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Teachers' Guide to Climate Education

80 lesson plans and 20 methods to support climate education

English edition



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Teachers' Guide to Climate Education

*a toolkit of 80 free teachers lesson plans and tests for each of 10 different school subjects in 6 languages
(EN, GR, IT, LV, PL, TR)*

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Cover image: oil on canvas by Elina Formica (1971-2023)

This volume has not been printed on paper in order to limit its production and contribute to the fight against climate change.

We thank anyone who reports any errors or inaccuracies. This volume was produced as part of the "Green Works!"

Project code: 2021-1-IT02-KA220-SCH-000023630

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.



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Foreword

This work has been written within the Erasmus+ project KA220-SCH – GREEN WORKS! Cooperation partnerships in school education 2021 Round 1 started on 01/11/2121 and ended in March 2024. The following schools participated:

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http://mebk12.meb.gov.tr/meb_iys_dosyalar/34/05

We would like to thank the following for their contribution and collaboration:

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Introduction

The Educational Guide on Climate Change in Schools is a valuable tool for teachers to address one of the most crucial challenges of our time: climate change. This guide has been specially created to help educators introduce the topic of climate change in an in-depth and engaging way through a variety of school subjects.

Climate change is not just a scientific issue, but involves a wide range of disciplines, from geography to biology, from mathematics to literature, from history to art. It is a global problem that requires multidisciplinary understanding and a coordinated response.

Throughout this guide, we will explore how to integrate the topic of climate change into lessons in different subjects, offering practical tips, educational resources, and engaging projects. Each section focuses on a specific subject, providing ideas and strategies for engaging students in the climate change debate in a meaningful way.

The goal of this guide is twofold: first, to provide teachers with the tools to create inspiring and relevant lessons on climate change; Secondly, to help students understand the complexity of the climate issue, develop critical thinking, and feel involved in adopting sustainable solutions.

The challenge of climate change requires a collaborative and comprehensive approach. Through education, we can inspire young minds to become aware and active citizens, capable of facing this challenge with intelligence and determination.

This guide is not just a handbook for teachers, but an invitation to transform classrooms into learning places dedicated to environmental sustainability, global awareness, and positive action. We hope this resource will inspire you to guide your students towards a greener future, where climate change is tackled with knowledge, passion, and commitment.

The role of the school

In our efforts to address the challenge of climate change and promote a culture of sustainability in our school, it is crucial to involve the entire school community. Every member, regardless of the role they play, has the ability to make a significant contribution to this crucial cause. In this chapter, we will look in detail at the roles and instructions for each group within our school.

1. The Headmaster

The Principal plays a leadership role in the school's climate initiative. Here's how you can contribute more in-depth:

- Leadership and personal commitment: The Principal should show a strong personal commitment to sustainability and climate change. This may include reducing its environmental impact and promoting the use of public transport or low-emission vehicles.
- Building a shared vision: The Principal should collaborate with faculty, administrative staff, and students to develop a shared vision of a sustainable school. This vision should be clear, inspiring, and inclusive.
- Setting goals and policies: Together with faculty and staff, the Principal should set clear goals to reduce the school's carbon footprint and develop sustainable school policies that drive change.

- Seeking resources: The Principal should actively seek funding opportunities and resources to support green projects, such as installing solar panels or purchasing low-emission school vehicles.
- Communication and community involvement: The Principal should communicate regularly with the school community and involve them in the decision-making process, making sure everyone feels involved in the school's climate mission.

2. Teachers

Teachers are critical in educating students about sustainability and climate change. Here's how they can contribute in more detail:

- Continuing education: Teachers should receive ongoing training on sustainability and best practices to integrate these concepts into their teaching. This may include workshops, refresher courses, and specific educational resources.
- Curriculum integration: Teachers should look for opportunities to integrate environmental issues into their curricula. For example, they can teach how climate change affects geography, history, math, and many other subjects.
- Hands-on projects: Organize hands-on projects related to the environment that actively engage students. These projects may include setting up school gardens, operating compost bins, or organizing environmental awareness events.
- Student support: Teachers should be a point of contact for students interested in climate action, providing support and resources for their projects and initiatives.
- Role model: Teachers can serve as role models of sustainable behavior inside and outside the school. By reducing resource consumption and promoting eco-friendly practices, they inspire students to act in the same way.

3. Students

Students are the beating heart of any climate initiative. Here's how they can participate in more detail:

- Education and awareness-raising: Students can actively engage in peer education, organizing presentations, workshops, and discussions on climate change within the school. They may also participate in external educational programs to broaden their understanding of the problem.
- Active participation: students can be the driving force behind environmental action in the school. This can include participating in climate activist groups, promoting petitions, and planning and implementing concrete projects.
- Energy saving: Students can actively engage in reducing energy consumption within the school, such as turning off unnecessary lights and adjusting heating/cooling.
- *Advocacy*: Students can lobby school and local leaders to adopt more sustainable policies inside and outside the school. They can also participate in demonstrations and public awareness campaigns.

- Monitoring and evaluation: Students can contribute to the definition and monitoring of performance indicators (KPIs) to measure progress in the school's climate-related initiatives. They can help you review these KPIs regularly and propose changes if necessary.

4. The cleaners and support staff

Support staff also play a crucial role in climate action. Here's how they can contribute in more detail:

- Waste management: Cleaners can actively collaborate to implement effective recycling programs within the school. This includes educating students and staff on proper waste separation.
- Operational efficiency: They can reduce resource consumption through eco-friendly practices such as saving water, reducing energy consumption, and using cleaning products responsibly.
- Outreach: Support staff can help raise awareness among students and staff about sustainability and environmentally responsible practices. This can be done through informative discussions and the promotion of sustainable behaviours within the school.

Therefore, involving the entire school community in the climate action plan requires a concrete commitment from each member. Each role is essential to creating a culture of sustainability that positively influences behavior within the school and beyond. Our goal is not only to educate future generations about climate change, but also to prepare them to be responsible leaders and citizens in a world that is increasingly committed to protecting our planet. Sustainability must become an integral part of our school culture, a shared goal that unites us in building a greener and more resilient future for all.

5. Families

Involving families can be just as important in ensuring the success of a school-wide climate action plan. Here are some ideas for getting families involved in promoting sustainability and in the school's climate action plan:

1.Regular communication

Communicating with families on a regular basis about sustainability projects and progress in reducing greenhouse gas emissions is key to maintaining strong support for promoting sustainability within the school. Schools can use a variety of communication tools, such as newsletters, websites, social media, and instant messaging apps, to inform families about the school's sustainability initiatives and goals.

2.Involving families in initiatives

Involving families in the school's sustainability initiatives can help create a sense of community and belonging. The school can organize events, such as cleaning days, garbage collections, and gardening, that involve families and students. In addition, households can be invited to participate in initiatives such as separate waste collection or the promotion of sustainable behaviors.

3.Education and awareness-raising

Educating families about environmental issues and raising awareness about sustainability can help promote a cultural shift that supports the promotion of sustainability within the school. Schools can organize awareness-raising events, such as lectures or film screenings, that involve families and

students. Additionally, they can provide insight into sustainability practices that families can adopt in their daily lives.

4. Collaboration

Collaboration between the school and families can be critical to the development and implementation of a climate action plan. Families can provide financial support or donate resources, such as gardening equipment or recycling materials, to the school's sustainability initiatives. In addition, families can participate in sustainability working groups or school climate action plan design meetings, providing feedback and suggestions on its implementation.

In summary, engaging families in the school's sustainability promotion and climate action plan can help create a sense of community and belonging around sustainability, and foster a cultural shift that supports long-term sustainability promotion.

Teaching and innovation

Teaching is a constantly evolving field, shaped over the centuries by numerous technological, social, and cultural advances. To fully understand the importance of innovation in teaching, it is necessary to take a deeper journey through the history of education, from the classical world to the present day, exploring further significant aspects.

In ancient Greece, teaching was characterized by an approach centered on dialogue and discussion. Masters such as Socrates used the method of maieutics to guide students towards the discovery of truths through questions and reflections. This approach emphasized criticism and reflection, principles that remain fundamental in contemporary teaching.

The invention of the book not only made it possible to retain knowledge, but it also allowed for the standardization of education. Written works have allowed for a wider dissemination of knowledge and access to the ideas of great thinkers, uniting generations through time.

Gutenberg's movable type printing democratized access to education, enabling the large-scale production of books and educational materials. This has led to an increase in literacy and the creation of more structured education systems around the world.

Before the spread of the book, the transmission of knowledge was largely based on oral culture. Stories, legends and knowledge were passed down from generation to generation through storytelling. This type of teaching emphasized the importance of storytelling and active listening, aspects that are still present in modern pedagogical strategies.

During the Age of Enlightenment, education was seen as a tool to rid the human mind of superstition and ignorance. Great thinkers such as Rousseau, Voltaire, and Kant emphasized the importance of an education based on reason, science, and tolerance, influencing the foundations of modern educational systems.

During the 19th century, the sciences of education began to emerge as academic disciplines. Theorists such as Jean-Jacques Rousseau and John Dewey contributed to the development of pedagogical theories that placed an emphasis on experiential learning and adapting teaching to the needs of students.

With the advent of globalization and global communication, education has become more accessible worldwide. E-learning, international exchange programs, and global collaboration have expanded educational opportunities, but they have also posed new challenges related to cultural and linguistic diversity.

In the modern world, innovation continues to revolutionize education. Technologies such as artificial intelligence, virtual reality, and personalized learning are transforming the way students

acquire knowledge and skills. At the same time, the importance of social and emotional skills is gaining ground in education, reflecting the growing awareness of the importance of the integral education of individuals.

The history of teaching is a history of change, adaptation and innovation. Educational approaches can vary greatly over time and in different cultures, but the goal remains the same: to prepare the younger generation to face the challenges and take advantage of the opportunities of their time, providing them with the necessary knowledge, skills and wisdom.

Classical Methodologies and Innovative Teaching

Lectures

The didactic method of the frontal lesson: fundamentals and insights

The lecture, also known as a master class or lecture, is one of the most widespread and widely used traditional teaching methods in schools and educational institutions around the world. This pedagogical approach involves the teacher presenting information and knowledge to students in a direct and organized way, usually through verbal communication, often supported by visual aids such as whiteboards, projectors, or digital presentations.

Origins and Evolution of the Lecture.

The lecture has deep roots in the history of education and can be traced back to ancient Greece, where philosophers such as Plato and Aristotle used dialogue and discussion to teach their students. However, the method in which we know the frontal lecture today has undergone a significant evolution over the centuries.

During the Renaissance, for example, lectures became an essential method for spreading new ideas, with professors speaking to a class of students in a structured and organized way. With the advent of formal education, the method of lectures has spread further in schools and universities, becoming the main vehicle for the transmission of knowledge.

Key Features of the Frontal Lecture

The lecture has some key features that distinguish it:

Teacher at the center: In the frontal lesson, the teacher is the main dispenser of knowledge. He expects him to have a deep understanding of the topic and communicate clearly and captivantly to students.

Verbal communication: Communication is mainly through verbal language. The teacher explains concepts, theories, or facts, providing explanations and demonstrations.

Structure and Organization: The lecture is usually well structured and organized, with a beginning, a development and a conclusion. This allows students to follow a logical path of learning.

Visual aids: Often, the lecture is supported by visuals such as whiteboards, PowerPoint slides, or projections. These visual tools help clarify complex concepts and keep students' attention.

Limited interaction: Traditionally, the frontal lesson has been characterized by little interaction between the teacher and the students. Students mostly listen and ask questions only occasionally.

Advantages and limitations of the Frontal Lecture

The frontal lesson has advantages and limitations that must be considered in the context of modern education:

Advantages:

Efficiency in the transmission of knowledge: it is an effective method of providing information and knowledge in a structured and concise way.

Standardization: It is easily repeatable and can be standardized to ensure that all students receive the same basic information.

Classroom Control: The teacher maintains control of the classroom and can handle a large group of students easily.

Limits:

Student passivity: Students tend to be passive and limited in active participation.

Variety of learning styles: It does not take into account the different learning styles of students, who may benefit more from more interactive approaches.

Limited discussion and in-depth analysis: The lecture may limit the possibility of in-depth discussions and exploring topics in detail.

Integration & Modernization

In modern education, frontal instruction is often supplemented with more interactive approaches, such as group work, classroom discussions, and project-based learning. This makes it possible to maximize the advantages of the frontal lesson, i.e. the efficient transmission of knowledge, while addressing limitations through more active and participatory methods.

In conclusion, the lecture is a solid and proven teaching method that has stood the test of time. However, to be truly effective, it must be integrated with other pedagogical approaches that allow students to be more active in the learning process, promoting critical understanding and active participation.

Video lessons on LIM

The Method of Video Lessons on Interactive Multimedia Whiteboard (IWB): Fundamentals and Insights

Interactive Multimedia Whiteboard (IWB) video lessons are a modern form of teaching that uses digital technology to enrich classroom learning. This pedagogical approach blends elements of the traditional classroom with the interactive and visual potential of digital technologies, allowing teachers to create engaging and dynamic learning experiences.

Origins and Development of Video Lessons on LIM

The roots of video lessons on LIM can be traced back to the increasing digitization of classrooms in recent decades. As technology has evolved, IWBs have replaced traditional whiteboards, allowing teachers to project digital content and interact directly with it through the use of pens and touch screens.

Key Features of LIM Video Lessons

The video lessons on LIM have some key features that distinguish them:

Interactivity: One of the main distinguishing features of video lessons on LIM is interactivity. Teachers can write, draw, highlight and interact directly with the projected digital content, actively engaging students.

Multimedia: Video lessons on LIM can incorporate a wide range of multimedia content, including images, videos, diagrams, and presentations, enriching the learning experience.

Personalization: Teachers can customize video lessons to fit the specific needs of the class or students. They can create tailored lessons to address specific topics or provide clarification on complex concepts.

Instant Feedback: The IWB allows teachers to provide instant feedback to students, correcting errors or answering questions in real-time.

Accessibility: Video lessons on LIM can be stored and shared online, allowing students to access learning resources at any time and from anywhere.

Advantages and Limitations of Video Lessons on LIM

Video lessons on LIM offer many advantages, but they also have some limitations:

Advantages:

Visual engagement: Using multimedia and interactive content can capture students' attention more effectively than a traditional classroom.

Personalized Learning: Teachers can tailor lessons to students' different needs, providing additional support or challenges depending on individual abilities.

Easy storage and sharing: Lessons can be stored and shared, making it easy to review content and learn independently.

Limits:

Dependence on technology: Video lessons on LIM require access to reliable technology and connectivity, which may not be available everywhere.

Disadvantage for untrained teachers: Creating interactive video lessons can take a significant learning curve for less tech-savvy teachers.

Loss of human contact: Face-to-face interaction with teachers and classmates can be limited in video lessons on LIM, leading to a possible loss of human connection.

Integration and the future of video lessons on LIM

Video lessons on LIM represent an evolution of traditional teaching, which fully exploits the potential of digital technologies to enhance the learning experience. Integrating this methodology with more traditional approaches provides an opportunity for balance, allowing teachers to tailor their lessons to the specific needs of students and provide engaging and interactive learning.

In conclusion, video lessons on LIM are a valuable resource for teachers looking to improve the effectiveness of their lessons and engage students more actively. However, it is important to balance this methodology with other forms of classroom interaction to ensure comprehensive learning and meaningful human involvement.

Interdisciplinarity

Interdisciplinarity is an educational approach that has become increasingly important in schools and educational institutions around the world. This pedagogical method promotes the integration of knowledge and skills from different disciplines, giving students a complete and connected picture of the world around them.

Origins and growth of Interdisciplinarity

Interdisciplinarity has its roots in antiquity, when scholars such as Leonardo da Vinci applied knowledge from different disciplines to understand and solve complex problems. However, it has only been in the last century that interdisciplinarity has gained relevance in educational theory and practice.

Growing recognition of the complexity of contemporary issues, such as climate change, global health, and technology, has made interdisciplinarity a crucial approach to preparing students to understand and address real-world challenges.

Key Characteristics of Interdisciplinarity

Interdisciplinarity is based on a few key characteristics that distinguish it:

Integration of disciplines: Instead of being limited to just one discipline, interdisciplinarity encourages linking between different disciplines to tackle complex problems. For example, a project on water might involve biologists, chemists, engineers, and social scientists.

Global approach: Interdisciplinarity aims to provide a comprehensive and connected understanding of a topic, allowing students to see the big picture and relationships between different pieces of information.

Critical Thinking Development: Students are encouraged to develop critical thinking and the ability to analyze and synthesize information from different sources.

Active learning: Interdisciplinarity often involves active learning through projects, discussions, and hands-on activities that allow students to apply what they have learned in real-world settings.

Problem solving: Students tackle complex real-world problems, looking for innovative and sustainable solutions.

Advantages and limitations of interdisciplinarity

The interdisciplinary approach offers many advantages, but also comes with some challenges:

Advantages:

Relevance: Students see the direct applicability of their knowledge in real-world situations, making learning more relevant and engaging.

Comprehensive understanding: Interdisciplinarity helps students see connections between different disciplines and develop a more comprehensive understanding of global issues.

Broad Skill Development: Students develop a wide range of skills, including critical thinking, problem-solving, and communication.

Limits:

Difficulty in implementation: Interdisciplinarity can be complex to plan and implement, requiring collaboration between teachers from different disciplines and well-structured curriculum design.

Assessment: Assessing interdisciplinary learning can be challenging, as students must demonstrate their understanding in ways other than traditional ones.

Integration and the Future of Interdisciplinarity

Interdisciplinarity is gaining more and more ground in 21st century education, as it prepares students to be flexible, creative thinkers capable of tackling complex real-world challenges. The integration of interdisciplinarity with other pedagogical methodologies, such as the use of digital technologies and project-based learning, offers opportunities for more comprehensive and effective training.

In conclusion, interdisciplinarity is an educational approach that promotes global understanding and critical thinking, preparing students to be informed citizens and capable of facing the challenges of our increasingly complex and interconnected world. Its growth continues to reflect the evolution of education to meet the challenges of the future.

Circle Time

The "*Circle Time*", also known as "Circle Time" or "Discussion Circle", is an interactive and participatory teaching method that has roots in the Montessori pedagogical approach and early childhood education. This practice engages students in a physical or virtual circle, creating an environment where they can share experiences, express thoughts, and build relationships in a structured context.

Origins and growth of "*Circle Time*"

"*Circle Time*" has its roots in Maria Montessori's educational philosophy and experience-based approach to learning. Over the years, it has been adopted and adapted in many educational institutions, especially in kindergartens and early childhood classes. However, its value in promoting student interaction, communication, and social-emotional development has made it a valuable approach in other school settings as well.

Key features of the "*Circle Time*"

The "*Circle Time*" has some key features that distinguish it:

Forming a circle: Students come together in a physical or virtual circle, creating a sense of equality and inclusion.

Open communication: Students are encouraged to share thoughts, feelings, experiences, or questions in a non-judgmental environment.

Structured dialogue: "*Circle Time*" follows a predefined structure, with clear rules and roles to facilitate communication and mutual respect.

Social-Emotional Development: The approach aims to promote students' social-emotional development, helping them develop empathy, listening skills, and respect for others.

Active participation: Students actively participate in discussions, answering questions, sharing experiences, and contributing to the classroom's learning process.

Advantages and Limitations of "*Circle Time*"

The "*Circle Time*" approach offers many advantages, but it also presents some challenges:

Advantages:

Social-Emotional Development: Promotes the development of students' social-emotional skills, promoting empathy, effective communication, and positive relationships.

Inclusion: Create an inclusive classroom environment where all students feel heard and respected.

Collaborative learning: Encourages collaborative learning, encouraging students to learn from each other and share different perspectives.

Limits:

Limited time: "*Circle Time*" requires time and planning, and sometimes may not be possible to implement regularly due to time constraints.

Effectiveness with large groups: It may be more difficult to effectively manage "*Circle Time*" with very large groups of students.

Respect for *privacy*: Students may feel uncomfortable sharing personal or sensitive information in a group setting.

Integration and the future of "*Circle Time*"

"*Circle Time*" represents a valuable pedagogical approach to foster open communication, the development of social-emotional skills and the creation of an inclusive classroom environment. It can be integrated with other teaching methodologies, such as project-based learning or the use of digital technologies, to create a comprehensive and dynamic learning environment.

In conclusion, "*Circle Time*" is a teaching method that emphasizes the importance of relationships and communication in learning. It continues to be a relevant approach in education, as it promotes the development of skills critical to students' success in today's society.

Role Playing

The Didactic Method of *Role Playing*: fundamentals and insights

Role Playing, also known as role-playing, is an engaging and interactive teaching method that allows students to take on imaginary or real roles, exploring different situations, problems and perspectives through the "living" of a specific character or figure.

Origins and Growth of *Role Playing*

Role Playing has roots in 20th-century psychology and therapy, but was quickly adopted in education to promote active learning and the acquisition of social and emotional skills. Its application has extended from therapeutic scenarios to formal and informal educational settings.

Key Features of *Role Playing*

Role Playing has some key features that distinguish it:

Role Taking: Students take on specific roles, which can be fictional characters, historical figures, or real-life professionals.

Situation Simulation: *Role Playing* involves simulating real or imagined situations, allowing students to act and make decisions in a structured context.

Experiential learning: Students learn through hands-on experience, developing practical skills and gaining an in-depth understanding of the concepts covered.

Exploring Different Perspectives: *Role Playing* allows students to explore different points of view and develop empathy towards people with different experiences and opinions.

Reflection and discussion: After the simulation, students reflect on their actions, decisions, and feelings, often participating in guided discussions.

Advantages and limitations of *Role Playing*

The *Role Playing approach* offers many advantages, but it also presents some challenges:

Advantages:

Active involvement: Students are actively engaged in learning, which can increase focus and interest.

Development of social skills: *Role Playing* fosters the development of social skills, such as communication, collaboration, and conflict management.

Real-world applicability: Learnings derived from *Role Playing* are often easily transferable to real life.

Limits:

Planning and time: Planning *Role Playing* scenarios can take time, and it takes space and resources to execute.

Emotional involvement: Students may feel emotionally invested in simulated situations, which can be stressful for some.

Evaluation: Assessing the success of *Role Playing* and its learning objectives can be complex and subjective.

Integration and the Future of *Role Playing*

Role Playing continues to be a valuable teaching approach that promotes experiential learning, empathetic understanding, and the development of practical skills. It can be integrated with other teaching methodologies, such as classroom discussion, the use of digital technologies, and project-based learning, to create a comprehensive and engaging learning environment.

In conclusion, *Role Playing* is a teaching method that emphasizes experience as a vehicle for learning. It represents an opportunity for students to put themselves in the shoes of others, explore different perspectives, and develop key skills to deal with complex situations in the real world.

