Technology - LESSON PLAN

Grade:	5th -8th, age 9-14
Subject:	United in Biodiversity - **Climate Changes**
Lesson n°:	4
Topic:	Guardians of the Atmosphere: Exploring Air Quality, Climate Change, and Biodiversity Loss.
Lessons focus and goals:	**Focus:** The main focus of this activity is to involve pupils/students in an immersive examination of the correlation between air quality, climate change, and biodiversity loss. By utilizing air sensors, students will explore how alterations in air composition contribute to climate change and, consequently, affect biodiversity. With the help of air sensors, teachers can initiate an environmental monitoring project across different classes, analyzing data gathered from their own sensor as well as those from other schools and even other countries. They can observe long-term changes in the environment and consider how this data may influence climate change and the equilibrium of ecosystems. **Goals:** In this activity, the primary goal is to empower pupils/students with a holistic understanding of the intricate connections between air quality, climate change, and biodiversity loss. The goals encompass a multifaceted approach, guiding students through the exploration of key concepts and hands-on experiences with air sensors, emphasizing the importance of integrating technology in environmental studies. The role of citizen science is at the center of the scene, highlighting how pupils/ students can actively contribute to the monitoring of air quality and supporting environmental management through the use of cutting-edge technologies such as air sensors. Communication and critical thinking skills are fostered through peer brainstorming and the creation of educational multimedia. Students will engage in reasoning and discussions to explore potential solutions for biodiversity loss resulting from climate change, especially those related to air quality. The activity ends with a reflective session. The use of digital tools facilitates a deeper understanding of environmental complexities, inspiring students to create action plans for promoting awareness and

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	positive change within their communities. This integration of technology not only enhances the learning experience but also equips students with practical skills relevant to the increasingly technology-driven landscape of environmental science and advocacy. Overall, these goals are designed to provide pupils/students with a profound understanding of the complex relationships between air quality, climate change, and biodiversity loss, while emphasizing the pivotal role of technology in driving informed environmental stewardship and positive community action.
Learning objectives:	- Develop a holistic comprehension of the intricate connections between air quality, climate change, and biodiversity loss from scientific, technological, and societal perspectives. - Gain practical experience with air sensors, fostering a tactile understanding of technology's role in environmental monitoring and data collection. Recognize and appreciate the importance of integrating technology, particularly air sensors, in environmental studies, emphasizing their role in enhancing scientific understanding and awareness. - Acquire digital literacy skills by using digital tools for data analysis and presentation, preparing students for the technology-driven landscape of environmental science and advocacy. - Understand the central role of citizen science in environmental monitoring, actively participating in monitoring air quality and advocating for environmental stewardship using cutting-edge technologies. - Encourage creative and innovative approaches inspiring students to create action plans for promoting awareness and positive change within their communities, translating knowledge into practical initiatives. Instill a sense of environmental stewardship by emphasizing the role of technology in informed decision-making and positive community action, encouraging responsible environmental behavior**.**

Materials	- Presentation materials, low cost Air Sensors (such as German sensor for PM10 and PM2.5 Luftdaten; Italian NO_2 sensor Radiello) - Assembling materials for hands-on activities (online instructions Luftdaten, Radiello) - Teachers and students' references What is Climate Change? Explore the Causes of Climate Change

