and plastic cups or small pots
- Instruct students to plant the seeds in the soil and place them in a non-polluted environment, such as near a window with access to sunlight
- Have students label the cups or pots with the date and the name of the seed
- Instruct students to water the plants regularly and observe their growth over the course of several weeks
- Ask students to record their observations and draw conclusions about the effects of a non-polluted environment on plant growth

CONCLUSION (10 MINUTES)

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

ACTIVITY 2

POLLUTION AND PLANT DEVELOPMENT

INTRODUCTION (10 MINUTES)

- Begin the lesson by asking students what they know about pollution and its effects on the environment
- Engage students in a discussion about plants and their importance in our ecosystem
- Explain to students that they will be learning about the effects of pollution on plants and how they can help protect them using technology

ACTIVITY (30 MINUTES)

- Divide the class into small groups and give each group a set of plant seeds, soil, and plastic cups or small pots
- Instruct students to plant the seeds in the soil and place them in a polluted environment, such as near a source of pollution, or simulate pollution with a small amount of pollutants in the soil
- Have students label the cups or pots with the date and the name of the seed
- Instruct students to water the plants regularly and observe their growth over the course of several weeks
- Ask students to record their observations and draw conclusions about the effects of a polluted environment on plant growth and development

CONCLUSION (10 MINUTES)

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

ACTIVITY 3

BRAINSTORMING SOLUTIONS

INTRODUCTION (10 MINUTES)

- Begin the lesson by asking students what they know about pollution and its effects on the environment
- Engage students in a discussion about plants and their importance in our ecosystem
- Explain to students that they will be learning about the effects of pollution on plants and how they can help protect them using technology

ACTIVITY (30 MINUTES)

- Lead a class discussion on ways to reduce pollution in the environment to protect plants and the ecosystem
- Instruct students to work in small groups and brainstorm ideas for reducing pollution in their own communities
- Instruct students to include technology in their solutions
- Have each group present their ideas to the class
- Engage students in a discussion about how they can take action to reduce pollution and protect plants and the environment using technology

CONCLUSION (10 MINUTES)

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

MINECRAFT ACTIVITY

In this section a formal structure for full lessons can be found. This particular scenario, *Remote Flora Control Centre*, has 4 challenges. Each challenge is designed to take up a whole session, so, including the introduction and the conclusion, 4 lessons will be employed to play this scenario. Some aspects of these sessions can be adapted depending on the teaching style or exact age group of the class.

REMOTE FLORA CONTROL CENTRE WORLD

INTRODUCTION (10 MINUTES)

- Students turn on their computers and access the Remote Flora Control Centre (RFCC) world
- Explain to students that in this Minecraft Education activity, they will embark on an adventure to learn about the use of drones and observation satellites to monitor crops from a control room
- Introduce students to the concept of humanity hypothetically relocating to Mars for environmental reasons

ACTIVITY (30 MINUTES)

In this challenge you play as a scientist who specializes in growing and protecting plants and their produces. The setting is a base that has a greenhouse, a lab and a control room. The backstory is that the scientist grows plants all year long in remote locations and then moves some of the crops into the greenhouse when the season changes. This allows him to store and protect plants and their produces whatever the season. He uses drones to water, monitor and even harvest his crops and with the use of satellite maps he can see at which point he will cultivate. The scientist's goal is to gather as many plants and crops as possible for a mission to relocate humanity to Mars.

In this scenario the player has to use the control room to find a suitable location for his next crops through the use of satellite maps. Then he has to use his drone to fly to this area to plant seeds and water them as well as some plants that he has planted in the past. He then has to harvest his crops and bring them back to the greenhouse, from there he has to store his ripe products in special temperature-controlled boxes.

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 and protect plants and the environment using technology

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

AIR POLLUTION AND PLANT HEALTH

INSTRUCTIONS:
READ THE FOLLOWING QUESTIONS AND SELECT THE BEST ANSWER

1. What is the main cause of air pollution?

- a. Cars and trucks
- b. Factories and power plants
- c. Forest fires and volcanic eruptions

2. How does air pollution affect plants?

- a. It makes them grow faster and stronger
- b. It causes them to produce more oxygen
- c. It damages their leaves and reduces their ability to photosynthesize

3. Which of the following is a sign of air pollution damage in plants?

- a. Dark green leaves
- b. Increased flowering
- c. Yellow or brown spots on leaves