Cooperative Learning

Cooperative learning is a pedagogical approach that promotes collaboration among students in order to achieve common learning goals. This teaching method aims to foster social interaction, the development of collaborative skills, and the acquisition of knowledge through mutual learning.

Origins and Growth of *Cooperative Learning*

Cooperative Learning has roots in social psychology and progressive education in the twentieth century. In the 1970s and 1980s, research studies helped solidify the cooperative approach as an effective strategy in formal education. Today, it is widely used in schools and higher education institutions around the world.

Key Features of *Cooperative Learning*

Cooperative Learning has some key features that distinguish it:

Teamwork: Students work in groups or teams to achieve shared goals.

Positive interdependence: Students depend on each other for the success of the group, encouraging collaboration and resource sharing.

Individual Responsibility: Each member of the group has an individual responsibility to contribute to the success of the team.

Facilitated interaction: Teachers create opportunities for structured interaction within groups, encouraging discussion, problem-solving, and critical thinking.

Reflection and discussion: After the cooperative activities, students reflect on the experience, discuss the challenges encountered, and share their findings with the whole class.

Advantages and Limitations of *Cooperative Learning*

The *Cooperative Learning approach* offers many advantages, but it also presents some challenges:

Advantages:

Social Skills Development: It fosters the development of social skills and communication, which are essential for effective collaboration.

Active learning: Actively engages students in learning, increasing attention and interest.

Diversity of perspectives: allows students to explore different perspectives and solutions, enriching learning.

Limits:

Group management: Managing heterogeneous groups can be complex, with the need to address social and behavioral dynamics.

Time: *Implementing Cooperative Learning* can take longer than traditional teaching methods.

Evaluation: Assessing individual input in a group setting can be a delicate task.

Integration and the Future of *Cooperative Learning*

Cooperative Learning is a teaching approach that emphasizes collaboration and the development of social skills, which are key elements in preparing students for the real world. It can be integrated with other teaching methodologies, such as project-based learning, *Role Playing* or the use of digital technologies, to create a complete and interactive learning environment.

In conclusion, *Cooperative Learning* represents a teaching method that promotes social interaction and knowledge building through mutual support among students. It continues to be a valuable approach to the formation of collaborative and competent citizens in the 21st century.

Peer Education

The didactic method of Peer Education: fundamentals and insights

Peer Education is an educational approach that involves students being taught and learning by their peers. This teaching method promotes the idea that students can learn meaningfully not only from teachers, but also from their peers, encouraging interaction and knowledge sharing among students.

Origins and Growth of *Peer Education*.

Peer education has roots in the theory of social learning and progressive education of the twentieth century. Over the years, it has been widely adopted in various educational settings, including schools, communities, and educational institutions, recognizing the potential of students as valuable educational resources.

Key Features of *Peer Education*.

Peer Education has some key features that distinguish it:

Peer learning: Students serve as teachers for their peers, sharing knowledge, experience, and skills.

Sharing experiences: *Peer Education* is based on sharing personal and practical experiences, making learning more authentic and relevant.

Collaborative approach: students collaborate with each other to tackle problems, develop projects, or achieve common goals.

Empathy and support: Students may feel more comfortable learning from other students, as they can better understand the challenges and needs of their peers.

Active roles: Students take on active roles as both teachers and learners, actively participating in the learning process.

Advantages and limitations of *Peer Education*

The *peer education approach* offers many advantages, but also presents some challenges:

Advantages:

Empathetic learning: Promotes empathetic learning, as students can better identify with each other.

Social Skills Development: Promotes the development of social skills, communication, and leadership.

Active learning: Engages students in active, participatory learning.

Limits:

Proper preparation: Students who serve as educators must be adequately prepared to perform this role effectively.

Evaluation: Assessing the effectiveness of peer learning can be a complex task, with challenges related to measuring progress and participation.

Disparity in knowledge: Students may have different levels of knowledge and skills, which can be a challenge in implementing *Peer Education*.

Integration and the Future of *Peer Education*

Peer Education is a teaching approach that highlights students' potential as educational resources. It can be integrated with other teaching methodologies, such as project-based learning, the use of digital technologies or interdisciplinarity, to create a comprehensive and dynamic learning environment.

In conclusion, *Peer Education* is a teaching method that promotes peer learning and mutual support among students. It represents an opportunity for students to share knowledge, develop social skills, and collaborate in acquiring new knowledge.

Classe capovolta (*Flipped Classroom*)

The *Flipped Classroom* is an innovative pedagogical approach that reverses the traditional teaching sequence. In a flipped classroom, students study learning materials at home via multimedia resources, such as videos or readings, and use classroom time for practical application of knowledge through discussion, problem-solving, and collaboration activities.

Origins and Growth of the Flipped Classroom

The concept of *the Flipped Classroom* began to gain traction in the early 2000s, but it has roots in active learning theory and the idea that learning should be a collaborative effort between teachers and students. In recent years, the Flipped Classroom has become one of the most discussed and adopted educational methodologies around the world.

Key Features of the Flipped Classroom

The Upside-Down Class has a few key features that set it apart:

Content inversion: Teaching material traditionally taught in the classroom is made available to students at home through multimedia resources, allowing them to study it in advance.

Classroom activities: Classroom time is dedicated to interactive activities, such as discussion, problem-solving, hands-on exercises, and collaborative projects.

Self-paced learning: Students are responsible for their own learning at home and can work at their own pace.

Active role of the teacher: The teacher takes on a role of guidance and support during classroom activities, rather than as the primary dispenser of content.

Personalization: The *Flipped Classroom* allows for greater personalization of learning, tailoring the material and activities to the needs of the students.

Advantages and limitations of the Flipped Classroom

The Flipped Classroom *approach* offers several advantages, but it also comes with some challenges:

Advantages:

Active learning: Students are actively involved in learning, increasing attention and participation.

Personalization: Allows for greater personalization of learning, tailoring the educational path to the individual needs of the students.

Critical Skills Development: Promotes the development of critical thinking, problem-solving, and collaboration skills.

Limits:

Technological Access: The *Flipped Classroom* requires access to digital resources, which could create unequal access among students.

Involvement outside of the classroom: Students need to be motivated to study independently at home, which may require discipline and responsibility.

Proper planning: Teachers should carefully plan classroom activities to ensure effective application of knowledge learned at home.

Integration and the future of the Flipped Classroom

The *Flipped Classroom* is an instructional approach that leverages technology to transform the traditional teaching model. It can be integrated with other teaching methodologies, such as project-based learning, Cooperative Learning or the use of digital technologies, to create a comprehensive and innovative learning environment.

In conclusion, the *Flipped Classroom* is a teaching method that emphasizes active student engagement and personalization of learning. It represents an opportunity to make learning more meaningful, challenging, and tailored to students' individual needs.

Laboratory teaching

Laboratory Teaching is a pedagogical approach that emphasizes learning through hands-on experience and direct interaction with specific materials, tools, or contexts. This teaching method aims to engage students in hands-on activities that lead them to discover, experience, and understand concepts in a concrete and meaningful way.

Origins and growth of Laboratory Teaching

Laboratory Teaching has its roots in the progressive pedagogy and experiential education of the twentieth century. In recent decades, it has been widely adopted in various educational settings, from elementary schools to universities, recognizing its value in promoting active and meaningful learning.

Key Features of Laboratory Teaching

Laboratory Teaching has some key characteristics that distinguish it:

Hands-on experience: Students actively participate in hands-on activities, manipulating materials, tools, or real-world situations.

Active learning: learning takes place through the active involvement of students, who are called upon to experiment and solve problems.

Concepts in context: Concepts are taught within a concrete context, making them more understandable and applicable.

Collaboration: Laboratory teaching often encourages collaboration between students, promoting communication and teamwork.

Reflection and discussion: After the lab activities, students are encouraged to reflect on their experiences and discuss the results.

Advantages and limitations of Laboratory Teaching

The Laboratory Teaching approach offers many advantages, but also presents some challenges:

Advantages:

Experiential learning: Promotes experiential learning, which is often deeper and longer-lasting.

Active learning: Actively engages students in learning, increasing engagement and motivation.

Real-world applicability: Students experience concepts and theories directly, making learning more applicable to the real world.

Limits:

Resources and space: Laboratory Teaching may require special resources, such as equipment or dedicated spaces, which may not be available in all schools.

Time: Implementing laboratory activities can take longer than traditional teaching methods.

Proper planning: Teachers must carefully plan lab activities to ensure effective application of concepts.

Integration and the future of Laboratory Teaching

Laboratory Teaching is a didactic approach that places practical experience at the center of learning. It can be integrated with other teaching methodologies, such as project-based learning, *Cooperative Learning* or the use of digital technologies, to create a complete and engaging learning environment. In conclusion, Laboratory Teaching is a teaching method that promotes learning through practical experience and direct interaction. It represents an opportunity for students to discover, experience, and understand concepts in a deeper and more meaningful way.

World café

The *Word Café* is a pedagogical approach that promotes conversation and deep reflection on the topics covered in the classroom through an informal and collaborative discussion format. This teaching method creates an environment where students can explore ideas, share viewpoints, and develop critical thinking.

Origins and Growth of the *Word Café*

The *Word Café* draws inspiration from the practice of meaningful dialogue, learning through conversation, and the pedagogy of collaborative learning. Although it does not have a history as old as some other methodologies, the *Word Café* has become popular in recent years for its ability to promote constructive dialogue.

Key Features of the *Word Café*

The *Word Café* has a few key features that set it apart:

Informal setting: Discussions take place in an informal setting, often with students sitting in circles or small groups.

Open-ended questions: Students face open-ended and thought-provoking questions that require in-depth reflection and discussion.

Participant rotation: In some cases, students may switch groups or tables during discussion to present ideas to a variety of points of view.

Ground rules: The *Word Café* can follow some basic rules, such as actively listening, respecting others' point of view, and building on the ideas of other participants.

Shared reflection: At the end of the session, students often share the main conclusions or ideas that emerged from the discussion.

Advantages and limitations of the *Word Café*

The *Word Café approach* offers several advantages, but it also presents some challenges:

Advantages:

Collaborative learning: Encourages collaborative learning, encouraging students to work together to develop ideas.

Critical thinking: promotes critical thinking and deep reflection on the topics covered.

Active participation: actively engages students in learning, increasing attention and interest.

Limits:

Time: Implementing *Word Café* can take time, particularly if you're discussing complex topics.

Proper guidance: Teachers must lead the discussion effectively to ensure meaningful results.

Variability in participation: Some students may participate less actively than others, creating challenges in managing the group.

Integration and the future of the *Word Café*

The *Word Café* is a teaching method that promotes dialogue and in-depth reflection on topics. It can be integrated with other teaching methodologies, such as project-based learning, *Cooperative*

Learning , or the use of digital technologies, to create a comprehensive and engaging learning environment.

In conclusion, the *Word Café* is a pedagogical approach that emphasizes meaningful conversation and critical thinking. It represents an opportunity for students to explore ideas, share points of view, and develop a deeper understanding of the topics covered.

Silvotherapy

Silvotherapy, also known as "*forest bathing*" or "*shinrin-yoku*" in Japanese, is a therapeutic approach that involves immersing yourself in natural environments, particularly forests, to improve physical, mental, and emotional well-being. This method promotes contact with nature as a means of relieving stress, improving health, and fostering connection with the surrounding environment.

Origins and Growth of Silvotherapy

Silvotherapy has roots in the Japanese tradition, where it was recognized as a beneficial practice for health as early as the 1980s. Over the past few decades, it has gained popularity around the world as an effective way to deal with stress and promote overall well-being.

Key Features of Silvotherapy

Silvotherapy has some key characteristics that distinguish it:

Nature Immersion: Individuals actively immerse themselves in natural environments, often forests or woodlands, for a dedicated period of time.

Sensory Connection: During the practice, it is encouraged to involve all the senses, such as listening to the sound of birds, contact with the earth and the perception of natural smells.

Present Mind: Silvotherapy exercises often emphasize the need to be present in the moment and to let go of everyday worries.

Health benefits: Silvotherapy is associated with several health benefits, including reducing stress, decreasing blood pressure, improving sleep and mood.

Advantages and limitations of Silvotherapy

The Silvotherapy approach offers many advantages, but it also presents some challenges:

Advantages:

Stress reduction: It is known to reduce stress levels and promote a feeling of calm and well-being.

Physical and mental health: It is associated with improvements in physical and mental health, including reduced blood pressure and increased concentration.

Connection with nature: promotes a greater connection with the natural environment and respect for nature.

Limits:

Limited access: Not everyone has access to forests or natural environments, which may limit the viability of Silvotherapy for some people.

Variability of effects: The effects of Silvotherapy can vary from person to person, and not everyone may experience the same benefits.

Time Need: It requires a time commitment, which could be a challenge for those with hectic schedules.

Integration and the future of Silvotherapy

Silvotherapy is an approach that promotes connection with nature and well-being through immersion in natural environments. It can be integrated with other therapeutic practices, such as meditation or cognitive-behavioral therapy, to create a holistic approach to wellness.

In conclusion, Silvotherapy represents a therapeutic approach that values contact with nature as a means of improving health and well-being. It offers a way to escape everyday stress and reconnect with the natural environment around us.

Orienteering

Orienteering is an outdoor sport that combines running, navigation, and puzzle-solving in a natural environment. This didactic and sporting method promotes the acquisition of orientation skills, the ability to make quick decisions and collaboration in an *outdoor context*.

Origins and growth of *Orienteering*

Orienteering has Swedish and Norwegian origins, dating back to the 19th century, but has evolved considerably over the years. It has become a competitive sport and recreational practice spread around the world, also used in education to promote experiential learning.

Key Features of *Orienteering*

Orienteering has some key characteristics that distinguish it:

Navigation: *Orienteers* must navigate a natural environment, using a map and compass to find control points arranged in a predefined path.

Running and walking: *Orienteers* can choose whether to run or walk while searching for checkpoints, depending on their skill level and goals.

Puzzle solving: In some cases, the path may include puzzles or questions that you must solve in order to find control points.

Competition and recreation: *Orienteering* can be practiced at a competitive level or as a recreational activity for fun and fitness.

Natural environment: *Orienteering* events often take place in natural settings, such as forests or parks, promoting connection with nature.

Advantages and limitations of *Orienteering*

Orienteering offers many advantages, but it also presents some challenges:

Advantages:

Development of Orientation skills: promotes the development of orientation skills, such as reading maps and using a compass.

Fitness and wellness: promotes fitness and well-being through outdoor physical activity.

Experiential learning: Offers experiential learning, where *orienteers* learn by doing.

Limits:

Access to Resources: *Orienteering* requires maps, compass, and access to suitable places for practice, which may not be easily accessible to everyone.

Competitiveness: Competition can be intense, and some may feel discouraged if they don't achieve the desired results.

Risk of Injury: Outdoor activity carries a certain risk of injury, and safety must be a priority.

Integration and the future of *Orienteering*

Orienteering is a sport and teaching method that promotes the formation of orientation skills and connection with nature. It can be integrated with other outdoor activities or used to promote experiential learning in educational settings.

In conclusion, *Orienteering* represents a unique approach to develop orientation skills, promote outdoor physical activity, and stimulate collaboration. It provides an opportunity to explore nature and gain practical skills in an engaging way.

Problem-Based Learning (PBL)

Problem-Based Learning (PBL) is a teaching approach that puts solving complex, real-world problems at the center of the learning process. This method encourages students to become active participants in their learning, challenging them to identify, analyze, and solve problematic situations collaboratively.

Origins and Growth of Problem-Based Learning

Problem-Based Learning has roots in progressive pedagogy and 20th-century experiential education. It was initially used in medical settings and then spread to a variety of disciplines and educational sectors. Today, it is widely adopted in many schools and universities around the world.

Key Features of Problem-Based Learning

Problem-Based Learning has a few key features that set it apart:

Complex scenarios: Students are presented with complex scenarios or cases that require resolution.

Active learning: Students are actively involved in identifying and analyzing problems, rather than being passive recipients of information.

Collaboration: PBL promotes collaboration among students, often working in groups to address problems.

Self-directed research: Students must conduct self-directed research to find solutions to the problems presented.

Reflection: After problem-solving, students reflect on the process and lessons learned.

Advantages and Limitations of Problem-Based Learning

The PBL approach offers many advantages, but it also presents some challenges:

Advantages

Deep Learning: Promotes deep and meaningful learning, as students must apply concepts and theories to solve real-world problems.

Skill Development: Promotes the development of problem-solving, critical thinking, collaboration, and autonomous research skills.

Preparation for the real world: Prepares students to deal with complex and ambiguous situations that they may encounter in life and in their future careers.

Limits:

Time and structuring: Implementing PBL can take longer than traditional teaching methods, and requires proper structuring or guidance.

Variability in learning: Students may approach problems differently, and some may feel overwhelmed or disoriented.

Assessment: Assessing PBL can be complex, as the results are often process-based and not just correct answers.

Integration and the Future of Problem-Based Learning

PBL is a teaching approach that emphasizes real-world problem-solving and active learning. It can be integrated with other teaching methodologies, such as *Cooperative Learning*, the use of digital technologies or experiential learning, to create a complete and interactive learning environment.

In conclusion, Problem-Based Learning is a teaching method that challenges students to become competent critical thinkers and problem solvers. It represents an opportunity to deal with real-life situations and apply knowledge in a meaningful way.

Project-Based Learning (PjBL)

Project-Based Learning (PjBL) is a pedagogical approach that emphasizes learning through the design, implementation, and presentation of complex projects. This teaching method encourages students to work collaboratively to solve real-world problems, developing critical skills, creative thinking, and practical application of knowledge.

Origins and Growth of Project-Based Learning

Project-Based Learning has roots in the progressive pedagogy of the twentieth century and has gained popularity in the field of education in recent decades. It was developed as a response to the need to prepare students to compete in an ever-changing world and face complex challenges.

Key Features of Project-Based Learning

Project-Based Learning has a few key features that set it apart:

Central project: Students work on a central project or complex challenge, often connected to real-world situations.

Active learning: Students are actively involved in the planning, implementation, and evaluation of the project.

Collaboration: PjBL promotes collaboration among students, who work together to achieve common goals.

Research and problem-solving: Students conduct research, analyze data, and solve problems in the context of the project.

Presentation: At the end of the project, students present their results clearly and convincingly.

Advantages and Limitations of Project-Based Learning

The PjBL approach offers many advantages, but it also presents some challenges:

Advantages:

Meaningful learning: Nurtures meaningful learning, as students connect theoretical knowledge to real-world practice.

Skill development: Promotes the development of key skills, such as critical thinking, communication, problem-solving, and teamwork.

Engagement and motivation: Increases student engagement and motivation, as they work on relevant and interesting projects.

Limits:

Time and planning: Implementing PjBL takes time to design projects and may be difficult to integrate into already dense curricula.

Assessment: Assessment of the PjBL can be complex, as students are assessed for both the work process and the results.

Student variability: Students may approach projects differently, with some requiring more support or guidance.

Integration and the Future of Project-Based Learning

PjBL is a teaching approach that emphasizes building knowledge through practice and collaboration. It can be integrated with other teaching methodologies, such as *Cooperative Learning*, the use of digital technologies or problem-based learning, to create a complete and interactive learning environment.

In conclusion, Project-Based Learning is a teaching method that challenges students to become active apprentices and competent problem solvers. It presents an opportunity to apply knowledge meaningfully and prepare students for success in a rapidly changing world.

Gamification

Gamification in education is a pedagogical approach that applies elements and dynamics typical of games to the learning process. This teaching method aims to engage students, improve their motivation, and make learning more fun through the use of challenges, prizes, and competitions.

Origins and growth of *Gamification* in education

Gamification in education is rooted in the principles of experiential learning and the use of motivational strategies in the educational context. In recent years, it has become increasingly popular due to the widespread use of technology and digital applications in education.

Key features of *Gamification* in education

Gamification in education has some key features that distinguish it:

Playful elements: Introduce game-specific elements, such as points, badges, leaderboards, and rewards, into the educational context.

Friendly Competition: Promotes competition in a healthy and friendly manner among students to achieve learning goals.

Clear Goals: Provides clear goals and challenging challenges to keep students interested.

Instant Feedback: Provides immediate feedback on students' efforts, allowing them to track their progress.

Personalization: *Gamification* can be customized to fit each student's learning needs.

Advantages and limitations of *Gamification* in education

The *gamification approach* in education offers many advantages, but also presents some challenges:

Advantages:

Increased motivation: Increases student motivation, as learning becomes more engaging and rewarding.

Active learning: Encourages active learning, as students are engaged in solving challenges and problems.

Collaborative learning: Can promote collaboration among students through friendly competitions.

Limits:

Over-reliance: Overuse of *gamification* could lead to a reliance on external rewards, rather than intrinsic motivation.

Complex customization: Customizing *gamification* systems can require significant resources.

Complex assessment: Assessing learning success can be complicated when using *gamification elements*.

Integration and the future of *Gamification* in education

Gamification in education is a teaching method that aims to make learning more engaging and motivating through the use of playful dynamics. It can be integrated with other teaching methodologies, such as project-based learning or problem-based learning, to create a comprehensive and stimulating learning environment.

In conclusion, *gamification* in education represents an innovative approach to engage students and improve their motivation to learn. It provides an opportunity to make education more fun and rewarding, while maintaining a focus on growth and skill development.

Inquiry-based learning

Inquiry-Based Learning is a didactic approach that puts active inquiry, critical analysis, and autonomous discovery at the center of the learning process. This teaching method encourages students to ask questions, conduct original research, and develop *problem-solving* and critical thinking skills.

Origins and Growth of Inquiry-Based Learning

Inquiry-Based Learning has roots in progressive pedagogy and 20th-century experiential education. It was further developed to address the need to prepare students to think critically, solve complex problems, and adapt to an ever-changing world.

Key Features of Inquiry-Based Learning

Survey-Based Learning has a few key features that set it apart:

Guiding Questions: Students formulate research questions that guide their learning process.

Active research: Students conduct original research using a variety of resources, including books, the internet, and interviews.

Critical Analysis: Students critically evaluate the information gathered and develop the ability to discern reliable sources.

Results and presentations: At the end of the survey, students present their findings through reports, presentations, or projects.

Self-paced learning: Inquiry promotes self-paced learning and the individual's responsibility in the educational process.

Advantages and Limitations of Survey-Based Learning

The Survey-Based Learning approach offers many advantages, but it also presents some challenges:

Advantages:

Critical Thinking: Promotes the development of critical thinking and analysis, as students must evaluate and synthesize complex information.

Meaningful learning: promotes meaningful learning, as students are actively involved in finding solutions to their questions.

Independence: Helps students develop independence and the ability to learn independently.

Limits:

Time: Implementing Inquiry-Based Learning takes time for planning, research, and analysis.