	Air Pollution 101 | National Geographic Particulate matter air pollution Little Things Matter: The Deadly Impact of Airborne Particles Exploring and analysing Luftdaten/Sensor.community PM measurements Nitrogen Dioxide | All About Air Pollution Nitrogen Pollution | Julian Tabunets | TEDxYouth@YCYWShanghai Radiello instructions [ENG] - Brainstorming apps, Word cloud app (Mentimeter, La Digital, etc.) - Podcast making app / Presentations app
Structure and activities	**Introduction and Background Information** (30 minutes): - Begin with a thought-provoking question or image related to air quality, climate change, or biodiversity loss to capture students' interest; - Clearly state the lesson's goals and what students are expected to learn. - Provide foundational information on air quality, climate change, and biodiversity loss (use videos chosen from materials). Encourage pupils/students participation by asking questions, facilitating discussions, and connecting concepts (using web tools such as Mentimeter, La Digitale, etc.). **Introduction to Air Sensors** (15 -30 minutes): - For younger pupils: Show air sensors already assembled and explain their importance in monitoring air quality. - For older pupils/students: Engage students in a hands-on activity where they assemble or interact with a simple air sensor to measure basic air quality parameters. **Biodiversity Overview** (30 minutes): - Provide an overview of biodiversity, emphasizing its importance in maintaining ecological balance. Climate change: what will happen if we do nothing? What is biodiversity? | Natural History Museum - Share case studies illustrating instances where changes in air quality and climate have led to biodiversity loss, for instance the climate and habitat changes caused by humans make amphibians prisoners of the climate, unable to move far enough to escape the increasing frequency and intensity of extreme heat, fires, droughts, and hurricanes induced by climate change; Amphibians are threatened due to climate change, habitat loss | WION Climate Tracker the Rising Temperatures influence Coral reefs, crucial for marine biodiversity, experience stress and degradation, leading to the loss of diverse marine species that depend on the reef ecosystem (etc.) What Would Happen If All The Coral Reefs Died Off? Why are coral reefs so important? | Problem Solved

	- Innovation and technology can help: 3D printed “tiles” help revive coral around the world **Citizen Science and Environmental Stewardship** (15 minutes): Because using air quality sensors also represents an important Citizen Science activity, introduce the concept of Citizen Science and its role in monitoring environmental changes. What is Citizen Science? Citizen Science at the heart for research and innovation EU-Citizen.Science Platform promotional teaser **Data Collection and Analysis** (30 minutes): Guide students in analyzing air quality data using map sensor Luftdaten. Many European Countries are already using this sensor and pupils/students can compare the situation of different countries and cities during different periods of the year. (If there is more time available, older students can use Google Sheets or other web tools, to correlate data from various environmental parameters under the guidance of their teacher). **Communication and Advocacy** (1 hour): Students are divided into small groups (maximum 3-4 students). Using web tools such as Virtual Whiteboard (for example DIGIPAD - La Digitale), students can discuss effective communication strategies in defense of climate change and biodiversity loss, emphasizing how technology aids in data collection, analysis, and dissemination. At the end of the discussion they will have to create short podcasts or other multimedia materials in defense of biodiversity using ICT, thus sharing action plans to promote positive changes in their communities. **Conclusion** (5-10 minutes per group): Each group presents their own work to the rest of the classmates.

Inclusion	- The aim of the lesson and its structure are explained to the students at the beginning of the activity; - Instructions are kept simple and repeated where necessary; - Students are put into mixed ability groups; - Equitable participation is encouraged: ● Ensure that all students have an opportunity to participate actively in the lesson; ● Monitor participation and intervene if certain students are being marginalized or excluded.

Assessments:

#1 - Understanding the intricate connections between air quality, climate change, and biodiversity loss

	Initiating	Developing	Excelling
Description of performance	Pupils/students identify a basic connection between air quality and climate change. Show initial awareness of air quality issues but needs further understanding of their consequences.	Pupils/students explain how air quality can influence climate change but lack depth in connecting it to biodiversity loss. Propose a scenario for improving air quality and its potential impact on a local ecosystem but lacks specificity. Applies knowledge to a practical scenario but needs more precision in proposing effective solutions.	Pupils/students analyze the consequences of a specific human activity on air quality, climate, and biodiversity with depth and sophistication. Show critical thinking skills by providing nuanced insights into the complexities of interconnected environmental issues.
Sample student response	“Air quality is like the pollution in the air, and climate change is when the weather gets warmer. Biodiversity loss is when some animals and plants go away. They are connected because bad air and climate change can make the animals and plants go away”	“When the air quality gets worse, it can contribute to climate change by releasing more pollutants. This can affect the temperature and weather patterns. The impact on biodiversity is that some species may struggle to survive due to changes in their habitats and food sources”	"The intricate connections between air quality, climate change, and biodiversity loss form a complex web of environmental interdependencies. Poor air quality, characterized by high concentrations of pollutants like CO_2, NO_2, PM_{10}, $PM_{2.5}$, etc. contributes to climate change through the greenhouse effect by altering temperature and precipitation and causing disease to living species. Climate change, in turn, affects biodiversity by causing changes in ecosystems, disrupting food chains