4. What can individuals do to help reduce air pollution and protect plants?

- a. Drive less and use public transportation
- b. Support renewable energy sources like solar and wind power
- c. All of the above

Answers:

- 1.b
- 2.d
- 3.a
- 4.c

WORKSHEET 2

WATER POLLUTION AND PLANTS

INSTRUCTIONS:
READ THE FOLLOWING STATEMENTS AND MATCH THEM TO THE CORRECT EFFECT OF POLLUTION ON PLANTS

1. Water pollution can be caused by both natural and human activities

2. Plants can help to absorb and filter pollutants from water

3. Excess nutrients in water, such as from fertilizers, can cause harmful algae blooms that can kill aquatic plants

4. Plants that are tolerant to pollution are often used in phytoremediation projects to help clean up contaminated sites

Answers:

All of the statements are true

WORKSHEET 3

EFFECTS OF POLLUTION ON PLANTS

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

1. Increases in temperature

2. Acid rain

3. Ozone depletion

4. Heavy metal contamination

- a. Stunned growth
- b. Damage to leaves and stems
- c. Increase susceptibility to pests and diseases
- d. Reduced photosynthesis

Answers:

1-a

2-d

3-c

4-b

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 QUIZ ON PLANTS AND POLLUTION

INSTRUCTIONS:

READ THE FOLLOWING QUESTIONS AND SELECT THE BEST ANSWER

1. What is phytoremediation?

- a) A process by which plants absorb pollutants from the air
- b) A process by which plants remove pollutants from soil or water
- c) A process by which plants are affected by pollution

2. What are the effects of air pollution on plant growth?

- a) Decreased photosynthesis and stunted growth
- b) Increased photosynthesis and healthy growth
- c) No effect on plant growth

3. How does water pollution affect plant life?

- a) Increased growth and improved plant health
- b) Decreased growth and plant death
- c) No effect on plant growth

4. What are some common air pollutants that can affect plant health?

- a) Carbon dioxide and oxygen
- b) Nitrogen and phosphorus
- c) Ozone and sulfur dioxide

5. How can pollution affect the biodiversity of plant life?

- a) Increased plant diversity and growth
- b) Decreased plant diversity and loss of species
- c) No effect on plant diversity

Answers:

- 1. b)
- 2. a)
- 3. b)
- 4. c)
- 5. b)

ACTIVITIES ON POLLUTION AND PLANTS

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

Plant observation activity:

Take students on a walk outside and have them observe the plants in the area. Ask them to describe the size, color, and health of the plants. Then, have students research the common pollutants in the area and how they can affect plant growth. Have students compare the health of the plants they observed to the expected effects of the pollutants

ACTIVITY 2

Plant phytoremediation activity:

Have students research the process of phytoremediation and how it can be used to clean up contaminated sites. Then, have them design and conduct an experiment to test the effectiveness of different plants in removing pollutants from water or soil

ACTIVITY 3

Plant and pollution art project:

Have students create an art project that depicts the effects of pollution on plants. They can use different materials to represent pollution and different plants to represent the variety of ways that plants can be affected. This activity can help students to better understand the impacts of pollution on the natural world and to develop their creativity

ACTIVITY 4

Air pollution and plant health experiment:

This experiment will help students understand the effects of air pollution on plants. Collect two identical plants of the same species. Place one of the plants in a clean container and the other plant in a container with cigarette smoke for a few hours each day. Over a period of days, observe the plants for changes in color and appearance

ACTIVITY 5

Research project on pollution, plants and technology:

Have students research a specific type of technology (GPS, satellite maps, drones, etc.) and its uses on plants preservation. They can use their findings to create a report or presentation that includes data, graphs, and images. Encourage students to share their findings with their classmates to promote

OTHER ACTIVITIES

- Have students research a specific type of air pollution and create a presentation on its causes, effects, and solutions
- Organize a field trip to a local park or natural area to discuss the importance of clean air and the role of plants in reducing air pollution

VIDEO RESOURCES

These videos provide a good overview of air pollution, its causes and effects, and possible solutions. You can select one or more of these videos to supplement your lesson and help students gain a better understanding of the topic

Power Plants and Pollution (2 minutes)

<https://www.youtube.com/watch?v=6ph2JzM0dsU>

Impact of air pollution on plants and wildlife (3 minutes)

<https://www.youtube.com/watch?v=YR0gwWU3yQ4&t=102s>

Tree-planting drones (2 minutes)

<https://www.youtube.com/watch?v=YR0gwWU3yQ4&t=102s>