Proper guidance: Teachers must provide proper guidance to ensure that students learn how to conduct research effectively.

Student variability: Students may have different research and analysis skills, which requires differentiated attention.

Integration and the Future of Inquiry-Based Learning

Inquiry-Based Learning is a teaching method that emphasizes autonomous discovery, research, and critical thinking. It can be integrated with other teaching methodologies, such as *Cooperative Learning*, the use of digital technologies or project-based learning, to create a complete and stimulating learning environment.

In conclusion, Inquiry-Based Learning represents a teaching approach that challenges students to become autonomous critical thinkers, researchers, and problem solvers. It provides an opportunity to develop research and analytical skills that are valuable in an ever-changing world.

Laboratory teaching with augmented reality viewers

Laboratory teaching with augmented reality headsets is an innovative approach to teaching that leverages technology to create engaging and immersive learning experiences. This teaching method allows students to interact with virtual objects overlaid on top of the real world, opening up new opportunities for active learning and exploration.

Origins and Growth of Laboratory Teaching with Augmented Reality

Augmented reality (AR) has begun to make its way into the world of education in recent years thanks to technological developments that have made AR headsets and educational applications accessible. This approach draws inspiration from experiential pedagogy and aims to enhance learning through immersive experiences.

Key Features of Augmented Reality Laboratory Teaching

Laboratory teaching with augmented reality has some key features that distinguish it:

Virtual overlay: Students use AR headsets or mobile devices to view virtual objects overlaid on the real world.

Interactive experiences: Students can interact with virtual objects, explore them, and modify them, making learning an active experience.

Immersive learning: Augmented reality creates an immersive learning environment that involves multiple sensory modalities, such as sight and sometimes hearing.

Real-world context: Virtual objects are often integrated into the real-world context, allowing students to apply knowledge directly in the field.

Various disciplines: Augmented reality can be used in a variety of disciplines, from science to history, geography to art.

Advantages and limitations of Laboratory Teaching with Augmented Reality

The augmented reality approach to laboratory teaching offers numerous advantages, but also presents some challenges:

Advantages:

Student Engagement: Create a high level of student engagement through interactivity and immersion.

Experiential Learning: Encourages experiential learning, where students learn by doing.

Personalized learning: Augmented reality can be customized to fit each student's needs.

Limits:

Cost and accessibility: Adopting AR headsets and related technologies can be costly, limiting access for some schools or institutes.

Teacher training: Teachers must be properly trained to effectively use augmented reality in the classroom.

Technological overload: Excessive use of technology can distract from core educational goals.

Integration and the future of Laboratory Teaching with Augmented Reality

Laboratory teaching with augmented reality headsets represents an innovative opportunity to improve the learning experience of students. It can be integrated with other teaching methodologies, such as cooperative learning or project-based learning, to create a comprehensive and engaging learning environment.

In conclusion, augmented reality lab teaching offers an exciting way to engage students and promote active, immersive learning. It represents a promising direction for the education of the future, where technology plays a central role in enriching learning.

Artificial intelligence

Artificial Intelligence (AI) in education is a growing field that uses algorithms and intelligent systems to improve learning, personalize education, and develop new educational solutions. This teaching method harnesses the power of AI to deliver more personalized and effective learning.

Origins and growth of Artificial Intelligence in education

The use of AI in education has roots in research into artificial intelligence and machine learning. In recent years, AI has been increasingly applied to improve education, facilitate assessment, and develop intelligent tutoring systems.

Key features of Artificial Intelligence in education

Artificial Intelligence in education has some key characteristics that distinguish it:

Personalization: AI can tailor the content and mode of learning to the specific needs of each student.

Automated assessment: AI can automatically assess students' progress and provide immediate feedback.

Smart Tutoring: AI-powered tutoring systems can guide students through learning by offering personalized explanations and suggestions.

Data analytics: AI can analyze large amounts of data to identify learning patterns and improve teaching strategies.

Continuous learning: AI algorithms can adapt and improve over time, offering continuous and personalized learning.

Advantages and limitations of Artificial Intelligence in Education

The use of AI in education offers numerous benefits, but it also presents some challenges:

Advantages:

Personalization: AI allows for personalized learning, tailored to the needs of each student.

Efficiency: AI can automate administrative and grading tasks, saving teachers time.

Instant feedback: Students receive instant feedback on their progress, enhancing learning.

Limits:

Privacy: The use of personal data for AI in education raises concerns about student privacy.

Need for training: Teachers need to be trained to use AI-powered solutions effectively.

Limitations of AI: AI has limitations in interpreting human context and emotion.

Integration and the Future of Artificial Intelligence in Education

AI in education is a teaching method that promises to revolutionize learning, making it more personalized and effective. It can be integrated with other teaching methodologies, such as project-based learning or problem-based learning, to create a comprehensive and technologically advanced learning environment.

In conclusion, Artificial Intelligence in education represents an extraordinary opportunity to improve education and make learning more personalized and effective. Its application is transforming the way we teach and learn, opening up new avenues for educational innovation.

Orientation lesson

The orientation class is an essential component of the educational process, as it provides students with critical information and guidance to guide them through their education and career choices. This lesson aims to support students in understanding their options and identifying future goals.

Origins and Importance of the Orientation Lesson

Orientation classes have roots in educational psychology and career guidance. They are designed to help students explore educational and career opportunities in an informed way, allowing them to make decisions based on personal interests, skills, and goals.

Key Features of the Orientation Lesson

The orientation lesson has some key features that distinguish it:

Exploring options: Students look at a variety of educational and career options, including schools, college programs, and career training possibilities.

Self-assessment: Students reflect on their skills, interests, and goals to identify the options that best suit them.

Detailed information: Detailed information is provided about different educational and career opportunities, including prerequisites, employment prospects, and funding options.

Future planning: Students develop educational and career plans based on their personal choices and goals.

Psychological support: An experienced counselor or teacher provides psychological support to address any concerns or uncertainties.

Advantages and Limitations of the Orientation Lesson

The orientation lesson approach offers many advantages, but it also presents some challenges:

Advantages:

Better decisions: Students are able to make more informed and focused decisions regarding their educational and career options.

Reduced indecisiveness: Helps reduce uncertainty and anxiety related to future choices by providing clear direction.

Sustainability: Students who receive good guidance tend to be more satisfied with their educational and career choices.

Limits:

Resource limitations: The availability of expert advisors can be limited, especially in educational settings with limited resources.

Individual differences: Each student is a unique individual with different needs, making it difficult to provide personalized guidance to everyone.

Changes in goals: Students may change their minds over time, so decisions made during the orientation lesson may not remain constant.

Integration and the future of the Orientation Lesson

Orientation classes are crucial in helping students plan their educational and career future. They can be integrated with other teaching methodologies, such as one-on-one counseling or online support, to provide comprehensive support to students in their growth and choices.

In conclusion, the orientation lesson is an important milestone in students' educational journey, as it helps them make informed decisions regarding their future choices. It provides a solid foundation for students' personal success and fulfillment, guiding them in the right direction toward their educational and professional goal.

Life design

"*Life Design*" is a holistic approach to career guidance and decision-making for the future that goes beyond simply choosing a career. This method encourages individuals to explore their passions, values, skills, and personal interests, in order to create a meaningful and fulfilling life, not only professionally, but also personally and socially.

Origins and Importance of *Life Design*

Life Design has its roots in positive psychology, career guidance, and the pursuit of happiness. It was developed to help people move beyond the traditional approach to career guidance, focusing on building a life that fully reflects who they are and what they desire.

Key Features of *Life Design*

Life Design has some key features that distinguish it:

Self-knowledge: The *Life Design* process begins with a deep self-assessment to understand one's passions, values, skills, and aspirations.

Exploration: People are encouraged to explore a wide range of career and life options, even outside of traditional paths.

Clear goals: *Life design* helps to set clear and realistic goals for the future, which reflect individual wishes.

Strategic planning: This includes creating a strategic plan to achieve goals, with concrete steps and actions to be taken.

Flexibility: the *Life Design* process takes into account change and adaptation over the course of life, so as to allow the redefinition of goals and aspirations.

Advantages and limitations of *Life Design*

The *Life Design approach* offers many advantages, but it also presents some challenges:

Advantages:

Personal fulfillment: Help people achieve a life that reflects their true passions and aspirations.

Increased satisfaction: It promotes greater personal and professional satisfaction, as choices are based on genuine interests.

Adaptability: Provides tools to deal with life's changes and challenges with flexibility.

Limits:

Complexity: The *Life Design* process can be complex and time-consuming, especially when considering various dimensions of life.

Lack of resources: Not all people have access to Life Design consultants or tools, which can be a challenge.

Unexpected changes: Life can bring unexpected changes, which requires continual adaptability and revision of plans.

Integration and the Future of *Life Design*

Life Design can be integrated into different stages of life, from choosing education to entering the workforce and beyond. It can also be combined with other approaches, such as career guidance or self-improvement, to create a comprehensive approach to life improvement.

In conclusion, *Life Design* represents an approach that aims to empower people to create an authentic and meaningful life based on what they really want and value. It is a process that evolves over time and can contribute to greater personal fulfillment and happiness.

Climate and teaching

Climate education is an urgent educational and societal imperative, requiring a multidisciplinary, scientifically accurate, and engaging approach to ensure that students gain an in-depth understanding of climate issues and their implications.

An advanced didactic approach to the topic of "climate" requires an in-depth analysis of the following elements:

1. Solid scientific foundation: To ensure a comprehensive understanding of climate change, it is essential to provide students with a solid scientific foundation. This includes examining the causes of climate change, such as the greenhouse effect, the role of greenhouse gases, the analysis of historical climate data, and future predictions based on climate models.
2. Understanding Climate Complexities: Students are expected to address the complexities of global climate systems, including ocean dynamics, atmospheric currents, feedback effects, and regional variations. This requires an in-depth view of climatology and meteorology.
3. Climate Research Methods: To develop critical thinking and research skills, students can get involved in climate research projects. These projects may include the analysis of real climate data, the creation of simple or complex climate models, and the interpretation of scientific publications on climatology.
4. Advanced technological tools: The use of advanced digital tools can enrich the learning experience. For example, students can use climate simulation software to explore future climate scenarios or access real-time climate data to analyze local and global weather trends.
5. Disciplinary interconnections: Climate education should embrace interdisciplinarity, linking climate science with disciplines such as ecology, economics, politics, sociology, and environmental ethics. This reflects the climate's interconnectedness with multiple aspects of human society.
6. Environmental Awareness and Climate Justice: Students are expected to develop a deep awareness of environmental issues and climate justice issues. This means examining how climate change disproportionately affects vulnerable communities and developing a commitment to a sustainable and just future.
7. Continuous education: Climate education should be an ongoing process, able to adapt to changes in our scientific knowledge and emerging climate-related challenges. Teachers should be well-informed and continuously updated on climate progress.

In conclusion, an advanced didactic approach to the topic of "climate" requires a deep scientific understanding, a multidisciplinary vision, the use of advanced technological tools, and a commitment to addressing global climate challenges. This approach provides students with a solid foundation to understand climate in depth and to take informed action to address climate change.

Below are the projects for 10 lessons related to disciplines that may have different names in each country of the European Community; however, they can be tailored to specific local educational needs. In some cases, the lessons offered for certain disciplines can be successfully adapted to others that have overlapping programs. For example, some "physical education" classes (called "exercise and sports science" in Italy) can be successfully adapted to biology, anatomy, physiology, etc. Similarly, some geography lessons can easily be adapted to Earth Sciences programs, being part of the "Integrated Sciences" subject of the first year of the two-year high school course in Italy.

Art & Music

curated by Iveta Cakule (art) Teresija Pelsa (music)

Lesson No. 1 – Art in a Rural Environment

Lesson plan

Keywords: art, city

Time: 40 minutes

Scuola: pre-intermediate

Objectives
1. Evaluate objects in an urban environment. 2. Express opinions and discuss the meaning of these items.

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. The teacher shows a picture with an urban art object. Students try to guess its title, the meaning, what it is. Present the objectives of the lesson.	Art in an urban environment	Guessing, brainstorming
Summary of previous knowledge (5 minutes): The students give a name to the environment, to the art objects they have seen and know and comment when, where. They express their thoughts: Why are such objects in the environment necessary?		Discussing, expressing opinions
Presentation of new content (25 minutes): Students are divided into groups of 3. Each group chooses 1-2 environmental objects in the urban environment and discusses: why does it have a shape like this, what could it symbolize, what is its meaning? One person from each group gives feedback on the group work		Teamwork

and tells the ideas that the group has developed.		
Summary and conclusion (5 minutes) Students write the letter to thank the author of the chosen item. The teacher thanks the students, evaluates their work, and summarizes the results. Students have to do their homework to create their own objects from the urban environment that could be placed near the school.	Art in an urban environment	Individual work

Verification	Typology
Create an example of urban art	Practical work

Skills acquired
Conceptual knowledge about urban art and its significance in the environment.
Practical skills to create an urban artwork based on the knowledge gained

Lesson No. 2 – Creativity and imagination. How to create fantastic characters?

Lesson plan

Keywords: nature, fantastic characters

Time: 40 minutes

School: Elementary-Intermediate

Objectives
1. Create fantastic characters and describe them: Mother of the Wind, Mother of the Forest, Mother of Water. 2. Be able to tell the story of the character creation process.

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Show pictures with different cool characters, thinking about their names. Formulate lesson objectives.		
Summary of prior knowledge (5 minutes): Discussion: Which fantastic characters from folk tales, nature-related stories can students name. What might the Wind Mother or Water Mother look like? Describing them. You can use a slideshow with pictures and videos.	Creativity and imagination	Discussion
Introducing new content (25 minutes): Choose one of the characters and materials, what it will be made of. (Different natural materials (sticks, cones, straw), twine, glue, fabric.) Character creation.		Individual work
Summary and Conclusion (10 minutes) Presentation of the works carried out. Analyze what the character refers to, what the chosen colors symbolize, what there is in common between the materials, colors, and font. After each student's presentation, feedback, comments, evaluations from other classmates and the teacher follow.		Students' presentation

Activity Methodology

Optional activity for the following lessons: Group work: how these figures can be used to shoot a video using a ready-made story from literature or a play written by them.	Project-based learning

Presentation of ideas. Shoot a video with characters created based on a story from literature or a play written by the students themselves.	

Checks	Typology
After each student's presentation, feedback, comments, evaluations from other classmates and the teacher follow.	

Skills acquired
Promote creativity and imagination.
Ability to analyze works of art.

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Guess riddles on snow and other natural materials. Present the objectives of the lesson.	https://riddlely.com/mysterious-nature-riddles/	Puzzles
Summary of previous knowledge (5 minutes): What can you do with snow? What other materials can be used? What would snow have to be in order for it to form?		Brainstorming
Presentation of new content (25 minutes): Look at examples of how to create a molding from the snow on the tree. Choose the animals that the students will create the silhouettes of. Get out into nature, choose a tree and shape it.	Examples	Outdoor Lesson
Summary and conclusion (5 minutes) Vision of the "gallery" by all students. Evaluation.		Evaluation-discussion

Lecture No. 3 – Nature, Forms and Materials in the Work of Art

Lesson plan

Keywords: snow, molding, tree

Time: 40 minutes

School: Elementary

Objectives

Experimenting and creating an art "gallery" using snow as a material: animals created on modeling.

Activity

Evaluation:
Students express their attitude towards this work, discuss the material, its advantages and disadvantages, choose their favorite works.
Students suggest when and where similar activities can be carried out (during competitions or creative workshops).

Methodology

Critical thinking skills

Verify

Open-ended questions about the process, materials, advantages, disadvantages, etc.

Typology

Discussion

Skills acquired

Use snow as a material for works of art.

To be able to talk about your work, the materials used, express advantages and disadvantages.

Evaluate other people's work.

Lesson No. 4 – Ability to Use Positive and Negative Squares in Creating a Logo

Lesson plan

Keywords: positive and negative spaces, forest, logo

Time: 45 minutes; Extras: creating a logo can be set as homework; After the lesson, an exhibition of ready-made logos can be organized

School: Elementary or Middle School

Objectives		
1. Create a "Be Forest Friendly!" logo using positive and negative spaces in art.		
Contents	References	Methodology
Introduction (2 minutes): Welcoming students and creating a learning atmosphere. Students listen to different sounds that can be heard in the forest. Students guess them and understand that the topic of this lesson is the forest. Present the objectives of the lesson.	HTTPS://ut.v/dk1ektngva?c=1v7fckergum61forVDGP	Gamification
Summary of prior knowledge (3 minutes): Discussion- How can we show the positive areas? What about the negatives? And what about the colors, which ones are darker, which ones are lighter? (Also can be watched a presentation or discussed information).	Hatps://youtu.b/k3ux8vidssui Positive and Negative Space: How to Use It to Create Better Paintings (drawpaintacademy.com)	Discussion
Introducing new content (35 minutes) Brainstorming: how to create a logo, what silhouettes, shapes can be used, where can the slogan be placed? Students see all outlines. Together with the teacher you will find the most successful ones, discussing what else could be done to improve the work. Each student chooses a pattern, which will be made as a logo,	 Hatpas://edge.uz/B637	Brainstorming Practical work

explains their choice and listens to suggestions from the teacher and classmates. The students make their own logos and organize an exhibition. (It can be done at home or in another lesson).	 Hutpas://edge.uz/67gs	
Summary and conclusion (5 minutes) Students take the test (optional) The final products are evaluated by the teacher and the students.	https://quizizz.com/admin/quiz/5fd8e1f4d405b7001d56a1a8?source=quiz_share Hutpas://edge.uz/nunk	Information and communication technologies Self-study Peer Education

Activity	Methodology
Artwork Evaluation: Self-assessment (above given worksheet) pair-evaluation (dare un feedback basato su Praise, Question, Polishing)	Self-study Peer Education

Verify	Typology
Cross-check	Checks already prepared online

Skills acquired

Practical skills on how to create a logo.
Conceptual skills on the positive and negative fields of art.
Critical thinking skills in the evaluation of a work of art.

Lesson No. 5 – How can the forms of nature inspire the invention of art?

Keywords: shape, nature, cinquain, inspiration

Time: 45 minutes + extras: activities for the next lesson

Scuola: pre-intermediate

Objectives
1. To prepare photos of elements of nature. 2. To create your own painting based on the photo. 3. To write a cinquain on the shape in the photo.

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. The teacher shows 3 photos at the same time for ten seconds. In the photos you can see some of the melting patches of snow. After that, the students say which of the photos is the most remarkable for them. Present the objectives of the lesson.		
Summary of previous knowledge (5 minutes): Students discuss which things, objects should pay more attention to when taking pictures of objects of different shapes (patches of melting snow, trees, etc.). Students review how to write a cinquain.	https://docs.google.com/presentation/t/13bfsmrj_yugayo7a/edit?usp=sharing	Discussion
Presentation of new content (35 minutes): Students go outside and take pictures of interesting objects in nature that resemble a shape. Students return to the classroom. They give title to their photos.		Outdoor Lesson
Summary and conclusion (5 minutes)		

Each student reads his or her poem. Students vote for the best cinquain and the best photo. In the next lesson, students can tell each other what they see in their classmates' photos and suggest their ideas for a possible drawing, painting, collage, object. Students create their work inspired by their photos, cinquains, and classmates' suggestions.		Student presentations. Individual work

Skills acquired

It promotes creativity, the ability to synchronize different types of art: literature, photography, painting or sculpture, drawing etc.
Develop critical thinking and the ability to analyze and evaluate works of art.

Lesson No. 6 – Creating Musical Instruments from Natural and Recycled Materials

Lesson plan

Keywords: tool, recycled materials, natural materials, climate change

Time: 120 minutes (3 x 40 minutes)

School: secondary, upper secondary

Objectives
1. Tackling the climate crisis in music by making musical instruments from natural and recycled materials.

Contents	References	Methodology
Introduction (5 minutes): Greeting Students and Creating a Learning Atmosphere: Students Listen to a Song Global Warming and the Effects of Climate Change Video rap di SquidBooks	https://youtu.be/akhb37bprc?c=refgalner	
Summary of prior knowledge (15 minutes):		Discussion

Students are encouraged to think about how we can change our daily habits, which are often very difficult but so important to all of us on this planet. The Earth we have alone needs to be fed. Humans have done a lot of damage to nature, and as a result, we are seeing a lot of climate change. The students are involved, then a discussion is held on this urgent issue. Present the objectives of the lesson: a common song written by them, including rap elements, sung by the pupils to the accompaniment of self-made musical instruments.		
Introducing new content (20+ 40+30 minutes): Lesson 1 - Talk about the phases of project work. Write the lyrics of a song. Lesson 2 - collection of natural and other materials (homework) and construction of different musical instruments. Lesson 3 - compose a song using the lyrics written in the 1st lesson. Presentation of the finished song.	8 Tips for Writing Copy Like a Pro (emastered.com) Hatps://youtu.b/7sunksa4niki?c=projection7 https://docs.google.com/presentation/d/1QbWwk6qbSt9bAZMbztU7p6a-XoPBYm5itLZwQffnS1g/edit?usp=sharing	Project-based learning Presentation
Summary and conclusion (10 minutes) Evaluate the final products - musical instruments, their		

sound, song lyrics, a song together, group work - using the praise technique - ask.

Activity	Methodology
Assessment Technique- Praise- Ask- Suggest: 1. Everyone only says the positive aspects of the job, the presentation, what are the benefits, they think they like them. 2. Students are asked questions that are not clear to them. 3. Students give constructive suggestions on what a presenter could do to improve his song, his instrument, his lyrics; what you might do next time when working in a team, etc.	Evaluation

Checks	Typology
Assessment is done after each lesson, because the work is quite challenging, and there are both teacher and classmate assessments, as well as self-assessments. After all evaluations, an overall grade is awarded.	

Skills acquired
Ability to collaborate and communicate during group work and discussions.
Provide and receive constructive feedback on project work.
Creativity: Create a musical instrument with different materials found around and write lyrics and compose and perform a song.

Lesson No. 7 – Solving the Problems of Climate Crises in Music

Lesson plan

Keywords: climate change, global warming, greenhouse effect

Duration: 45 minutes for 5 lessons

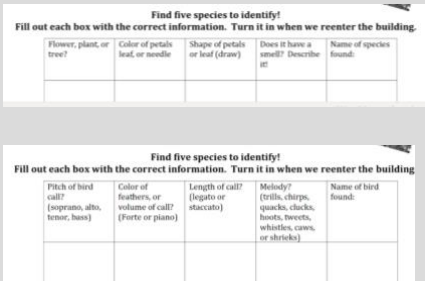
School: Elementary and up

Objectives
1. Effectively identify different species of plants and trees in and around our school campus. 2. Work positively in a group in order to create a unique climate song using the correct meter and rhythm skills. 3. Discuss and successfully learn the main vocabulary terms related to climate change.