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			and impacting species' habitats. The loss of biodiversity further aggravates climate problems, as different ecosystems play a crucial role in regulating the Earth's climate. This intricate dance of cause and effect emphasizes the urgency of addressing these interconnected challenges to the health of our planet."

#2 - The importance of working with reliable scientific data and reliable sources of information

	Initiating	Developing	Excelling
Description of performance	Pupils recognise the need for reliable data without providing a detailed explanation of why it is essential. They require a greater awareness in understanding the meaning of reliability of scientific data.	Pupils understand the importance of reliable scientific data to support valid conclusions, but specific examples are missing. They show a developing understanding.	Pupils provide a comprehensive and detailed explanation of why working with reliable scientific data is crucial. They show a mastery of the concept, integrating the understanding and practical implications of relying on reliable scientific information.
Sample student response	"It's important to have good data so we can trust the information. Reliable data helps us make good decisions."	"Reliable data is needed in science to make sure our results are accurate. If the data isn't good, our conclusions might be wrong. So, using good data is important for getting trustworthy	"In scientific studies, the importance of relying on reliable data cannot be overstated. Reliable data forms the bedrock of trustworthy conclusions and accurate results.

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		results in our experiments."	Working with reliable data not only upholds the integrity of our experiments but also contributes to the credibility of scientific research as a whole. It is crucial for making informed decisions, drawing valid conclusions, and advancing our understanding of the natural world."

Quantitative Assessment Rubric:

Criteria	Initiating	Developing	Excelling
Description of Performance			
Understanding the intricate connections between air quality, climate change, and biodiversity loss			
	1-3 points	4-6 points	7-10 points
	1-3 points	4-6 points	7-10 points
	1-3 points	4-6 points	7-10 points
The importance of working with reliable scientific data and reliable sources of information			
	1-3 points	4-6 points	7-10 points
	1-3 points	4-6 points	7-10 points
	1-3 points	4-6 points	7-10 points

Total Points Calculation:

- Total points for each criterion can be calculated by summing up the points awarded in each category.

Assessment Table: Inclusion and Diversity - Climate Change

Criteria	Check
Information offered in multiple formats	
- Variety of learning materials provided	
- Text, visual, auditory resources	
Inclusive methodologies like peer-to-peer learning	
- Opportunities for collaborative activities	

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- Group discussions, peer teaching	
Use of ICT tools	
- Integration of technology in learning activities	
- Use of online platforms, interactive tools	
Overall Inclusion and Diversity	
- Integration of diverse perspectives	
- Opportunities for student engagement	
- Promotion of equitable participation	

Explanation of Criteria:

- **Information offered in multiple formats:**
  - Assess whether the lesson plan provides learning materials in various formats such as text, visuals, and auditory resources to cater to diverse learning styles.

- **Inclusive methodologies like peer-to-peer learning:**
  - Evaluate if the lesson plan incorporates inclusive methodologies like peer-to-peer learning, group discussions, and collaborative activities to encourage interaction and engagement among students.

- **Use of ICT tools:**
  - Determine if the lesson plan utilizes ICT tools such as online platforms and interactive resources to enhance learning experiences and accessibility.

- **Overall Inclusion and Diversity:**
  - Summarize the overall assessment of inclusion and diversity in the lesson plan, considering the integration of diverse perspectives, opportunities for student engagement, and promotion of equitable participation.