Contents

References

Methodology

Introduction (2 minutes): Welcoming students and creating a learning atmosphere. Show students pictures of plants, birds, animals, trees they may have seen. Present the objectives of the lessons.		Lecture, prediction
Summary of prior knowledge (43 minutes): Lesson 1 Create flashcards. Create sound and visual maps. Complete a chart. Make a list of plants, birds, trees that you plan to find in the wild. Review how to be an active listener, behavior, and safety rules in nature. Examine the identification of the implant. Listen to local birds and review bird identification. Review your rhythm and measurement skills. Create four-beat bars in groups. Using the created flashcards, discuss vocabulary specific to nature and climate change: greenhouse effect, climate, climate change, global warming.		Practical work Teamwork Lectures
Introducing new content (45 minutes): Lesson 2 Outside: Get ready for a walk (equipment, rules, clothes, etc.) Along the way, stop several times to identify sounds, flowers, plants, etc. Give feedback on the walk. Lesson 3 In the classroom:	 Htaps://ClimateKid. NASA.Gov	Outdoor Lesson Evaluation

Answer the questions. Segway music. Use the created flashcards to review vocabulary. Explore the content of the website. Discussion Watch a video Discussion Lesson 4: In the classroom Write a song.	https://youtu.be/UCZmLFeK3TM?si=DLSiSrfa5VlaHuHV	Peer work Discussion Ability to read, listen Discussion Creative work
Summary and conclusion (20-45 minutes) Lesson 5: Perform the songs. Provide performance feedback. Musical skills to be assessed: steady rhythm, rhythmic writing, vocal expression. Evaluation: Positive and engaged participation, successful collaboration, creative input in discussions, group sharing, deliverables.		Presentation Evaluation

Activity	Methodology
Create flashcards with plants, flowers, trees, and birds from our region with the rhythm value written underneath. E.g.: Fireweed= ti ti ta o tri-pi-le.	Practical work
Create sound and visual maps with a grid for students to embark on an adventure in the forest.	Skills
The students ask each other about the identification of the simple species that are the subject of the lesson. Students assign each card an instrument to play as they say the name aloud. Example: Twisted shank (ti ta played on Guiro).	Teamwork Evaluation
Give feedback on the walk: What was your favorite view? What was the most peculiar sound? Is there anything you've never seen?	Discussion
Answer the questions: Why is it important to appreciate and love our natural world? How can we	Evaluation

use music to help others appreciate and respect our natural world? Segway in sharing music videos about the climate; After each video, ask students to share: Something they enjoyed musically, Something they learned about our climate, Something they think we should tell others.	
Explore & Share Content: NASA Kids Ask BIG QUESTIONS Use the site to explore a topic of interest (allow the class to select) and use classmates to allow children to read on their own and ask questions. Follow up with a short class discussion.	Peer work, e-skills Discussion
Review rhythmic and musical skills. Divide into small groups to review the rhythm count and create measures of four. Give each group the week's buzzwords: plants, climate change glossary to create sentences that can fit into four lines.	Teamwork
Writing a song: ○ Select popular melodies that children vote for (nursery rhymes, pop songs, patriotic melodies, etc.) ○ Select the theme of the song the kids vote on (loving nature, what's in our backyard, the changing climate) ○ Share the watchwords to use for a particular theme and write them on the board so the children can refer to them ○ Divide students into groups to write eight 4-bar bars (one verse) for our song. Each group will produce their own music on blank sheets of writing paper.	Creative work
As students work, the teacher will create and write the chorus of the song on the board. Fill in the verses and share a draft of the song with others at the end of the lesson. Improve your performance.	Evaluation

Checks

Typology

Semi-structured testing	Discuss the teacher's suggested questions

Skills acquired

She participates in dance, theater, music, visual arts, and creates writing.
Hone artistic skills and develop self-discipline through rehearsals, practice, and revision.
Appropriately use new and traditional materials, tools, techniques, and processes in the arts.
Demonstrate the creativity and imagination necessary for innovative thinking and problem-solving.

Collaborate with others to create and execute artwork.

Improvise rhythmic and melodic ideas and describe the connection to a specific purpose and context

Present the final version of the music to others and describe the connection to the expressive intent

Lesson No. 8 – Musical Games on the Environment

Lesson plan

Keywords: music, animals, improvisation

Time: 60 minutes

School: Elementary and up

Objectives
Listen to music, take notes, and analyze it. Working in a group and performing sounds, using body language to

Contents	References	Methodology
Introduction (1 minute): Welcoming students and creating a learning atmosphere. Present the objectives of the lesson.		
Summary of prior knowledge (5 minutes): Make a list of tips on how to analyze a piece of music.		Brainstorming
Introducing new content (50 minutes): Listen to the music track (no video) Take notes, analyze music Teamwork Discuss your analysis, compare with classmates Choose a musical excerpt (every group is different, preferably) and perform it, using	Saint-Saëns - Carnival of the Animals https://utu.v/umosnil-lapikke?c=ionpaw83okvial	Analysis, Critical Thinking Cooperation Creativity

imagination and creativity, body language. Present your performance to the class		
Summary and conclusion (5 minutes) Evaluate, analyze your performance Suggestions, comments		Discussion Evaluation

Activity	Methodology
Take notes: - Which animals can be presented in music? - What is the atmosphere of each piece of music? - What music is used to describe each character?	Note-taking

Checks	Typology
Questions: What was the most fun thing about the task? What was the biggest challenge? What problems occurred during the group work? What new skills have you acquired? What would you do differently another time? What would you suggest to other bands to do for their performances?	Class Discussion

Skills acquired
Pensiero critico Creativity Cooperation Communication

Lesson No. 9 – Nature and Environmental Issues in Folklore

Lesson plan

Keywords: nature, rondo, G major

Time: 45 minutes

School: Elementary

Objectives
1. Create a sound painting in the shape of a rondo. 2. Nature as a source of inspiration can be found in a wide variety of musical genres. 3. Nature and images of nature are represented in folklore, classical music, and contemporary music.

Contents	References	Methodology
Introduction (2 minutes): Welcoming students and creating a learning atmosphere. Listen to the excerpt of the music. Present the objectives of the lesson.	https://youtu.b/njlo6kadjia?C=6F9Mo5V1Miss-One	
Summary of prior knowledge (3 minutes): Create your own reminder for the rondo		
Introducing new content (35 minutes): Coloring Volatile Grades Color the sounds of the triple tonic of G major Write trii tonic Evaluate yourself Answer Listen and sing Estimate Arrange the motifs according to the shape of the roundabout How many rhythm variations are possible	https://drive.google.com/file/d/1l2goeRh5JtJUFk5QRyKECLM7tXfy8Bl-/view?usp=sharing	Individual work

Create Your Own Musical Landscapes		
Summary and conclusion (5 minutes)		
Self-evaluation Group Assessment		Evaluation

Activity	Methodology
Use a worksheet, do tasks	Individual work

Checks	Typology
Cross-check	Assessment prepared by the teacher

Skills acquired

Telling by listening: - if a piece is in the form of a rondo; - the atmosphere of the music; - tell and write how different natural phenomena are represented in music; - Know the instruments by their timbre.
Comparing the two pieces, describe what they have in common and what they have in common: - the performers - who sings, who sings, the instruments play, who plays; - distinguish between soloist and orchestral, ensemble; -time; - Determine the size.
Create Music: - recognize G major in sheet music; - write and sing the tonic triplet of G major; - sing the G major range with international precision; - sing a Latvian folk song about nature; - Play a sound painting in a group.

Identify the characteristics of the musical genres studied:

- describe in my own words how a popular song differs from an original song;
- identify the common and distinctive traits of vocal and instrumental music.

Create a performance for the group:

- create and perform your own example in the form of a rondo (rhythm or melody);
- singing;
- play individually and with others (in the form of a rondo);
- together with others, create sound paintings that represent different phenomena of nature (sea, wind, forest, storm) with sound gestures, movements, voice or instruments.

Lesson No. 10 – Song of the Earth

Lesson plan

Keywords: tree, song

Time: 40 minutes

School: Elementary and up

Objectives	
1. Get to know the music about nature and the forest.	
2. Promote listening to nature.	
3. Compose a hymn and write the lyrics.	

Contents	References	Methodology
Introduction (10 minutes): Welcoming students and creating a learning atmosphere. Listen to music by famous composers. Listen to the sounds of the birds. Try to guess who it is. Present the objectives of the lesson.	https://utu.v/vija1ksuxli?c=rkN9beldk5JK https://www.lsm.lv/raksts/dzive--stils/vide-un-dzivnieki/putni-vitero-noklausies-26-putnu-dziesmas.a80313/ https://dabasdati.lv/lv/cat/275	Individual work
Summary of prior knowledge (5 minutes): Identify trees in images	https://enchantedlittleworld.com/learn-how-to-identify-trees-and-leaves/	Peer work

Introducing new content (20 minutes): Listen to the sounds of nature. Listen and compose.	https://docs.google.com/document/d/13URkkXt9GKbLX44dPHYHRI7YymfLBzyJPEbx7CtX5Nc/edit?usp=sharing	Individual work
Summary and conclusion (5 minutes) Present the hymn to the tree. Voting and debate.		Presentation Evaluation

Activity	Methodology
Listen to pieces by famous composers, such as Finnish composer Sibelius "Spruce", "Birch", "Aspen", "When the Rowan Blooms", "Solitary Pine". Write down the emotions, the associations, draw a picture of the music you listened to.	Individual work
Listen to the sounds of nature: Get outside, close your eyes for a few minutes, listen to the sounds around, share your experiences	Creativity, imagination
Voting and debates: Vote for the favorite, the most successful anthem; discussing the tree and the sounds involved in the song.	Evaluation

Checks	Typology
Presentation	Evaluation

Skills acquired

Socially Emotional Learning
Listen and pay attention to nature
Composition skills, writing lyrics
Fostering creativity
Using nature as a source of creativity and inspiration

Biology

a cura di Kalina Klikczynska

Lesson No. 1 – What My Environment Is

Lesson plan

Keywords: environment, climate, food chain

Hours: 30 minute class, 15 minute activity

School: 10th grade

Objectives
Provide basic knowledge on the subject. Promote critical thinking and in-depth analysis of the topic Actively involve students in the learning process. Promote a deep understanding of the topic

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Present the goal of the lesson and what students will learn.		Conceptual knowledge: key concepts related to the idea of environment
Summary of prior knowledge (15 minutes): Remember concepts or information learned in previous lessons related to the current topic. Establish a connection between past and present content.	Hats://youu.b/nf1dmuxude?c=joke94kolbalhevar	Critical thinking: proposing a connection between ideas based on logical reasoning
Presentation of new content (15 minutes): Detailed explanation of the key topics of the lesson. Use of slides, diagrams, examples, or visual materials to facilitate understanding.	https://youtu.be/2lqhJNgn_Wg?si=Og44eQJjexWJL4es	Problem-solving skills

Answer students' questions and encourage active participation.		
Summary and conclusion (10 minutes): Summarizing the key points of the lesson and the main conclusions. Reinforce the lesson objective and the skills students have acquired. Provide any additional resources or assignments for the next lesson.	https://youtu.be/UiTDPHC9DjY?si=au4N0QUEKfE6iNoa	Pensiero critico

Activity	Methodology
Group activity: discussion to find a connection between certain parts of the environment Presenting Ideas from Group Discussions	Collaboration and communication skills

Verification	Typology
Cross-check	Human and non-human part of the environment

Skills acquired
Problem solving

Lesson No. 2 – Using Water

Lesson plan

Keywords: water, water scarcity

Hours: 20 minute class, 15 minute activity

School: 10th-12th grade

Objectives
1. Provide basic knowledge on the subject. 2. Promote critical thinking and in-depth study of the subject 3. Actively involve students in the learning process. 4. Promote a deep understanding of the topic

Contents	References	Methodology
Introduction (5 minutes):		Conceptual knowledge: key concepts related to

Welcoming students and creating a learning atmosphere. Present the goal of the lesson and what students will learn. Water scarcity problem		the idea of environment
Summary of prior knowledge (10 minutes): Remember concepts or information learned in previous lessons related to the current topic. Establish a connection between past and present content.	https://youtu.be/JyzvcrZluf0?si=KTWNJRG0sDyWRSaf	Critical thinking: proposing a connection between ideas based on logical reasoning
Presentation of new content (15 minutes): Detailed explanation of the key topics of the lesson. Use of slides, diagrams, examples, or visual materials to facilitate understanding. Answer students' questions and encourage active participation.	Graphs: Water Usage https://ut.v/on9rpwg?c=_ri8ak3u8bsf8o	Problem-solving skills
Summary and conclusion (5 minutes): Summarizing the key points of the lesson and the main conclusions. Reinforce the lesson objective and the skills students have acquired. Provide any additional resources or assignments for the next lesson.	HTDPS://ut.v/B1F-K6V3Vo?C=KAFGMI7K2PV3VVT	Pensiero critico

Activity	Methodology
Group activities: filling the charts: how much water we use in the kitchen, etc Presenting Ideas from Group Discussions	Collaboration and communication skills

Verification	Typology
Cross-check	Water Use, Freshwater, Salt Water

Skills acquired

Problem solving

Lesson No. 3 – The Two Faces of Wind Energy

Lesson plan

Keywords: wind energy, windmill

Hours: 20 minute class, 15 minute activity

School: 10th-12th grade

Objectives

5. Provide basic knowledge on the subject.
6. Promote critical thinking and in-depth study of the subject
7. Actively involve students in the learning process.
8. Promote a deep understanding of the topic

Contents	Reference	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Present the goal of the lesson and what students will learn.		Conceptual knowledge: key concepts related to the idea of environment
Summary of prior knowledge (10 minutes): Remember concepts or information learned in previous lessons related to the current topic. Establish a connection between past and present content.	HTTPS://ut.v/c9g94Sevica?c=cvP95_rvLuir7ppd	Critical thinking: proposing a connection between ideas based on logical reasoning
Presentation of new content (15 minutes): Detailed explanation of the key topics of the lesson. Use of slides, diagrams, examples, or visual materials to facilitate understanding.	https://humangerny.us/economics-renewable-energy-u-s/?gsilide=cjvickiakt-dbbsivath-ggl1hztez_littsls63D127hdb5JPfk_gv09IS3H3AK97scheschbach-kcawed_bv https://www.enelgreenpower.com/learning-hub/renewable-energies/wind-energy/advantages-wind-energy	Problem-solving skills

Answer students' questions and encourage active participation.	https://www.energy.gov/eere/wind/advantages-and-challenges-wind-energy	
Summary and conclusion (5 minutes): Summarizing the key points of the lesson and the main conclusions. Reinforce the lesson objective and the skills students have acquired. Provide any additional resources or assignments for the next lesson.	https://youtu.be/m7Ek3yYAOlg?si=v_q2GSPGiWZvECjq	Pensiero critico

Activity	Methodology
Group Activity: Discussion based on topics found online	Collaboration and communication skills

Verification	Typology
Cross-check	Renewable energy, energy crisis, fossil fuels

Skills acquired
Problem solving

Lesson No. 4 – The Food Supply Chain

Lesson plan

Keywords: wind energy, windmill

Hours: 30 minute class, 15 minute activity

School: 10th-12th grade

Objectives
9. Provide basic knowledge on the subject. 10. Promote critical thinking and in-depth study of the subject 11. Actively involve students in the learning process. 12. Promote a deep understanding of the topic

Contents	References	Methodology
Introduction (5 minutes):		Conceptual knowledge: key concepts related to

Welcoming students and creating a learning atmosphere. Present the goal of the lesson and what students will learn.		the idea of environment
Summary of prior knowledge (10 minutes): Remember concepts or information learned in previous lessons related to the current topic. Establish a connection between past and present content.	https://youtu.be/j78g5iRnYBM?feature=shared	Critical thinking: proposing a connection between ideas based on logical reasoning
Presentation of new content (10 minutes): Detailed explanation of the key topics of the lesson. Use of slides, diagrams, examples, or visual materials to facilitate understanding. Answer students' questions and encourage active participation.	https://youtu.be/5z8rakhsuyag?c=f6vrm9ujay8fzpf	Problem-solving skills
Summary and conclusion (5 minutes): Summarizing the key points of the lesson and the main conclusions. Reinforce the lesson objective and the skills students have acquired. Provide any additional resources or assignments for the next lesson.	https://youtu.be/og3ls1bktgk?c=J4Vasherlub7F71BCI	Pensiero critico

Activities (one or more)	Methodology
Group Activity: Discussion based on topics found online	Collaboration and communication skills

Verification (one or more)	Typology
Cross-check	Carnivores, herbivores, omnivores, consumers, producers, destroyed

Skills acquired

Problem solving

Lesson No. 5 – Pollution of the Environment

Lesson plan

Keywords: pollution, pollutant, chemicals

Hours: 30 minute class, 15 minute activity

School: 10th-12th grade

Objectives

- 13. Provide basic knowledge on the subject.
- 14. Promote critical thinking and in-depth study of the subject
- 15. Actively involve students in the learning process.
- 16. Promote a deep understanding of the topic

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Present the goal of the lesson and what students will learn.	HTDPS://ut.v/IP5KGJC?C=K9GN0P4UPSU0Y	Conceptual knowledge: key concepts related to the idea of environment
Summary of prior knowledge (10 minutes): Remember concepts or information learned in previous lessons related to the current topic. Establish a connection between past and present content.	https://quizizz.com/admin/quiz/63aec9fe19dd09001da42d37?source=quiz_share	Critical thinking: proposing a connection between ideas based on logical reasoning
Presentation of new content (10 minutes): Detailed explanation of the key topics of the lesson. Use of slides, diagrams, examples, or visual materials to facilitate understanding.	Hattapus://youtu.b/stankai5kuk0?c=djl1ubkbikyak	Problem-solving skills

Answer students' questions and encourage active participation.		
Summary and conclusion (5 minutes): Summarizing the key points of the lesson and the main conclusions. Reinforce the lesson objective and the skills students have acquired. Provide any additional resources or assignments for the next lesson.	https://youtu.be/MQLadfsvfLo?feature=shared	Pensiero critico

Activities (one or more)	Methodology
Group Activity: Discussion based on trivia questions	Collaboration and communication skills

Verification (one or more)	Typology
Cross-check	Pollution, pollutants, environment

Skills acquired
Problem solving

Lesson No. 6 – Natural Disasters – Water

Lesson plan

Keywords: flood, tornado, disaster

Hours: 20 minute class, 15 minute activity

School: 10th-12th grade

Objectives
17. Provide basic knowledge on the subject. 18. Promote critical thinking and in-depth study of the subject 19. Actively involve students in the learning process. 20. Promote a deep understanding of the topic

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere.	Hats://youu.b/b1hgmoz?C=Hzwegeorgs3JLBI	Conceptual knowledge: key concepts related to the idea of environment

Present the goal of the lesson and what students will learn.		
Summary of prior knowledge (10 minutes): Remember concepts or information learned in previous lessons related to the current topic. Establish a connection between past and present content.	Hattapus://youtu.b/myger8?c=ganejjhfga va6-jalanj	Critical thinking: proposing a connection between ideas based on logical reasoning
Presentation of new content (10 minutes): Detailed explanation of the key topics of the lesson. Use of slides, diagrams, examples, or visual materials to facilitate understanding. Answer students' questions and encourage active participation.	https://quizizz.com/admin/quiz/63aebc64595ced001ebc772c?source=quiz_share	Problem-solving skills
Summary and conclusion (5 minutes): Summarizing the key points of the lesson and the main conclusions. Reinforce the lesson objective and the skills students have acquired. Provide any additional resources or assignments for the next lesson.	https://youtu.be/mUBxtTEOiPl?si=k7Mc-xFrg6ZI9D7Z	Pensiero critico

Activity	Methodology
Group Activity: Discussion based on trivia questions	Collaboration and communication skills

Verification	Typology
Cross-check	Oceans, rivers, floods, tornadoes

Skills acquired
Problem solving

Lesson No. 7 – Microplastics

Lesson plan

Keywords: microplastic, nano plastic, pollution

Hours: 20 minute class, 15 minute activity

School: 10th-12th grade

Objectives
21. Provide basic knowledge on the subject. 22. Promote critical thinking and in-depth study of the subject 23. Actively involve students in the learning process. 24. Promote a deep understanding of the topic

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Present the goal of the lesson and what students will learn.	https://u2.bay/kixrota0tyi?c=inufzu_3gbe0cggi	Conceptual knowledge: key concepts related to the idea of environment
Summary of prior knowledge (10 minutes): Remember concepts or information learned in previous lessons related to the current topic. Establish a connection between past and present content.	https://youtu.be/NsztcDYe7kk?si=OL-G9vW--jqKfys9	Critical thinking: proposing a connection between ideas based on logical reasoning
Presentation of new content (10 minutes): Detailed explanation of the key topics of the lesson. Use of slides, diagrams, examples, or visual materials to facilitate understanding.	https://quizizz.com/admin/quiz/63f5e6be8e126001e6750fe?source=quiz_share	Problem-solving skills

Answer students' questions and encourage active participation.		
Summary and conclusion (5 minutes): Summarizing the key points of the lesson and the main conclusions. Reinforce the lesson objective and the skills students have acquired. Provide any additional resources or assignments for the next lesson.		Pensiero critico

Activity	Methodology
Group Activity: Discussion based on trivia questions	Collaboration and communication skills

Verification	Typology
Cross-check	Microplastics, nanoplastics, pollution

Skills acquired
Problem solving

Lesson No. 8 – Feeding the World

Lesson plan

Keywords: fair trade, equality, fairness

Hours: 30 minute class, 15 minute activity

School: 10th-12th grade

Objectives
25. Provide basic knowledge on the subject. 26. Promote critical thinking and in-depth study of the subject 27. Actively involve students in the learning process. 28. Promote a deep understanding of the topic

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere.		Conceptual knowledge: key concepts related to the idea of environment

Present the goal of the lesson and what students will learn.		
Summary of previous knowledge (5 minutes): Remember concepts or information learned in previous lessons related to the current topic. Establish a connection between past and present content.	HTTPS://ut.v/etu560qq?c=RGKK14S	Critical thinking: proposing a connection between ideas based on logical reasoning
Presentation of new content (10 minutes): Detailed explanation of the key topics of the lesson. Use of slides, diagrams, examples, or visual materials to facilitate understanding. Answer students' questions and encourage active participation.	Hats://vv.fairtrade.org.pl/Fairtrade/Zanki/ https://www.fairtrade.net/product	Problem-solving skills
Summary and conclusion (5 minutes): Summarizing the key points of the lesson and the main conclusions. Reinforce the lesson objective and the skills students have acquired. Provide any additional resources or assignments for the next lesson.	https://youtu.be/AkZDqRq0GTg?si=MwtdpcUJVPaRTed5	Pensiero critico

Activity	Methodology
Group Activity: Discussion based on trivia questions	Collaboration and communication skills

Verification	Typology
Cross-check	Fair trade, food supply chain, the supplier, the consumer

Skills acquired
Problem solving

Lesson No. 9 – How to Create a Sustainable Future (Part 1)

Lesson plan

Keywords: sustainable, ethical, moral

Hours: 40 minute class, 15 minute activity

School: 10th-12th grade

Objectives
29. Provide basic knowledge on the subject. 30. Promote critical thinking and in-depth study of the subject 31. Actively involve students in the learning process. 32. Promote a deep understanding of the topic

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Present the goal of the lesson and what students will learn.		Conceptual knowledge: key concepts related to the idea of environment
Summary of previous knowledge (5 minutes): Remember concepts or information learned in previous lessons related to the current topic. Establish a connection between past and present content.	Create a Mind Map: Environmental Unethical Behavior https://utu.v/jkd0yaduk?c=f-bk6thmilgam2	Critical thinking: proposing a connection between ideas based on logical reasoning
Presentation of new content (10 minutes): Detailed explanation of the key topics of the lesson. Use of slides, diagrams, examples, or visual materials to facilitate understanding. Answer students' questions and encourage active participation.	Creating a Mind Map: Sustainable (Ethical) Environmental Behavior	Problem-solving skills

Summary and conclusion (5 minutes): Summarizing the key points of the lesson and the main conclusions. Reinforce the lesson objective and the skills students have acquired. Provide any additional resources or assignments for the next lesson.	https://youtu.be/3rQi2uNqwxk?si=qshlnZ--tOLq2Xi	Pensiero critico

Activity	Methodology
Group Activities: Discussion, Mind Mapping	Collaboration and communication skills

Verification	Typology
Cross-check	Sustainable, pollution, child labour

Skills acquired
Problem solving

Lesson No. 10 – How to create a sustainable future (part 2)

Lesson plan

Keywords: sustainable, waste, food scarcity

Schedule: 60 minute class, 15 minute activity

School: 10th-12th grade

Objectives
33. Provide basic knowledge on the subject. 34. Promote critical thinking and in-depth study of the subject 35. Actively involve students in the learning process. 36. Promote a deep understanding of the topic

Contents	References	Methodology
Introduction (10 minutes): Welcoming students and creating a learning atmosphere. Present the goal of the lesson and what students will learn.		Conceptual knowledge: key concepts related to the idea of environment

Summary of prior knowledge (10 minutes): Remember concepts or information learned in previous lessons related to the current topic. Establish a connection between past and present content.	https://w.mars.pr/n/mars-and-you/news/blog/the-basic-rules-of-zero-waste	Critical thinking: proposing a connection between ideas based on logical reasoning
Presentation of new content (10 minutes): Detailed explanation of the key topics of the lesson. Use of slides, diagrams, examples, or visual materials to facilitate understanding. Answer students' questions and encourage active participation.	https://www.trvst.world/sustainable-living/eco-friendly/how-to-promote-zero-waste/	Problem-solving skills
Summary and conclusion (10 minutes): Summarizing the key points of the lesson and the main conclusions. Reinforce the lesson objective and the skills students have acquired. Provide any additional resources or assignments for the next lesson.	https://ut.v/ojon67u?c=wall9pin6tj87A	Pensiero critico

Activity	Methodology
Group Activities:Discussion	Problem solving

Verification	Typology
Cross-check	Zero Waste Policy

Skills acquired
Problem solving

Chemistry

a cura di Damian Paruszevska

Lesson No. 1 – Sand Filter

Lesson plan

Keywords: wastewater treatment, filtration, filter baffles, wastewater

Hours: 45 minutes lecture, 2 hours laboratory exercises, 45 minutes test, any additional external activities - visit to the purification plant

School: Upper Secondary School

Objectives
1. Provide basic knowledge about wastewater treatment 2. Empowering students to apply their knowledge in practice 3. Promote a deeper understanding of the topic 4. Developing dexterity in students

Contents	References	Methodology
Introduction (5 minutes): Welcome students and create an atmosphere conducive to learning. Introduce the purpose of the lesson and what students will learn. Conference	https://royalbrinkman.pl/bank-wiedzy/projekty-techniczne/jak-dziala-filtr-piaskowy	Pensiero critico Watch a video
Summary of prior knowledge (10 minutes): Discussion of the Filtration Principle Lecture, Brainstorming		Class Discussion

Presentation of new content (20-30 minutes): Introduction to the construction of a sand filter and its principle of operation Laboratory exercises - demonstration, autonomous work of students in pairs Answering students' questions and encouraging active participation (5 minutes) Question analysis Discussion	Prepare a glass tube with a diameter of 10 mm and a length of 60 cm, attach a semi-permeable membrane (gauze, bandage) on one side. Introduce about 40 cm of sand into the pipe, starting with very small grains of sand and ending with large grains of sand. Assemble the hose with the soil firmly upright and pour cold water over it. Crush about 10 g of powdered blackboard chalk and mix with 100 cm³ of water. Pass the resulting suspension through a constructed sand filter.	Laboratory exercises
Summary and conclusion (5 minutes): Summary of the key points of the lesson and main conclusions Table of Contents	1. What observations can be made after performing the exercise? The sand filter is one of the simplest filters. Sand particles trap solids from the water, and only water passes through. 2. Can such a filter be used for wastewater treatment? This type of filter is often used to clean wastewater from pollutants. 3. What are the advantages of a sand filter? The filter is cost-effective and renewable 4. What are the disadvantages of the sand filter? Purification takes a long time	Evaluation

Activity	Methodology
Performing a laboratory exercise. Handiwork	

Verification**Typology**

Structured test Tests prepared by the teacher

Skills acquired

Ability to apply soil properties

Practical skills in building a filter with soil and conducting adsorption

Ability to understand the problem of wastewater treatment

Practical use of the acquired knowledge

Lesson No. 2 – Fume Absorption – Fume Purification**Lesson plan**

Keywords: absorption, exhaust gases, air pollutants

Hours: 45 minutes lecture, 2 hours laboratory exercise, 45 minutes test, any additional external activities - visit to the cogeneration plant

School: Upper Secondary School

Objectives

1. Provide basic knowledge on gas treatment
2. Provide a basic understanding of air and its pollutants
3. Provide basic knowledge on absorption
4. Empowering students to apply their knowledge in practice
5. Promote a deeper understanding of the topic
6. Developing dexterity in students

Contents	References	Methodology
Introduction (5 minutes): Welcome students and create an atmosphere conducive to learning. Introduce the purpose of the lesson and what students will learn. Conference		Class Discussion
Summary of prior knowledge (10 minutes): Discuss the principle of absorption, retrieve information on air composition and air pollutants Lecture, brainstorming		Class Discussion Pensiero critico Brainstorming
Presentation of new content (25 minutes): Introduction to the construction of an absorption kit, analysis of the phenomenon Laboratory exercises - demonstration, autonomous work of students in pairs	Exercise Prepare a calcium hydroxide solution by weighing about 5 g of solid calcium hydroxide and pouring 200 cm³ of water over it. Strain the resulting suspension through a filter paper to obtain a clear filtrate. Insert a tube into the resulting clear solution and blow air out of your lungs.	Laboratory exercises

Summary and conclusion (10 minutes):	1.What observations can be made during the exercise?	Evaluation
Answer pupils' questions and encourage active participation	After a while, the clear/clarified solution becomes cloudy under the influence of carbon dioxide in the exhaled air. Carbon dioxide is absorbed by the liquid	
Question Analysis	2.Why was the gas (carbon dioxide) absorbed?	
Discussion	A chemical reaction occurred between the carbon dioxide and the calcium hydroxide, resulting in calcium carbonate precipitate	
Summary of the key points of the lesson and main conclusions Table of Contents	3.Can we absorb other gases in this way?	
	Absorption is an example of how a liquid can absorb gases. In the same way, we can absorb some components of exhaust gases such as carbon dioxide, sulfur dioxide.	
	4.Why are carbon dioxide and sulfur dioxide so dangerous to the environment?	
	Carbon dioxide and sulfur dioxide are involved in the formation of acid rain	
	5.Can the absorption method be used in industry?	
	Yes, it is often used not only for carbon dioxide and sulfur dioxide, but also for other substances.	
	6.Can the absorption method be used on ships?	
	Yes, it is used to remove sulfur dioxide from exhaust gases	

Activity	Methodology
Performing a Laboratory Exercise Manual Work	

Verification	Typology
Structured test Teacher-prepared tests	

Skills acquired

- | |
|---|
| 1. The ability to identify air pollutants and methods for their removal |
| 2. Practical skills to build an absorption kit and carry out purification |
| 3. Ability to understand the problem of gas purification |
| 4. Ability to solve urban dust problems |

Lesson No. 3 – Exhaust Gas Pollution

Lesson plan

Keywords: flue gases, air pollutants

Hours: 45 minutes of lessons, 45 minutes of testing, possible additional outdoor activity - visit to the cogeneration plant

School: Upper Secondary School

Objectives
1. Provide basic knowledge on gas treatment
2. Introduce basic knowledge about air and its pollutants
3. Enable pupils to apply their knowledge in practice
4. Promote a deeper understanding of the topic
5. Developing Critical Thinking in Students

Contents	References	Methodology
Introduction (5 minutes): Welcome students and create an atmosphere conducive to learning. Introduce the purpose of the lesson and what students will learn. Conference	https://kongskilde-industries.com/industrial/pl/zastosowania/dedusting-and-separation-systems/	Class Discussion
Summary of prior knowledge (10 minutes): Retrieval of information on air composition and air pollutant	https://www.advancedcyclonesystems.com/pl/hurricane/ Hatpas://vv.youtube.com/watch?v=jgennclundg	Watch a video Class Discussion Brainstorming
Presentation of new content (20 minutes): Familiarization with the problems of environmental pollution by dust and gases.	Hatps://vv.youtube.com/watch?v=v8zftby-4 https://mappingair.meteo.uni.wroc.pl/2020/07/metody-oczyszczania-spalin-w-paleniskach-domowych/	Pensiero critico Peer work Conference
Summary and conclusion (10 minutes): Answer students' questions and encourage active participation Question Analysis Discussion Summary of the key points of the lesson and main conclusions Table of Contents	1. How can we dust exhaust gases in industry and homes? The easiest way is to use chambers with baffles that are permeable to gases and not permeable to solids. Dust-laden gas can be passed through a variety of fabric filters, or dust-laden gas can be passed through a stream of water that holds solids. 2. What can devices that use electricity for dust extraction be called? Devices of this type are called electrostatic precipitators. 3. How can such devices work? The dust flowing through the device under the influence of electricity collects electrical charges, which force it to flow towards the wall of the electrostatic precipitator on which the dust settles. The appliance	Evaluation

system automatically cleans the walls of the device of excess dirt.

4. Is the electric current method for dust extraction effective?

The method that uses electric current is one of the most effective methods of air purification and can be used in households.

Activity	Methodology
Analysis of the Discussion topic	

Verification	Typology
Structured test Teacher-prepared tests	

Skills acquired

1. Ability to identify air pollutants and methods of their removal
2. Ability to understand the problem of gas treatment
3. Ability to solve the problem of urban dustiness
4. Ability to analyze the degree of air pollution

Lesson No. 4 - Soil Adsorption Properties

Lesson plan

Keywords: wastewater treatment, adsorption, wastewater, soil absorption properties

Hours: lecture 45 minutes, laboratory exercises 2 hours, test 45 minutes

School: High School

Objectives
1. Provide basic knowledge about wastewater treatment 2. Enable students to apply knowledge in practice 3. Promote a deeper understanding of the topic 4. Develop students' dexterity 5. Know the use of land properties 6. Ability to propose a wastewater treatment method Table of Contents References Methodology

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating an atmosphere conducive to learning. Present the purpose of the lesson and what students will learn. Conference	Hats://vv.youtube.com/watch?v=5kupka pjal4	Watch a video
Summary of prior knowledge (10 minutes): Discussion of the Filtration Principle Lecture, Brainstorming	https://vv.youtube.com/watch?v=ijvik7 w 8	
Presentation of new content (20-30 minutes): Familiarization with the construction of a soil-filled filter and its principle of operation	Prepare a glass tube with a diameter of 10 mm and a length of 60 cm, attach a semi-permeable membrane (gauze, bandage) on one side. Insert about 40 cm of potting soil into the pipe. Securely fasten the hose with the soil in an upright position and pour cold water over it. Prepare a solution consisting of tap water and a few drops of ink. Slowly pass the resulting mixture of water and ink through the soil, observing the changes.	Problem-solving skills Laboratory exercises Demonstration Self-employment of students in pairs

Summary and conclusion (5 minutes): Summarizing the key points of the lesson and the main conclusions. Reinforce the lesson objective and the skills students have acquired. Provide any additional resources or assignments for the next lesson.	1. Why was the ink absorbed? The medium has adsorption properties, i.e. after passing the mixture through the layer, the ink is absorbed. We get clear, clean water. 2. Can soil properties be used to treat municipal wastewater? Yes 3. What are the advantages of this purification method? The method is simple and inexpensive. No large amounts of chemicals are used 4. What are the disadvantages of this purification method? The cleaning method is slow. Large amounts of soil are required	Pensiero critico Evaluation

Activity	Methodology
Performing a laboratory exercise. Handiwork	

Verification	Typology
Structured test Tests prepared by the teacher	

Skills acquired

1. Ability to apply soil properties
Practical skills in building a filter with soil and conducting adsorption
Ability to understand the problem of wastewater treatment
Practical use of the acquired knowledge

Lesson No. 5 – Acid Rain

Lesson plan

Keywords: Acid rain, air pollution, air composition

Hours: 45 minute lesson, 45 minute rehearsal

School: Upper Secondary School

Objectives
1. Provide a basic understanding of acid rain 2. Promote a deeper understanding of the topic 3. Be able to propose the effects of acid rain 4. Be able to propose the causes of acid rain

Contents	References	Methodology
Introduction (5 minutes): Welcome students and create an atmosphere conducive to learning. Introduce the purpose of the lesson and what students will learn.	Hats://vv.youtube.com/watch?v=-dike3wifo	Class Discussion
Summary of prior knowledge (10 minutes): Discussion on the formation of air pollutants	https://www.twojapogoda.pl/wiadomosc/2018-04-20/kwasne-deszcze-zdegradowaly-lasy-i-gleby-w-sudetach-zobaczcie-skutki-tej-katastrofy-ekologicznej/	Watch a video Conference Brainstorming
Presentation of new content (20-30 minutes): Discussion of the Causes of Acid Rain Discuss the effects of acid rain	https://open.uj.ed.pl/matt/page/viewpf?it=1284	Problem-based learning Teamwork Discussion Conference

Summary and conclusion (10 minutes):	Objective: <u>To learn about the formation and negative effects of acid rain.</u>	Evaluation
Answering students' questions and encouraging active participation (5 minutes)	1. What pollutants cause acid rain? Acid rain damages vegetation, accelerates metal corrosion, and acidifies the environment.	
Question analysis	2. How is acid rain formed? Acid rain is caused by the reaction of gaseous acid oxides with water.	
Discussion	3. Which gaseous oxides contribute most to the formation of acid rain? Sulphur dioxide, carbon dioxide and nitrogen oxides	
Summary of the key points of the lesson and main conclusions Table of Contents	4. How can acid rain be counteracted? Carbon dioxide and sulphur dioxide must be removed from the flue gases.	

Activity	Methodology
Analysis of the Discussion topic	

Verification	Typology
Structured test Teacher-prepared tests	

Skills acquired

1. Ability to apply soil properties
2. Ability to practically build a soil filter and conduct adsorption
3. Ability to understand the problem of wastewater treatment
4. Practical application of the acquired knowledge

Lesson No. 6 – Investigating Environmental Influences on Metal Corrosion

Lesson plan

Keywords: corrosion, electrochemical corrosion, environmental influence on corrosion

Timing: 45 minutes lecture, 2 hours laboratory exercises, 45 minutes test, any additional external activities – visit to galvanic plants

School: Upper Secondary School

Objectives
1. Provide basic knowledge about corrosion 2. Empowering students to apply their knowledge in practice 3. Promote a deeper understanding of the topic 4. Developing dexterity in students 5. Analyze the impact of the environment on corrosion

Contents	References	Methodology
Introduction (5 minutes): Welcome students and create an atmosphere conducive to learning. Introduce the purpose of the lesson and what students will learn. Conference		Class Discussion
Summary of prior knowledge (10 minutes): Corrosion Discussion	Hapts://vv.youtube.com/watch?v=sukjukam5eoi	Watch a video Brainstorming Conference
Presentation of new content (20-30 minutes): Studying the impact of the environment on corrosion	Prepare the NaOH solution, NaCl solution, vinegar solution, demineralized water, tap water, cola, put six nails in six tubes and introduce one of the substances into each tube. Observe the corrosion phenomenon after the first week and after two weeks.	Laboratory Exercises Demonstration Self-employment of students in pairs

Summary and conclusion (5 minutes): Answering pupils' questions and encouraging active participation (5 minutes) Question analysis Discussion Summary of the key points of the lesson and main conclusions Table of Contents	1. What is corrosion? Corrosion is the gradual destruction of materials between their surface and their surroundings. 2. Do only metals corrode? No, various materials are affected 3. Provide examples of corrosion of other materials The negative effect of the sun on plastic garden furniture, the deterioration of concrete monuments 4. What substances form rust? Rust is a non-uniform layer of oxidation products of iron and its alloys (e.g. steel) in water, humid atmosphere or soil, containing mainly iron oxides and hydroxides 5. What is Patina? Patina, snow, grit - a product of atmospheric corrosion of copper and its alloys in humid air. The surface layer of patina forms a light green to grayish-green coating. Its main constituent is copper(II) hydroxide carbonate - $[\text{Cu}]_2\text{CO}_3$. 6. What observations do we have in the different samples? Corrosion proceeds faster in the tube with the vinegar solution and slower in the NaOH solution	Evaluation

Activity	Methodology
Performing a Manual Work Laboratory Exercise.	

Verification	Typology
Structured test Teacher-prepared tests	

Skills acquired

1. Ability to verify the influence of the environment on corrosion
2. Ability to analyze test results
3. Ability to understand the problem of metal corrosion and degradation of road constructions

Lesson No. 7 – Electrochemical Corrosion

Lesson plan

Keywords: corrosion, electrochemical corrosion, environmental influence on corrosion and its speed

Timing: 45 minutes lecture, 2 hours laboratory exercises, 45 minutes test, any additional external activities – visit to galvanic plants

School: Upper Secondary School

Objectives
1. Provide basic knowledge about corrosion 2. Empowering students to apply their knowledge in practice 3. Promote a deeper understanding of the topic 4. Developing manual dexterity in pupils 5. Analyze the influence of the environment on the corrosion rate

Contents	References	Methodology
Introduction (5 minutes): Welcome students and create an atmosphere conducive to learning. Introduce the purpose of the lesson and what students will learn. Conference		Class Discussion
Summary of prior knowledge (10 minutes): Corrosion Discussion	https://www.dlauczna.pl/lekcja/chemia,elektrochemia,korozja-elektrochemiczna-sposoby-ochrony-przed-korozja	Watch a video Brainstorming

Presentation of new content (20-30 minutes): Studying the influence of the environment on the corrosion rate	Objective: Familiarize yourself <u>with the influence of different substances on the corrosion rate.</u> - Place a solution of oxidized hydrochloric acid and solid NH_4SCN into a tall vessel (graduated cylinder). Fill the container with distilled water and suspend a nail at the outlet of the container. Observe the changes. - Prepare two nails; Wrap the first with zinc foil and the second with copper wire. Place the nails in the tube with the saline solution	Problem-based learning Laboratory exercises - demonstration, autonomous work of students in pairs
Summary and conclusion (10 minutes): Answering pupils' questions and encouraging active participation (5 minutes) Question analysis Discussion Summary of the key points of the lesson and main conclusions Table of Contents	1. What observations do we see in the first experiment? The environment of hydrochloric acid and hydrogen peroxide reacts with the suspended nail - corrosion progresses faster. Iron(III) ions penetrate the water and combine with ammonium rhodanide to create a bleeding effect on the nail. 2. What observations do we see in the second experiment? We don't see any corrosion on the galvanized nail, while the copper-wrapped nail is covered with a layer of rust. 3. What effect do redox reactions have on corrosion? An oxidizing environment accelerates the phenomenon of corrosion. In the first exercise we see the oxidizing effect of oxidized water, while in the second exercise we can see the effect of metal activity. Zinc is a more active metal than iron and therefore a nail wrapped in zinc does not corrode, while in the second case iron is more active than copper and we observe the corrosion of iron. 4. What factors must be present for corrosion to occur Atmospheric corrosion requires only water and oxygen from the air.	Evaluation

Activity	Methodology
Performing a Laboratory Exercise Manual Work	

Verification	Typology
Structured test Teacher-prepared tests	

Skills acquired
1. Ability to verify the influence of the environment on the corrosion rate
2. Ability to analyze test results
3. Ability to understand the problem of metal corrosion
4. Familiarization with the structure of a galvanic cell

Lesson No. 8 – Corrosion Protection of Metals

Lesson plan

Keywords: corrosion, electrochemical corrosion, corrosion protection

Timing: 45 minutes lecture, 2 hours laboratory exercises, 45 minutes test, any additional external activities – visit to galvanic plants

School: Upper Secondary School

Objectives
1. Provide basic knowledge about corrosion
2. Empowering students to apply their knowledge in practice
3. Promote a deeper understanding of the topic
4. Develop pupils' dexterity
5. Enable pupils to learn about corrosion protection methods

Contents	References	Methodology
Introduction (5 minutes): Welcome students and create an atmosphere conducive to learning. Introduce the purpose of the lesson and what students will learn. Conference		
Summary of prior knowledge (10 minutes): Corrosion Discussion	Exercise 1 Introduce metallic magnesium, zinc, aluminum and copper in 4 tubes. Add concentrated hydrochloric acid to each tube and observe the changes. Repeat with concentrated nitric acid (V). Take note of your comments Exercise 2 Put 5 g of copper(II) sulfate in a large beaker, dissolve the salt in 200 g of distilled water and soak aluminum foil in the solution. After 5 minutes, add a little common salt. Note the observation before and after adding the common salt. Exercise 3 Put a nail, a nail painted with enamel, a nail wrapped in zinc foil, and a nail wrapped in copper wire into the test tubes. Soak all nails in the NaCl solution. Take note of your observations	Pensiero critico Problem-based learning Brainstorming

Presentation of new content (20-30 minutes): Study of Corrosion Protection Methods Discussion of corrosion protection methods.	<u>Remarks:</u> Exercise 1 In the first experiment we see how hydrochloric acid reacts with magnesium, zinc and aluminum, but not with copper. Nitric acid reacts with all metals except aluminum. When you react with copper, a brown gas is emitted. Exercise 2 In the second exercise, the aluminum does not react with the copper sulfate solution because the aluminum foil is covered with an aluminum oxide passivation layer. To remove the protective layer we use table salt. After removing the passivation layer, we see the aluminum foil darken and dissolve into the solution. Exercise 3 We don't see any change on the galvanized nail and the paint-coated nail. A reddish tarnish appears on a nail dipped in a saline solution and on a copper-tipped nail.	Laboratory exercises - demonstration, autonomous work of the students in pairs, discussion.

Summary and conclusion (5 minutes): Answering students' questions and encouraging active participation (5 minutes) Question analysis Discussion Summary of the key points of the lesson and main conclusions.	1. Why does aluminum react with one acid and not the other? In nitric acid, the aluminum is tightly covered by a protective layer of aluminum oxide, which does not react with nitric acid at a later stage. This protective layer is called passivation. 2. What is passivation? A process in which a chemically active substance in a given environment produces a passive coating on its surface, formed by the chemical reaction of this substance with its environment. Passivation occurs when this coating is completely resistant to further reactions with this environment and, at the same time, is tight enough to form a protective barrier for the surrounding substance. 3. What is corrosion? Corrosion is the gradual deterioration of materials, which occurs between their surface and their surroundings. 4. What is Rust? Rust is a non-uniform layer of oxidation products of iron and its alloys (e.g. steel) in water, humid atmosphere or soil, containing mainly iron oxides and hydroxides 5. What is Patina? Patina, snow, grit - a product of atmospheric corrosion of copper and its alloys in humid air. The surface layer of patina forms a light green to grey-green coating. Its main constituent is copper(II) hydroxide carbonate - $[\text{Cu}]_2\text{CO}_3$. 6. What are the conditions that promote corrosion? Corrosion is favored by an acidic environment, which coats the material with a less active metal, does not use protective coatings, creating a corrosive environment 7. How to protect metals from corrosion? Coat metals with protective layers - varnishes varnishes, coat with more chemically active metals - galvanizing and	Evaluation

chrome plating of iron, avoid a favorable environment for corrosion.

Activity	Methodology
Performing a Laboratory Exercise Manual Work	

Verification	Typology
Structured test Teacher-prepared tests	

Skills acquired
1. The ability to apply an appropriate corrosion protection method

2. Ability to analyze test results

3. Ability to understand corrosion protection methods

Lesson No. 9 – Sustainable Fuels - Bioethanol

Lesson plan

Keywords: fossil fuels, biodiesel, bioethanol

Hours: Lectures 45 minutes, laboratory exercises 2 hours, tests 45 minutes, any additional external activities - visit to an ethanol production plant

School: Upper Secondary School

Objectives
1. Provide basic knowledge about fuels
2. Introduce basic knowledge on fuel production
3. Empowering students to apply their knowledge in practice
4. Promote a deeper understanding of the topic

Contents	References	Methodology
Introduction (5 minutes): Welcome students and create an atmosphere conducive to learning. Introduce the purpose of the lesson and what students will learn. Conference		Class Discussion
Summary of prior knowledge (10 minutes): Fossil Fuel Information Recall Lecture, Brainstorming, Discussion	https://eszkola.pl/chemia/destylacja-ropy-naftowej-8397.html	Watch a video

Presentation of new content (20-30 minutes): Discussion of green fuel news Discussion on the production of green fuels Discuss the use of green fuels Lectures, group work, discussion, brainstorming, laboratory exercises	Organic fuels - bioethanol Objective: To familiarize students with bioethanol production. Introduce equal amounts of sugar into two bottles with fermentation tubes and pour 500 cm³ of distilled water. Place 10 g of brewer's yeast in the first bottle and 10 g of distillation yeast in the second bottle. Leave both bottles for a week. After a week, strain the mixture and distill the clear filtrate. The pure ethanol boils at 78 °C, then collect the fraction between 76 and 80 °C. Determine which yeast you got the most product with. You can test the concentration of the resulting alcohol with a refractometer, an alcohol meter, or when measuring density with a pycnometer.	Lectures, group work, discussion, brainstorming, laboratory exercises
Summary and conclusion (10 minutes): Answering students' questions and encouraging active participation (5 minutes) Question analysis Discussion Summary of the key points of the lesson and main conclusions Table of Contents	1. What fossil fuels do you know Coal, Natural Gas, Petroleum 2. Which of these fossil fuels do we use for transportation? Coal, Natural Gas, Petroleum 3. Which of these fossil fuels do we use for transportation? Natural Gas & Oil 4. What fuels are produced from crude oil LPG, gasoline, paraffin, diesel 5. What requirements do fuels have to meet nowadays. Fuels must be free of sulphur compounds, aromatic compounds, olefins and heavy metals. They should have a high vapor pressure, a high octane rating, and contain biocomponents. 6. What components/additives are currently used in fuels? Ethanol from alcoholic fermentation is now added to gasoline. Previously, tetraethyl lead was used to improve the octane rating of gasoline. During combustion, the compound leaked into the environment in the form of dust and settled on plants, thus	Evaluation

releasing harmful lead into nature. Today, ethanol improves the octane rating and vapor pressure of gasoline and is produced in an environmentally friendly way.

7. What Other Feedstocks Can Be Used to Produce Bioethanol

Cereals, potatoes, corn, sugar cane, sugar beet, fruits, baked goods and confectionery.

Activity	Methodology
Analysis of the topic of discussion.	

Verification	Typology
Structured test Teacher-prepared tests	

Skills acquired

1. Ability to demonstrate the benefits of green fuels
2. Ability to understand the problem of using green fuels
3. Ability to solve environmental problems
4. Ability to describe the possibilities of green fuel production

Lesson No. 10 – Green Fuels - Hydrogen

Lesson plan

Keywords: fossil fuels, biodiesel, hydrogen

Hours: 45 minutes lecture, 2 hours laboratory exercises, 45 minutes test, any additional external activities - visit to a hydrogen production plant

School: Upper Secondary School

Objectives
1. Provide basic knowledge about fuels 2. Introduce basic knowledge on fuel production 3. Empowering students to apply their knowledge in practice 4. Promote a deeper understanding of the topic 5. Introducing laboratory methods for hydrogen production

Contents	References	Methodology
Introduction (5 minutes): Welcome students and create an atmosphere conducive to learning. Introduce the purpose of the lesson and what students will learn. Conference		Class Discussion
Summary of prior knowledge (10 minutes): Recall of fossil fuel information	https://www.youtube.com/watch?v=KukUre3m&BB=YouCoup3Reinltex9Itsa%3D	Watch a video Conference Brainstorming

Presentation of new content (20-30 minutes): Discussion of messages on green fuels Discussing the production of green fuels - hydrogen Discussion on the use of green fuels		Lectures, group work, discussion, brainstorming, possible design of a laboratory exercise - water electrolysis
Summary and conclusion (10 minutes): Answering students' questions and encouraging active participation (5 minutes) Question analysis Discussion Summary of the key points of the lesson and main conclusions Table of Contents	<u>Environmentally friendly fuels - hydrogen.</u> Objective: to familiarize pupils with environmentally friendly fuels and the methods for producing them. 1. Which fuels are considered environmentally friendly? Hydrogen 2. What compounds are produced when gasoline is burned, and what compounds are produced when hydrogen is burned? When gasoline is burned, carbon monoxide, sulfur oxides, and nitrogen oxides are produced. A lot of particulate matter is also produced during combustion. 3. When hydrogen burns, water vapor is produced. Doesn't the combustion of hydrogen produce any pollution? Unfortunately not, the combustion of hydrogen produces a large amount of nitrogen oxides, but compared to gasoline, hydrogen is a less polluting fuel. 4. How is hydrogen produced? In the laboratory, hydrogen can be produced by reacting metals with acids, by reacting metals in the first group of the periodic table with water, and by reacting metal hydrides with water. 5. What is Electrolysis? Electrolysis – a term used to describe any change in the chemical structure of a substance that occurs under the influence of an external electrical voltage applied to it. In a narrower sense, the term includes only decomposition processes	Evaluation

6.What do we get from the electrolysis of water?

Electrolysis of water produces hydrogen and oxygen

7.Is the electrolysis process cost-effective?

Unfortunately, the electrolysis process requires a lot of energy

8.How do we get hydrogen in industry?

In industry, hydrogen is obtained by a methane/steam conversion reaction at 500 °C and using a nickel catalyst.

9.Is it possible to obtain bio-hydrogen?

Yes, you can. We can obtain hydrogen from the electrolysis of water by using solar panels to produce electricity. We use electricity to break down water molecules.

Activity	Methodology
Object Analysis	Discussion
Performing a Lab Exercise	Handiwork

Verification	Typology
Structured Teacher Test	Prepared Tests
Cross-check	

Skills acquired

1.Ability to demonstrate the benefits of green fuels
2.Ability to understand the problem of using green fuels
3.Ability to solve environmental problems

4. Ability to describe the possibilities of green fuel production

5. Ability to apply the use of green fuels

Physical education

curated by Pietro Pitruzzello

Lesson No. 1 – Athletics

Lesson plan

Keywords: Awareness, athletics, climate change, sustainability adaptation

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities

School: first two years of secondary schools.

Objectives
Main objectives of the physical education lesson on "athletics" and climate change: Awareness: Provide students with a basic understanding of climate change and its impact on the environment. Connection between physical activity and environment: Show participants how sports activities, including track and field, can be affected by climate change. Athletics Education: Introduce key concepts of athletics, such as disciplines, training techniques, and technical aspects. Promote an active lifestyle: Encourage students to engage in outdoor physical activities and raise awareness of the importance of physical activity for health. Knowledge of sustainable practices: Inform students about how they can reduce the environmental impact of sports activities through sustainable practices. Specific objectives: Understanding Climate Change: Explain what climate change is and its root causes. Identify the impact on training facilities: Discuss how climate change may affect track and field training facilities (e.g., temperature changes, heavy rainfall, or drought). Understanding Athletics Disciplines: It features the main disciplines of track and field, such as sprinting, long jump, and shot put, and outlines the skills required. Evaluation of training under different conditions: It helps students understand how weather conditions can affect athletes' performance and how training can be adapted accordingly. Promoting sustainability: Discuss sustainable practices in athletics, such as equipment recycling, responsible water use, and pollution reduction. Participation in practical activities:

Organize a practical athletics session during which students can apply the techniques they have learned.

Discussion on future measures:

Encourage a discussion about future commitments students can make to contribute to the fight against climate change, both in sport and in everyday life.

Lesson content	References	Methodology
I. Introduction (10 minutes) Welcome students and introduce the topic. Explain the main and specific objectives of the lesson. II. Climate Change Awareness (10 minutes) Briefly explain climate change and its causes. Discuss how climate change can impact daily life, including sport. III. Connecting Athletics to the Environment (10 minutes) Illustrate how weather conditions can affect athletics (e.g., wet tracks or wind). Provide examples of weather-influenced sporting events. IV. Introduction to Athletics (10 minutes) Introduce the main disciplines of athletics: running, long jump, shot put. Describe the skills required for each discipline. V. Adaptation of training under various conditions (10 minutes) Discuss how athletes train in different weather conditions. Offer suggestions for tailoring training to the environment. VI. Promoting Sustainability in Athletics (5 minutes) Discuss sustainable practices in athletics (equipment recycling, responsible water use, pollution reduction).	https://www.worldathletics.org/	Frontal lecture in the classroom Dialogic lesson

Invite students to share ideas for more sustainable athletics. VII. Practical activity (10 minutes) Organize a short practical session in athletics where students can try out some disciplines. Emphasize the importance of considering the environment and climatic conditions during the activity. VIII. Discussion on future steps (5 minutes) Start a discussion about future commitments students can make to combat climate change, both in sport and in everyday life. IX. Summary and Conclusion (5 minutes) Summarize the key points of the lesson. Thank the students for their participation and emphasize the importance of sustainable athletics. X. Homework (5 minutes) Assign homework, such as researching how professional athletes are coping with climate change or writing a short essay on sustainable practices in athletics. Be sure to use appropriate images and charts to improve student understanding and engagement. Customize the slides to suit your teaching style and the age of the students, always aiming to keep the lesson engaging and informative. Assign homework, such as researching how professional athletes are coping with climate change or writing a short essay on sustainable practices in athletics.		
Text for the slides of the lecture on "Athletics" and climate change: Slide 1: Introduction Titolo: Welcome to the Lesson on Track and Field and Climate Change	theclimategroup.org	Slides to make a presentation by inserting images as well.

Content: Lesson objectives, teacher introduction, lesson duration.

Slide 2: Climate Change Awareness

Titolo: What Are Climate Changes?

Content: Definition of climate change, root causes (greenhouse gas emissions, deforestation), impact on the planet.

Slide 3: Connecting Track and Field to the Environment

Title: How climate change affects sport

Content: Examples of environmental impact on sporting events (floods, heat waves), awareness of the need for adaptation.

Slide 4: Athletics

Titolo: Getting to Know Track and Field

Contents: Introduction to the main disciplines: running, long jump, shot put; skills required for each.

Slide 5: Adapting Training to Various Conditions

Title: Training in Different Weather Conditions

Content: How athletes prepare for competitions in various weather conditions; Strategies for dealing with cold, heat, rain, etc.

Slide 6: Sustainable Practices in Athletics

Title: Sustainability in sport

Content: Promotion of sustainable practices (equipment recycling, water conservation, pollution reduction); the role of athletes in adopting eco-friendly behaviours.

Slide 7: Hands-On Activity

Title: Putting What We've Learned into Practice!

Contents: Practical session: running, long jump, shot put; Emphasis on awareness of environmental conditions during activity.

Slide 8: Discussion of Future Steps

Title: How can we contribute?

Content: call for a discussion on future commitments to combat climate change; promote a sustainable lifestyle. Slide 9: Summary and Conclusion Title: Lesson Summary Contents: Brief summary of the key points covered; thanking the students for their participation. Slide 10: Homework Titolo: Next Steps Content: Homework assignment: research on athletes promoting sustainability in sport, writing a short essay on sustainable practices in athletics. Be sure to use appropriate images and charts to improve student understanding and engagement. Customize the slides to suit your teaching style and the age of the students, always aiming to keep the lesson engaging and informative.		

Activity	Methodology
Activity: Sustainable Sports Day Objective: To promote sustainability through the organization of an outdoor sports day that applies the knowledge gained on sustainability in athletics. Arrangement: Planning and preparation (in advance): Assign students to form working groups to organize the "Sustainable Sports Day". Each group should develop a detailed plan for the event, including sports activities, sustainable measures to be taken (recycling, waste reduction, responsible water use, etc.), and promotion of the event among students and school staff. Sustainable Sports Day Event:	Project-by-project learning.

Organize the day of the outdoor event where students actively participate in various sports activities related to track and field (running, long jump, shot put, etc.). Make sure students apply the sustainable practices they learned in class, such as garbage collection, using recycling bins, and adhering to sustainability guidelines. During the event, each group of students is responsible for explaining to the other participants how they are helping to make the event more sustainable. Data Collection & Feedback: After the event, collect data and feedback from students and attendees on the effectiveness of sustainable practices and the overall experience. Ask students to reflect on how athletics can be more sustainable and how they can apply these practices in their daily lives. Summary and discussion: Host a classroom recap session where students share their findings, findings, and suggestions to further improve the event. Emphasize the importance of environmental responsibility and sustainability in both sport and everyday life. Future projects: Encourage students to consider future projects that can contribute to the promotion of a sustainable lifestyle and sustainability in athletics, such as creating a permanent equipment recycling program or participating in local sustainability initiatives. This activity not only allows students to apply what they have learned during the lesson, but actively engages them in promoting sustainable practices in the context of athletics. In addition, it raises awareness among students about the importance of taking care of the environment while participating in their favorite sport.	

Checks	Typology
Unstructured quiz on the lesson of "athletics" and "climate change". 1. What is Athletics? - Answer: Athletics is a sport discipline that includes various running, jumping, and throwing events. 2. What is climate change and what are its main causes? - Answer: Climate change refers to long-term alterations in Earth's weather patterns. The main causes of climate change include greenhouse gas emissions, deforestation, and air pollution. 3. What is one of the impacts of climate change on outdoor sporting events?	Open-ended test with short answers.

- Answer: One of the impacts of climate change on outdoor sporting events is the uncertainty of weather conditions, which can affect event schedules and the safety of athletes. 4. Name three athletics disciplines. - Answer: Running (e.g., 100 meters), long jump, and shot put are some disciplines in track and field. 5. What skills are needed for the long jump? - Answer: Some skills needed for the long jump include speed, leg power, and landing technique. 6. How can athletes adapt their training in response to adverse weather conditions? - Answer: Athletes can adapt their training by wearing weather-appropriate clothing, adapting training programs, and following specific safety protocols. 7. What does "sustainability" mean in sport? - Answer: Sustainability in sport refers to the adoption of practices and behaviors that reduce the environmental impact of sports activities, promoting the responsible use of resources and the reduction of pollution. 8. Name two sustainable practices in athletics. - Answer: Some sustainable practices in athletics include recycling equipment and responsibly using water for facility maintenance. 9. What can students do to promote a sustainable lifestyle in athletics? - Answer: Students can promote a sustainable lifestyle in athletics by adopting eco-friendly practices during training and sporting events and raising awareness to do the same, among others. 10. How can you contribute to the fight against climate change in your daily life? - Answer: Students can contribute to the fight against climate change by reducing the use of plastic, saving electricity and water, using public transportation or bicycles instead of cars, and promoting awareness of climate change.	
Structured quiz on the lesson with answers: 1. What is Athletics? - Answer: Athletics is a sport discipline that includes various running, jumping, and throwing events. 2. What are some of the main causes of climate change?	E.g. Tests already prepared from textbooks or, as in this case, open questions with short answers.

- Answer: The main causes of climate change include greenhouse gas emissions, deforestation, and air pollution. 3. What is one of the impacts of climate change on outdoor sporting events? - Answer: One of the impacts of climate change on outdoor sporting events is the uncertainty of weather conditions, which can affect event schedules and the safety of athletes. 4. Name three athletics disciplines. - Answer: Running, long jump, and shot put are some disciplines in track and field. 5. What skills are needed for the long jump? - Answer: Some skills needed for the long jump include speed, leg power, and landing technique. 6. How can athletes adapt their training in response to adverse weather conditions? - Answer: Athletes can adapt their training by wearing weather-appropriate clothing, adapting training programs, and following specific safety protocols. 7. What does "sustainability" mean in sport? - Answer: Sustainability in sport refers to the adoption of practices and behaviors that reduce the environmental impact of sports activities, promoting the responsible use of resources and the reduction of pollution. 8. Name two sustainable practices in athletics. - Answer: Some sustainable practices in athletics include recycling equipment and responsibly using water for facility maintenance. 9. What can students do to promote a sustainable lifestyle in athletics? - Answer: Students can promote a sustainable lifestyle in athletics by adopting eco-friendly practices during training and sporting events and raising awareness to do the same, among others. 10. How can you contribute to the fight against climate change in your daily life? - Answer: Students can contribute to the fight against climate change by reducing the use of plastic, saving electricity and water, using public transportation or bicycles instead of cars, and promoting awareness of climate change.	
Simple multiple-choice test of 20 questions with correct answers indicated:	multiple-choice tests prepared by the teacher.

What is Athletics?

- a) A type of dance
- (b) A sporting discipline
- c) A form of yoga
- d) A board game

Answer: (b) A sporting discipline

What is the main cause of climate change?

- a) Consumption of chocolate
- (b) Greenhouse gas emissions
- (c) Noise pollution
- d) Lack of solar energy

Answer: b) Greenhouse gas emissions

What is one of the impacts of climate change on outdoor sporting events?

- a) Increase in the prize pool
 - b) Improved air quality
 - c) Uncertainty of weather conditions
 - d) Increased participation of athletes
- Answer: (c) Uncertainty of weather conditions

What are some athletics disciplines?

- a) Hammer throw, tennis, swimming
 - b) Running, football, cycling
 - c) Running, long jump, shot put
 - d) Yoga, gymnastics, climbing
- Answer: (c) Running, Long Jump, Shot Put

What skills are needed for the long jump?

- a) Good memory and writing skills
 - b) High temperature resistance
 - c) Speed, leg power and landing technique
 - d) Ability to swim and dive
- Answer: (c) Speed, leg power, and landing technique

How can athletes adapt their training in response to adverse weather conditions?

- a) Only train indoors
 - b) Changing sports
 - c) Wear appropriate clothing and adjust training programs
 - d) Withdrawal from training
- Answer: (c) Wear appropriate clothing and adjust training programs

What does "sustainability" mean in sport?

- a) Be good at team sports
- b) Saving money
- c) Adopt eco-friendly practices to reduce the environmental impact of sports activities
- d) Follow the rules strictly

Answer: (c) Adopt eco-friendly practices to reduce the environmental impact of sports activities

Name a sustainable practice in athletics.

- a) Consume a lot of plastic bottles
- b) Use of disposable equipment
- c) Recycling of sports equipment
- d) Wasting water during training

Answer: c) Recycling of sports equipment

What can students do to promote a sustainable lifestyle in athletics?

- a) Ignoring sustainable practices
- b) Use more natural resources
- c) Adopt eco-friendly practices during training and raise awareness among others
- d) Avoid sports altogether

Answer: (c) Adopt eco-friendly practices during training and raise awareness among others

How can you contribute to the fight against climate change in your daily life?

- a) Do nothing
- b) Reduce the use of plastic, save energy and water, use public transport or a bicycle and raise awareness among others
- c) Increase electricity consumption
- d) Ignoring climate change

Answer: (b) Reduce the use of plastics, save energy and water, use public transportation or a bicycle, and raise awareness among others

Skills acquired

Knowledge of track and field disciplines: Students would gain an understanding of the major disciplines of track and field, such as running, jumping, and throwing, and the skills required for each.

Climate Change Awareness: Students would understand what climate change is, its causes, and its impacts on the environment and outdoor sporting events.

Adaptation to weather conditions: Students would learn how athletes can adapt their training and performance in response to adverse weather conditions, ensuring optimal safety and performance.

Promoting sustainability: Students would gain knowledge about sustainable practices in athletics and how to help reduce the environmental impact of sports activities.

Practical Application: Through hands-on activities during the class, students would apply the skills they gained in athletics and environmental awareness.

Critical thinking: Students would develop the ability to think critically to address environmental challenges in athletics, seeking sustainable solutions.

Communication: Students would have the opportunity to communicate their ideas and knowledge gained during the lecture, promoting discussions about sustainability and the importance of the environment.

Environmental responsibility: Students would develop a greater awareness of the importance of taking environmental responsibility both in sport and in everyday life, promoting eco-friendly behaviors.

Collaboration: If involved in group projects or organizing a sustainable sporting event, students would have developed collaboration and teamwork skills.

These skills have applications not only in the field of athletics but also in the daily lives of students, encouraging responsible and sustainable behaviors towards the environment.

Lesson No. 2 – Cardiovascular System

Lesson plan

Keywords: cardiovascular, climate, adaptation, environmental impact, prevention

Timetable: 90-minute lesson, 90-minute activity, 60-minute test. Any other activities

School: first two years of secondary schools.

Objectives
Main objective: to explain how climate change affects the human cardiovascular system, highlighting the potential health implications.
Specific objectives:
Understanding climate change: Explain what climate change is, its root causes, and its overall effects on the Earth.
Recognize the importance of the cardiovascular system: Provide an overview of the human cardiovascular system and its importance to overall health.

Explore the direct effects of climate change on the cardiovascular system:

- Illustrate how extreme temperatures can affect blood pressure and heart rate.
- Explain how air pollution can increase the risk of cardiovascular disease.
- Discuss the importance of air quality in heart health.

Examining the indirect effects of climate change on the cardiovascular system:

- Discuss how natural disasters related to climate change can impact heart health.
- Learn how climate-influenced distribution of infectious diseases can affect heart health.

Identify prevention and mitigation strategies:

- Present advice on how people can protect their heart health in a changing world.
- Examine the importance of environmental policies and sustainability in mitigating the effects of climate change on health.

Promote awareness and action:

- Encourage students to consider their role in mitigating climate change and promoting heart health.
- Emphasize the importance of promoting sustainability and adopting environmentally friendly behaviors to protect health.

Lesson content	References	Methodology
Introduction (5 minutes) Welcome and introduction to the topic. Explanation of the importance of understanding the interaction between climate change and heart health. Understanding climate change (10 minutes) Definition and causes of climate change. Brief discussion on the general effects of climate change on Earth. The cardiovascular system (10 minutes) Overview of the human cardiovascular system and its role in health. Discussion on the importance of maintaining a healthy cardiovascular system. Direct effects of climate change (15 minutes) How extreme temperatures can affect blood pressure and heart rate. Air pollution and risk of cardiovascular disease.	https://www.escardio.org/Journals/E-Journal-of-Cardiology-Practice/Volume-22/climate-change-and-cardiovascular-disease-the-impact-of-heat-and-heat-health-a https://unric.org/it/che-cosa-sono-i-cambiamenti-climatici/ HTTPS://T.EEA.EUROPE.U/IT/ARCTICS/E-WANDAKI-D-UN2019Arian-Pew	The lecture will be based on visual presentations, classroom discussions, case studies, and interactive activities. It can include viewing climate maps, discussing scientific research, and collaborating on projects that raise awareness of the importance of environmental sustainability and heart health.

Air quality and heart health.

Indirect effects of climate change (10 minutes)

Impacts of natural disasters related to climate change on heart health.

Exploring how climate-influenced distribution of infectious diseases can affect heart health.

Prevention and mitigation strategies (5 minutes)

Advice on how to protect your heart health in a changing world.

The importance of environmental policies and sustainability.

Promoting Awareness and Action (5 minutes)

I invite you to reflect on individual commitments to tackle climate change and promote heart health.

Emphasis on the importance of sustainable behaviors.

Interactive activity or group discussion (5 minutes)

Students participate in an activity or group discussion on how they can help mitigate the health effects of climate change.

Summary and questions (5 minutes)

Summary of the key points of the lesson.
Open for student applications.

Rating (5 minutes)

Explanation of evaluation methods (participation, projects, tests).

Assignment of any tasks or projects related to the topic.

Conclusion (5 minutes)

General summary of the importance of the topic.

I invite you to continue exploring the interplay between climate change and heart health outside of the classroom.

This lesson structure provides a comprehensive overview of the topic and allows students to learn through various modalities, including discussion, hands-on activities, and self-exploration.		
Text for the slides of the lecture on the Impact of Climate Change on the Cardiovascular System: Slide 1: Introduction Title: Impact of climate change on the cardiovascular system Subtitle: Understanding and Protecting Your Health Contents: Welcome! Today, we're going to explore how climate change affects the health of our hearts. Slide 2: Lesson Objectives Main objective: to explain the interaction between climate change and the cardiovascular system. Specific objectives: We will examine direct and indirect effects, prevention strategies and awareness-raising actions. Slide 3: Understanding Climate Change Definition: Climate change is the long-term alteration of Earth's climate patterns. Causes: greenhouse gas emissions, deforestation, pollution, etc. General effects: rising temperatures, extreme weather events, environmental impacts. Slide 4: The cardiovascular system What it is: The cardiovascular system includes the heart, arteries, veins, and blood. Role: Transports oxygen-rich blood and nutrients throughout the body. Health: A healthy cardiovascular system is essential for life. Slide 5: Direct Effects of Climate Change Extreme temperatures: Increased blood pressure and heart rate during extreme heat. Air pollution: increased risk of cardiovascular disease due to exposure to air pollutants. Slide 6: Direct effects of climate change (continued)	https://www.nature.com/articles/s41569-020-00473-5	Text for slides to be used in class with the insertion of special images.

Air Quality: Discussion of how air quality affects heart health.

Examples: air pollutants such as PM2.5, ground-level ozone.

Slide 7: Indirect Effects of Climate Change

Impacts of natural disasters related to climate change on heart health.

Climate-influenced distribution of infectious diseases and consequences for the heart.

Slide 8: Prevention and Mitigation Strategies

Individual tips: How to protect your heart health in a changing world.

Environmental policies: the importance of responsible environmental policies.

Slide 9: Promoting Awareness and Action

Personal Commitment: Reflecting on personal commitments to address climate change and promote heart health.

Sustainable behaviors: Emphasize the importance of eco-friendly behaviors.

Slide 10: Interactive Activity or Group Discussion

Activity: Students participate in an activity or group discussion about how they can help mitigate the health effects of climate change.

Slide 11: Summary and Questions

Summary: Brief summary of the key points of the lesson.

Questions: Open for student questions.

Slide 12: Evaluation

Evaluation methods: Explanation of evaluation methods (participation, projects, tests).

Assignments: Any task or project related to the topic.

Slide 13: Conclusion

Remember the Importance: Summary of the importance of the topic.

Invitation: Invitation to continue exploring the interplay between climate change and heart health outside of the classroom.

Slide 14: Thank you

Thank you: Thanking the students for their participation.

Contact: Provide contact information for additional questions or requests. Slide 15: Final questions Questions: Open for further questions from students if needed. This slide structure covers the main objectives and specific content areas of the lesson, providing a visually engaging and informative presentation for students.		

Activity	Methodology
An after-class activity that engages students and encourages them to further explore the interplay between climate change and heart health could be a research and outreach project. Here's how it could be structured: Title of the activity: "Research and Awareness Project: Climate Change and Heart Health" Objective: Students will conduct independent research and create a project that highlights the interplay between climate change and heart health, with the aim of raising awareness in the community. Phases of activity: Phase 1: Individual research (1-2 weeks) Select a topic: Each student selects a specific aspect of the interaction between climate change and heart health to focus on (e.g., the impact of extreme temperatures, air pollution, natural disasters). Research: Students conduct in-depth research on their chosen topic, using reliable sources such as scientific articles, environmental reports, and statistical data. Content creation: Each student creates a multimedia presentation (PowerPoint, video, infographic, poster, etc.) that summarizes their findings and impact on heart health. Phase 2: Presentation and class discussion (1-2 days) Presentation: Students share their research and present their projects to the class. Each presentation should last about 5-10 minutes.	Project activity of the project-based learning type (PjBL)

Class discussion: After each presentation, open a class discussion where students can ask questions, express opinions, and discuss the importance of the topic. Phase 3: Community Awareness (2-3 weeks) Creating Outreach Materials: Students collaborate to create outreach materials based on their projects. These materials could include brochures, posters, informational videos, or social media posts. Distribution of materials: Students distribute outreach materials in their school, community, or online to inform others about the impacts of climate change on heart health. Collecting feedback: Students gather feedback on their outreach initiative and evaluate the effectiveness of the materials created. Phase 4: Reflection and evaluation (1-2 days) Reflection: Students reflect on their experiences in the project and the effectiveness of outreach efforts. Assessment: Students are assessed on the quality of their research, presentations, and outreach initiatives. Step 5: Final presentation (1 day) Final presentation: Students share their experiences and accomplishments with the class in a final presentation. Conclusions: This project will engage students in active learning, raise awareness of the impacts of climate change on heart health, and encourage them to become advocates for promoting sustainable behaviors and protecting heart health in their community.	

Checks	Typology
Structured assessment of 20 questions on the cardiovascular system and climate change: Section 1: Questions about the cardiovascular system 1. What is the cardiovascular system and what is its primary role in the human body? 2. What does the cardiovascular system include? 3. What are the main components of the heart and what is their function? 4. Explain the process of blood circulation in the human body. 5. What is the significance of blood pressure and what is its role in heart health? Section 2: Questions about climate change and heart health	Structured test of 20 questions

6. What is climate change and what are its main causes?
7. What are the direct effects of climate change on the cardiovascular system?
8. How can extreme temperatures affect heart health?
9. What are the effects of air pollution on heart health?
10. How can air quality affect heart health?

Section 3: Indirect Effects of Climate Change

11. Explain how natural disasters related to climate change can impact heart health.
12. What are climate-influenced infectious diseases and how can they affect heart health?

Section 4: Prevention and Awareness Strategies

13. What are some strategies people can adopt to protect their heart health in a changing world?
14. Why are environmental policies and sustainability important for mitigating the health effects of climate change?

Section 5: Questions for Reflection and Action

15. What is your personal commitment to addressing climate change and promoting heart health?
16. What sustainable behaviors can you adopt in your daily life to protect your heart health?

Section 6: General Questions

17. What is the importance of understanding the interaction between climate change and heart health?
18. How can individuals and society contribute to mitigating the health effects of climate change?
19. How can the research and awareness-raising project contribute to raising public awareness of this issue?
20. What are some concrete actions your community could take to address the interaction between climate change and heart health?

These questions should cover the main topics covered in class and allow students to demonstrate their understanding of the topic and its implications for human health.

Structured quiz of 20 questions on the cardiovascular system and climate change. Each question is followed by four answer options, of which only one is correct.

Section 1: Cardiovascular System (questions 1-5)

ES. tests already prepared from textbooks or structured assessment.

1. What is the primary organ of the cardiovascular system?

- a) Lung
- b) Stomach
- c) Heart
- d) Kidney

Correct answer: c) Heart

2. What does the cardiovascular system carry throughout the body?

- a) Air
- b) Nutrients and oxygen
- c) Water
- d) Light

Correct answer: b) Nutrients and oxygen

3. What are the two main components of blood?

- a) Red and green
- b) Plasma e globuli rossi
- c) Red blood cells and neutrophils
- d) Albumin and insulin

Correct answer: b) Plasma and red blood cells

4. What is the primary function of the human heart?

- a) Filter the blood
- b) Digest food
- c) Blood pump
- d) Producing oxygen

Correct Answer: c) Pumping the blood

5. What is blood pressure?

- a) The amount of blood in the body
- b) The force exerted by blood on the walls of the arteries
- c) The speed of blood circulation
- d) Blood temperature

Correct answer: b) The force exerted by blood on the walls of the arteries

Section 2: Climate Change and Heart Health (Questions 6-10)

6. What are the main causes of global climate change?

- a) Human activities such as industrialization
- b) Tectonic plate movements
- c) Solar variations
- d) Volcanic eruptions

Correct answer: a) Human activities such as industrialization

7. What are the direct effects of climate change on the cardiovascular system?

- a) Increased food consumption
- b) Increased blood pressure and heart rate in extreme heat
- c) Decreased heart rate

d) Reduction in the size of the heart

Correct answer: b) Increased blood pressure and heart rate in extreme heat

8. How can air pollution affect heart health?

a) Increasing the strength of the heart

b) Reducing the risk of heart disease

c) Increasing the risk of cardiovascular disease

d) Improving arterial function

Correct answer: c) Increasing the risk of cardiovascular disease

9. How can air quality affect heart health?

a) It has no effect on heart health

b) Improving kidney function

c) Reducing blood pressure

d) Having a negative impact on arteries and heart health

Correct answer: d) Negatively affecting arteries and heart health

10. What is one of the indirect effects of climate change on the cardiovascular system?

a) Increased blood pressure

b) Reduced heart rate

c) Improvement of lung function

d) Reduced risk of heart infections

Correct answer: a) Increased blood pressure

Section 3: Prevention and Awareness Strategies (Questions 11-15)

11. What are some prevention strategies to protect heart health in a changing world?

a) Consume high-fat foods

b) Maintain a sedentary lifestyle

c) Avoid exposure to secondhand smoke

d) Adopt sustainable behaviours and reduce pollution

Correct answer: d) Adopt sustainable behaviors and reduce pollution

12. Why are environmental policies and sustainability important for mitigating the health effects of climate change?

a) They have no influence on health

b) Because they can reduce healthcare costs

c) They are not important for human health

d) Because they can limit pollution and protect heart health

Correct answer: d) Because they can limit pollution and protect heart health

13. What is your personal commitment to addressing climate change and promoting heart health? (Question for reflection)

14. What sustainable behaviors are you already adopting or intend to adopt in your daily life to protect your heart health? (Question for reflection)

Section 4: General Questions (Questions 16-20)

15. What is the importance of understanding the interaction between climate change and heart health?

16. How can individuals and society contribute to mitigating the health effects of climate change?

17. How can the research and awareness-raising project help to promote awareness on this issue?

18. What are some concrete actions your community could take to address the interplay between climate change and heart health?

Answers:

c) Heart

b) Nutrients and oxygen

b) Plasma e globuli rossi

Test with true/false answers to 20 questions about the cardiovascular system and climate change. Write "T" if the statement is true and "F" if it is false.

Section 1: Cardiovascular System (questions 1-5)

(T/F) The heart is the primary organ of the cardiovascular system.

(T/F) The cardiovascular system transports nutrients and oxygen throughout the body.

(T/F) Red blood cells are an important component of blood plasma.

(T/F) The human heart is responsible for digesting food.

(T/F) Blood pressure is the force exerted by blood on the walls of the arteries.

Section 2: Climate Change and Heart Health (Questions 6-10)

(T/F) Climate change is mainly caused by natural phenomena such as volcanic eruptions.

(T/F) The direct effects of climate change on the cardiovascular system include increased blood pressure and heart rate in extreme heat.

(T/F) Air pollution has no impact on heart health.

tests prepared by the teacher for answers (true or false)

(T/F) Air quality can negatively affect heart health.

(T/F) The indirect effects of climate change on the cardiovascular system include an increase in heart rate.

Section 3: Prevention and Awareness Strategies (Questions 11-15)

(T/F) Adopting sustainable behaviors and reducing pollution are strategies to protect heart health in a changing world.

(T/F) Environmental policies and sustainability are irrelevant to human health.

Section 4: General Questions (Questions 16-20)

(T/F) Understanding the interplay between climate change and heart health is of little importance.

(T/F) Individuals and society cannot contribute to mitigating the health effects of climate change.

(T/F) A research and awareness-raising project can help promote awareness of the interaction between climate change and heart health.

(T/F) Communities cannot take concrete action to address the interplay between climate change and heart health.

Answers:

T
T
F
F
T
F
T
F
T
T
T
F
T
T
T
F
F
T
F

Skills acquired

After participating in the lecture on the cardiovascular system in relation to climate change, students should have acquired a number of skills. Here are some of the key skills students may have developed:

Understanding the Cardiovascular System: Students have gained a deep understanding of the human cardiovascular system, including its role in overall health and blood circulation.

Knowledge of climate change: They have developed an understanding of climate change, its causes, and its general effects on Earth systems.

Awareness of the interaction between health and the environment: students understood how climate change can directly and indirectly affect human health, particularly that of the heart and cardiovascular system.

Identification of direct and indirect effects: They learned to recognize the direct effects of climate change on heart health, such as increased blood pressure during heat waves, as well as indirect effects, such as climate-related infectious diseases.

Knowledge of prevention strategies: students have gained knowledge on how to prevent cardiovascular health risks in a changing world by adopting sustainable behaviors and supporting responsible environmental policies.

Communication skills: They learned how to communicate and raise awareness in the community about the connection between climate change and heart health through research and outreach projects.

Reflection on personal commitment: Students were encouraged to reflect on their personal commitment to mitigating the effects of climate change and protecting their heart health.

Evaluation skills: They have developed the ability to evaluate sources of information, scientific research and data related to the effects of climate change on heart health.

Group work and presentation: Students collaborated in groups and developed presentation skills to share their research and projects with their classmates.

Promoting civic engagement: Students were encouraged to consider their role in civic action, both individually and collectively, to address climate change and protect heart health.

These skills are not only relevant to understanding the topic covered in the lesson, but can also be applied in various real-life situations and careers, promoting greater environmental awareness and an active commitment to personal and global health.

Lesson No. 3 - Breathing and Carbon Footprint

Lesson plan

Keywords: breathing, carbon footprint, air quality, sustainable living, emission reduction

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities

School: first two years of secondary school.

Objectives
Main objectives: 1. Understand the concept of climate change and its impact on global and individual health. 2. Recognize the importance of breathing for both individual well-being and the global climate system. 3. Learn about the carbon footprint as a measure of personal influence on climate change. 4. Develop fine motor skills and fitness skills that promote a sustainable lifestyle. 5. Promote healthy and sustainable behaviors in daily life. Specific objectives: 1. Understand the concepts of greenhouse gases, greenhouse effect and climate change and their impact on human health and the environment. 2. Analyze the human respiratory process, including the inhalation and exhalation phases and the role of the lungs in the respiratory system. 3. Explain how the human respiratory process is related to the carbon cycle and carbon dioxide (CO₂) production. 4. Calculate your personal carbon footprint, considering daily activities such as transportation, energy consumption, and diet. 5. Participate in breathing exercises and targeted physical activities to improve breathing capacity and overall well-being. 6. Examine lifestyle choices, such as using public transport, reducing plastic use, and choosing low-carbon foods, to reduce the individual carbon footprint. 7. Discuss strategies to raise awareness among others and promote sustainable behaviors in the community. Now that we've established your goals, you can structure your lesson around those goals and select the activities, demonstrations, and learning materials you need to achieve them. Be sure to engage students in an interactive and hands-on way, encouraging reflection on their actions and impact on the planet.

Lesson content	References	Methodology
Introduction (10 minutes): - Introduce the concept of climate change and its importance.	https://www.nature.com/articles/s41598-018-27631-7	Lectures

- State the objectives of the lesson and explain how breathing is related to climate change.

Part 1: Breathing and Carbon (15 minutes):

- Explain the human respiratory process, emphasizing oxygen intake and CO₂ production.
- Show how CO₂ is a greenhouse gas that contributes to climate change.
- Use charts or images to illustrate this concept.

Practical activity: breathing exercises (10 minutes):

- Conduct a series of breathing exercises to allow students to experience the process of inhaling and exhaling.
- Discussion: Ask students how their bodies respond during exercise in terms of breathing.

Part 2: Carbon Footprint Calculation (10 minutes):

- Explain what a carbon footprint is and how it is calculated.
- Provide examples of day-to-day activities that contribute to your carbon footprint.
- Encourage students to calculate their personal carbon footprint or make rough estimates.

Discussion (10 minutes):

- Compare results and discuss how day-to-day activities affect the carbon footprint.
- Discuss actions that can be taken to reduce the carbon footprint.

Part 3: Promoting sustainable behaviors (5 minutes):

- Examine various strategies to reduce your carbon footprint, such as public transportation, recycling, and a low-carbon diet.

Hands-on activity: Brainstorming (5 minutes):

- Divide students into groups and ask them to brainstorm how to reduce their carbon footprint in their daily lives.
- Each group presents its own ideas.

<https://library.weschool.com/lezione/ecologia-carbonio-co2-monossido-fotosintesi-respirazione-petrolio-carbone-organica-5920.html>

Conclusions and assignments (5 minutes): - Emphasize the importance of small daily actions in the fight against climate change. - Assign tasks, such as keeping a journal of sustainable actions or getting involved in an environmental project. Summary and Closing (5 minutes): - Summarize the key points of the lesson. - Invite students to ask questions or share their final thoughts. This lesson structure is designed to be interactive and engaging, allowing students to learn in a hands-on and participatory way. Be sure to tailor activities and discussions according to the age and level of understanding of the students.		
Slides for the lecture "Breathing and carbon footprint" in relation to climate change: Slide 1: Introduction Titolo: Respiration and Carbon Footprint Subtitle: Connecting Our Breath to Climate Change Contents: Brief introduction on climate change and its importance. Exposition of the main objectives of the lesson. Slide 2: Link between respiration and carbon Title: The Role of Breathing Contents: Explanation of the human respiratory process. Illustration of the process of oxygen exchange and CO₂ production in the lungs. Slide 3: Greenhouse gases and climate change Title: Greenhouse Gases and Our Planet Contents: Definition of greenhouse gases and their impact on climate change. Graph or image depicting the carbon cycle and the role of CO₂.	https://link.springer.com/article/10.1007/s13351-020-9133-7	Slides to be used for the lecture, insert appropriate images.

Slide 4: Breathing Exercises

Titolo: Practical Experience

Contents:

Guide students through a series of breathing exercises.

Encourage students to actively participate and observe their breathing reactions.

Slide 5: Calculating the Carbon Footprint

Title: Measuring Our Impact

Contents:

Explanation of what a carbon footprint is.

Examples of day-to-day activities that contribute to your carbon footprint.

Slide 6: Calculating Your Personal Carbon Footprint

Title: Calculate Your Impact

Contents:

Guide students on how to calculate their personal carbon footprint.

Provide examples and formulas for the calculation.

Slide 7: Discussion: Reducing the Carbon Footprint

Title: Sustainable Behaviours

Contents:

Discuss how day-to-day activities affect your carbon footprint.

Present strategies to reduce the carbon footprint, such as public transport and recycling.

Slide 8: Brainstorming - Ideas for Reduction

Titolo: Think Big!

Contents:

Divide students into groups.

Each group presents ideas for reducing the carbon footprint in their daily lives.

Slide 9: Conclusions and Tasks

Title: Learning to Act

Contents:

Summary of the key points of the lesson. Assign tasks, such as keeping a journal of sustainable actions or getting involved in an environmental project. Slide 10: Final Summary and Questions Title: Our Responsibility Contents: It emphasizes the importance of small, everyday actions in tackling climate change. Invite students to ask questions or share their final thoughts. Be sure to use relevant images, charts, and images in your slides to make the lesson more engaging and understandable. You can also consider using videos or practical examples to further illustrate the concepts.		

Activity	Methodology
Activity: Carbon Footprint Reduction Project Objective of the activity: Students will apply what they have learned during the lesson to develop a personal plan to reduce their carbon footprint. Arrangement: 1. Review Personal Carbon Footprint: Have students review their personal carbon footprint calculations that they made during class. This will serve as a starting point for the activity. 2. Identify areas for improvement: Students should look at their carbon footprints and identify areas where they can reduce carbon emissions. For example, they can focus on more sustainable transportation, reducing energy consumption, or making eco-friendly food choices. 3. Develop an action plan: Each student should create a detailed plan for how they plan to reduce their carbon footprint. The plan should include specific targets, actions to be taken, and an estimate of the emission reductions expected to be achieved. 4. Implement the plan: Students should begin implementing their plans, keeping track of the actions they have taken and the progress they have made in reducing their carbon footprint.	Project with Project-Based Learning (PjBL) methodology

5. Monitoring and Reflection: Periodically, students should monitor and record their achievements. This activity can last several weeks or months, depending on the length of the course. 6. Presentation of results: At the end of the activity, students can present the results of their carbon footprint reduction project. They can share the challenges they have encountered, the solutions they have found, and how much CO2 emissions have been saved through their actions. 7. Class discussion: Conclude the activity with a class discussion where students share their experiences and reflect on the importance of individual actions in the fight against climate change. Also, discuss how individual actions can inspire others and have a collective impact. This project will not only help students put into practice what they have learned, but it will also make them more aware of their habits and opportunities to contribute to environmental sustainability.	

Checks	Typology
Semi-structured with 10 questions, along with the correct answers: Question 1: What is the carbon footprint? Answer: The carbon footprint is a measure of the amount of carbon emissions, specifically carbon dioxide (CO2), that an individual or business produces directly or indirectly. Question 2: What is the main greenhouse gas responsible for climate change? Answer: Carbon dioxide (CO2) is the main greenhouse gas responsible for climate change. Question 3: What is the carbon cycle and how is it related to climate change? Answer: The carbon cycle is the process in which carbon moves between the atmosphere, biosphere, geosphere, and hydrosphere. The CO2 released into the atmosphere during human activity is a significant contributor to climate change as it acts as a greenhouse gas, trapping heat in the atmosphere. Question 4: What is the role of the lungs in the human respiratory system? Answer: The lungs are organs of the respiratory system that facilitate the exchange of oxygen and carbon dioxide between the inhaled air and the bloodstream.	Semi-structured short-answer test

Question 5: What does the term "greenhouse effect" represent? Answer: The "greenhouse effect" represents the process in which greenhouse gases such as CO₂ trap heat in the Earth's atmosphere, contributing to global warming and climate change. Question 6: What are some daily actions that can help reduce your carbon footprint? Answer: Some daily actions to reduce your carbon footprint include using public transportation, recycling, reducing energy consumption, choosing foods with a low carbon footprint, and decreasing the use of plastics. Question 7: How do you calculate your personal carbon footprint? Answer: The personal carbon footprint can be calculated by considering the CO₂ emissions produced by activities such as transportation, energy consumption, and diet, and by using specific online tools or calculators. Question 8: What does "reduce, reuse, recycle" mean? Answer: "Reduce, reuse, recycle" is an environmental principle that promotes the reduction of waste and carbon emissions by minimizing consumption, reusing products, and recycling materials. Question 9: Why is it important to reduce your personal carbon footprint? Answer: Reducing one's personal carbon footprint is important for mitigating climate change, protecting the environment, and ensuring a sustainable future for future generations. Question 10: How is our breathing related to climate change? Answer: Our respiration produces CO₂ as a by-product, which contributes to greenhouse gas emissions. While the individual contribution is relatively small, it is important to understand the connection between respiration and global emissions.	
Structured test consisting of 10 multiple-choice questions, together with the correct answers: Question 1: What is the main greenhouse gas responsible for climate change?	E.g. tests already prepared by textbooks or structured multiple-choice test, open-

- a) Oxygen
 - b) Methane
 - c) Carbon dioxide (CO₂)
 - d) Nitrogen
- Correct answer: c) Carbon dioxide (CO₂)

Question 2: What does the greenhouse effect represent?

- a) Cooling of the Earth's atmosphere
 - b) Effect of an agricultural greenhouse
 - c) Warming of the Earth's atmosphere due to the accumulation of greenhouse gases
 - d) Absence of gases in the atmosphere
- Correct answer: c) Warming of the Earth's atmosphere due to the accumulation of greenhouse gases

Question 3: What is the process by which oxygen enters our body and CO₂ is eliminated?

- a) Digestion
 - b) Blood circulation
 - c) Breathing
 - d) Excretion
- Correct answer: c) Breathing

Question 4: What does the term "carbon footprint" represent?

- a) Measurement of the weight of carbon in the human body
 - b) Amount of CO₂ produced by an activity or individual
 - c) Amount of CO₂ in the soil
 - d) Rate of photosynthesis in plants
- Correct answer: b) Amount of CO₂ produced by an activity or individual

Question 5: What is the carbon cycle?

- a) The process by which carbon moves between the atmosphere and the lungs
 - b) The process by which carbon moves between the biosphere, the geosphere, the hydrosphere and the atmosphere
 - c) Process by which carbon moves between the food we eat and our body
 - d) Process of producing carbon dioxide in the lungs
- Correct answer: b) The process by which carbon moves between the biosphere, the geosphere, the hydrosphere, and the atmosphere

Question 6: What is the primary role of the lungs in the human respiratory system?

- a) Absorb oxygen from the air
- b) Filter the incoming air

ended answers, true or false.

- c) Produce CO₂
- d) Transport of blood

Correct answer: a) Absorb oxygen from the air

Question 7: What are some daily actions that can help reduce your carbon footprint?

- a) Use public transport, recycle, reduce energy consumption
- b) Increase electricity consumption, drive alone, consume too much meat
- c) Use the car every day, use disposable products
- d) Do not recycle, use plastic bags

Correct answer: a) Use public transport, recycle, reduce energy consumption

Question 8: How can personal carbon footprint be calculated?

- a) With a thermometer
- b) With a ladder
- c) Use of online calculators or specific calculators
- d) Counting calories consumed

Correct answer: c) Use of online calculators or specific calculators

Question 9: Why is it important to reduce your personal carbon footprint?

- a) Increasing CO₂ emissions
- b) Improving air quality
- c) Combating climate change and protecting the environment
- d) Increase energy consumption

Correct answer: c) Fight climate change and protect the environment

Question 10: How is human respiration related to CO₂ emissions?

- a) Human respiration has no relation to CO₂ emissions.
- b) During breathing, the body absorbs CO₂ from the air.
- c) During breathing, the body releases CO₂ into the air.
- d) Human respiration is a significant source of methane (CH₄) emissions.

Correct answer: c) During breathing, the body releases CO₂ into the air.

multiple-choice test with "X" for correct answers to 10 questions:

Question 1: What is the main greenhouse gas responsible for climate change?

- a) Oxygen
- b) Methane
- c) Carbon dioxide (CO₂)

E.g. tests prepared by the teacher: multiple-choice tests

d) Nitrogen

Correct answer: c) X

Question 2: What does the greenhouse effect represent?

a) Cooling of the Earth's atmosphere

(b) Effect of an agricultural greenhouse

c) Warming of the Earth's atmosphere due to the accumulation of greenhouse gases

(d) Absence of gases in the atmosphere

Correct answer: c) X

Question 3: What is the process by which oxygen enters our body and CO₂ is eliminated?

a) Digestion

b) Blood circulation

c) Breathing

(d) Excretion

Correct answer: c) X

Question 4: What does the term "carbon footprint" represent?

a) Measurement of the weight of carbon in the human body

(b) Amount of CO₂ produced by an activity or individual

c) Amount of CO₂ in the soil

d) Rate of photosynthesis in plants

Correct answer: b) X

Question 5: What is the carbon cycle?

a) The process by which carbon moves between the atmosphere and the lungs

b) The process by which carbon moves between the biosphere, the geosphere, the hydrosphere and the atmosphere

c) Process by which carbon moves between the food we eat and our body

d) Process of producing carbon dioxide in the lungs

Correct answer: b) X

Question 6: What is the primary role of the lungs in the human respiratory system?

a) Absorb oxygen from the air

b) Filter the incoming air

c) Produce CO₂

d) Transport of blood

Correct answer: a) X

Question 7: What are some daily actions that can help reduce your carbon footprint?

- a) Use public transport, recycle, reduce energy consumption
- b) Increase electricity consumption, drive alone, consume too much meat
- c) Use the car every day, use disposable products
- d) Do not recycle, use plastic bags

Correct answer: a) X

Question 8: How can personal carbon footprint be calculated?

- a) With a thermometer
- b) With a ladder
- c) Use of online calculators or specific calculators
- d) Counting calories consumed

Correct answer: c) X

Question 9: Why is it important to reduce your personal carbon footprint?

- a) Increasing CO2 emissions
- b) Improving air quality
- c) Combating climate change and protecting the environment
- d) Increase energy consumption

Correct answer: c) X

Question 10: How is human respiration related to CO2 emissions?

- a) Human respiration has no relation to CO2 emissions.
- b) During breathing, the body absorbs CO2 from the air.
- c) During breathing, the body releases CO2 into the air.
- d) Human respiration is a significant source of methane (CH4) emissions.

Correct answer: c) X

Skills acquired

After participating in the lecture on "Respiration and Carbon Footprint" in relation to climate change, students will have acquired a range of skills and knowledge. Here are some of the skills students may have acquired:

Understanding Climate Change: Students will have gained a clear understanding of climate change, including the concepts of greenhouse gases, the greenhouse effect, and their implications for the planet and human health.

Knowledge of the carbon cycle: Students will have gained knowledge about the carbon cycle and how carbon moves between the atmosphere, biosphere, geosphere, and hydrosphere.

Understanding the role of breathing: Students will be able to explain the process of human breathing and the role of the lungs in the respiratory system.

Carbon footprint calculation: Students will have learned how to calculate their own personal carbon footprint, taking into account the daily activities that contribute to CO₂ emissions.

Carbon footprint awareness: Students will be more aware of their individual impact on climate change and the actions they can take to reduce their carbon footprint.

Development of motor skills: Through breathing exercises and physical activities, students may have developed motor skills related to the respiratory system.

Planning sustainable actions: Students will have learned how to plan sustainable actions in their daily lives, such as using public transport, recycling, and choosing foods with a low carbon footprint.

Presentation skills: If students have been involved in presentations or class discussions, they may have improved their communication and presentation skills.

Critical thinking: Students may have developed the ability to critically evaluate information related to climate change and sustainability actions.

Environmental awareness: The class may have helped to raise students' awareness of the importance of environmental protection and individual contributions to the fight against climate change.

These skills and knowledge are essential to responsibly and consciously address the environmental and climate challenges that the world is currently facing.

Lesson No. 4 – Metabolism and Nutrition

Lesson plan

Keywords: metabolism, nutrition, digestion, calories, macronutrients

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities

School: first two years of secondary school.

Objectives
Main objectives of the lesson: 1. Understand the concept of metabolism and its relationship with body energy. 2. Analyze the importance of nutrition in providing energy and nutrients needed for metabolism.

3. Examine how climate change affects food availability and nutrition.
4. Promote awareness of the impact of climate change on human health and well-being.
5. Identify actions individuals can take to mitigate the impact of climate change on nutrition.

Specific objectives of the lesson:

1. Define metabolism as the process of converting nutrients into energy within the human body.
2. Explain how nutrients such as carbohydrates, proteins, and fats are essential for optimal metabolism.
3. Illustrate how global warming, changes in weather patterns, and extreme weather conditions can affect food production and the availability of nutritional resources.
4. Examine the consequences of climate change on food production and quality, including decreased agricultural yields and alterations in the nutritional composition of food.
5. Discuss the impact of climate change on human health, including the risks of nutritional deficiencies and nutrition-related diseases.
6. Present some strategies and actions that individuals can take to reduce the impact of climate change on nutrition, such as choosing low-impact environmental foods, reducing food waste, and supporting sustainable agricultural practices.

These goals aim to provide students with a comprehensive understanding of the connection between metabolism, nutrition, and climate change, while promoting awareness of individual responsibility in addressing this global challenge.

Lesson content	References	Methodology
Here is a lesson structure to address the topic "Metabolism and Nutrition in Relation to Climate Change" in a physical education class: Lesson duration: 60 minutes I. Introduction (10 minutes) - Welcome and introduction to the topic. - Explanation of the importance of metabolism and nutrition for health and physical activity. - Connection to the theme of climate change and the environment. II. Metabolism and nutrition (15 minutes) - Definition of metabolism and explanation of its key components. - Discussion of macronutrients (carbohydrates, proteins, fats) and their role in metabolism. - Emphasis on the importance of a balanced diet to support a healthy metabolism. III. Climate Change and Diet (15 minutes)	https://besjournals.onlinelibrary.wiley.com/doi/10.1111/1365-2435.13663 https://www.nutriviva.it/metabolismo-e-nutrizione/	Lectures and dialogues

- Presentation of climate change and its causes.
- Discussion on the effects of climate change on food production.
- Examination of the quality and quantity of food affected by climate change.

IV. Impact of climate change on nutrition (10 minutes)

- Explore the effects of climate change on the availability of nutritious food.
- Discuss potential consequences for human health, such as nutritional deficiencies and disease.

V. Individual and collective actions (5 minutes)

- Presentation of actions that individuals and communities can take to mitigate the effects of climate change on nutrition.
- Examples of sustainable food choices and responsible farming practices.

VI. Discussion and questions (5 minutes)

- Open class discussion to gather students' opinions and answer any questions.

VII. Hands-on activity (5 minutes)

- If possible, organize a hands-on activity, such as assessing the nutritional content of certain foods or discussing strategies to reduce food waste.

VIII. Conclusion (5 minutes)

- Summary of the key points of the lesson.
- Emphasize the importance of considering the environment and nutrition in relation to climate change.
- Encourage students to reflect on how they can contribute to positive change.

IX. Compiti a casa (5 minutes)

- Assign tasks or assignments, such as researching sustainable agricultural practices or writing a short essay on the connections between nutrition, metabolism, and climate change.

This lecture structure aims to engage students through a clear and interactive presentation of the topic and provides opportunities for in-depth discussion on climate change, nutrition, and their impact on individual and global health and well-being.		
Slides for the lecture on "Metabolism and nutrition in relation to climate change": Slide 1: Introduction Title: Welcome to the Metabolism and Nutrition Lesson! Subtitle: Learning to connect health, nutrition and the environment. Contents: Brief introduction to the topic. Lesson objectives. Slide 2: Metabolism and Nutrition Title: What is metabolism? Subtitle: The engine of your body. Contents: Definition of metabolism. Explanation of the key components of metabolism. Slide 3: Metabolism and Nutrition Title: Nutrition and Metabolism Subtitle: The Importance of Nutrients. Contents: Discussion of macronutrients: carbohydrates, proteins, fats. Role of nutrients in supporting metabolism. Slide 4: Climate Change and Diet Titolo: Climate Change Subtitle: How and why it's happening. Contents: Explanation of the causes of climate change. Slide 5: Climate Change and Diet Title: Impact on Food Production Subtitle: How Climate Change Affects Food.	https://www.frontiersin.org/articles/10.3389/fpls.2023.1087712/full	Slides to create a frontal and dialogic lesson.

Contents:

Discussion on the effects of climate change on food production.

Slide 6: Impact of climate change on nutrition

Title: Food Quality

Subtitle: How Climate Change Can Alter Food Quality.

Contents:

Examine decreased agricultural yields and changes in the nutritional composition of foods.

Slide 7: Impact of Climate Change on Nutrition

Titolo: Human Health

Subtitle: How climate change can affect our health.

Contents:

Discussion of potential health consequences, such as nutritional deficiencies and nutrition-related diseases.

Slide 8: Individual and Collective Actions

Title: What Can We Do?

Subtitle: Reducing the impact of climate change on nutrition.

Contents:

Presentation of actions that individuals and communities can take to mitigate the effects of climate change on nutrition.

Slide 9: Discussion and Questions

Titolo: Your Opinion Matters!

Contents:

Invitation for students to share their opinions and ask questions.

Slide 10: Practice Activity

Title: Practical application

Subtitle: Evaluation of the nutritional content of foods.

Contents:

Explanation of the practical activity (if possible) to involve students in a real evaluation of the nutritional content of certain foods.

Slide 11: Conclusion

Title: Synthesis and Reflection

Subtitle: Connections between nutrition, metabolism and climate change.

Contents:

Summary of the key points of the lesson.

Reflection on the importance of considering the environment in relation to nutrition.

Slide 12: Homework and Conclusions

Title: What to do after class?

Contents:

Assigning homework, such as researching sustainable agricultural practices or writing a short essay on the links between nutrition, metabolism, and climate change.

Thanksgiving and encouragement for the students' active participation in addressing this important challenge.

This slide structure should help you guide the lesson effectively, covering all key topics and engaging students in meaningful discussions about the interplay between metabolism, nutrition, and climate change.

Activity	Methodology
Activity: Environmental and nutritional awareness project Description:_____: Divide students into groups and assign them the task of creating an environmental and nutritional awareness project. The aim of the project is to educate the school community or local community about the importance of healthy eating in relation to climate change. Each group should plan a series of activities to promote awareness and action. Phases of the activity: Group training: divide students into groups of 3-4 people. Project Themes: Each group must select a specific theme related to the environment and nutrition, such as: - "Reduce food waste" - "Promote diets with low environmental impact" - "Sustainable Food Farming"	Project-Based Learning (PjBL)

- "Impact of climate change on child nutrition" Research and planning: Each group should conduct research on their chosen topic and plan a series of activities to raise awareness among other students, teachers, or the local community. Activities may include: - Workshop on sustainable meal preparation - Informative presentations - Fundraising events for environmental organizations - Social media awareness campaigns - Creation of informational materials such as posters, flyers, or educational videos Budget: Ask each group to develop a rough budget for their activities. Time planning: Groups should establish a timeline for the implementation of their activities, including dates and deadlines. Project presentations: Each group must present their project to other students and a group of local teachers or experts. Presentations should include the rationale for choosing the theme, an explanation of the planned activities, and the estimated budget. Project implementation: After the presentation, the groups should implement their activities. Evaluation and sharing of results: At the end of the implementation period, groups should collect data and feedback on their activities and share it with the class. Final thought: Groups should reflect on the experience, lessons learned, and potential impact of their activities. Class Discussion: Conclude the activity with a class discussion on the importance of individual and collective action in mitigating the effects of climate change through food and environmental education. This activity encourages students to put into practice the knowledge gained during the lesson and take proactive steps to promote healthy and sustainable eating within the community. It also provides them with the opportunity to develop leadership, planning, and communication skills.	

Checks	Typology
Semi-structured assessment with 20 questions on the topic "Metabolism, nutrition and climate change". The correct answers are given at the end.	Semi-structured test with 20 questions

Questions:

1. What is metabolism?
2. What are the three main macronutrients and what is their role in metabolism?
3. Explain how climate change can affect food production.
4. What are some of the possible consequences of climate change on human nutrition?
5. What does "food waste" mean and what is its impact on the environment?
6. What is the link between low-impact diets and sustainability?
7. What are some strategies to reduce your environmental impact through food choices?
8. What is a "vegan diet" and how might it impact the environment?
9. What is the difference between a "sustainable diet" and an "unsustainable diet"?
10. What is the importance of a balanced diet for metabolism?
11. What is climate change and what are its main causes?
12. Explain how global warming can affect the availability of clean water.
13. What are some diseases related to malnutrition?
14. How can sustainable food production help mitigate the effects of climate change?
15. What are the most energy-efficient food sources?
16. How can you help reduce food waste?
17. What can individuals do to promote food sustainability in their community?
18. Explain the importance of biodiversity in food production.
19. What is the main objective of the environmental and nutritional awareness project?
20. What are the key steps to plan and implement an environmental and nutritional awareness project?

Answers:

1. Metabolism is the process by which the human body converts nutrients into energy.
2. The three main macronutrients are carbohydrates, protein, and fat. Carbohydrates provide energy, protein is essential for tissue growth and repair, and fats are important for energy production and absorption of fat-soluble vitamins.
3. Climate change can affect food production by altering weather patterns, increasing temperatures, and potentially reducing agricultural yields.
4. Possible consequences of climate change on human nutrition include nutritional deficiencies, limited availability of nutritious foods, and rising food prices.

5. Food waste refers to edible food that is discarded or wasted. It has a negative impact on the environment as it contributes to the waste of resources such as water, soil, and energy.
6. Low-impact diets rely on foods that require fewer natural resources to produce and have a lower environmental impact than other diets. They are more sustainable.
7. Some strategies to reduce environmental impact through dietary choices include consuming less meat, reducing food waste, preferring local and seasonal foods, and choosing organic and low-impact products.
8. A vegan diet excludes all animal products, including meat, dairy, and eggs. It can have a positive impact on the environment by reducing resource use and greenhouse gas emissions associated with the animal industry.
9. A sustainable diet is based on food choices that consider the balance between nutrition, environmental sustainability, and social impact, while an unsustainable diet is characterized by food practices that harm the environment and human health.
10. A balanced diet provides all the nutrients needed for proper metabolism, including carbohydrates, proteins, fats, vitamins, and minerals.
11. Climate change refers to long-term changes in Earth's climate patterns, including global warming and sea level changes. The main causes are the increase in greenhouse gas emissions due to human activity.
12. Global warming can affect the availability of clean water by altering precipitation patterns, melting glaciers, and salinizing freshwater supplies.
13. Some diseases linked to malnutrition include vitamin D deficiency, iron deficiency, protein malnutrition, and chronic hunger.
14. Sustainable food production can help mitigate the effects of climate change through responsible farming practices, efficient use of resources, and the promotion of climate-resilient crops.
15. The most energy-efficient food sources are often plant-based, such as legumes and grains.
16. To help reduce food waste, you can plan meals, store and use leftovers, check expiration dates, and donate excess food to charitable organizations.
17. Individuals can promote food sustainability in their community by supporting local farmers, participating in farmers' markets, raising awareness of food-related issues, and engaging in outreach projects.
18. Biodiversity in food production is important because it ensures the genetic diversity of crops and animals, helping to prevent the loss of essential food varieties.
19. The main objective of the Environmental and Nutrition Awareness Project is to educate and sensitize the community about the interconnection between nutrition and climate change and how food choices can impact the environment.
20. Key steps in planning and implementing an environmental and nutrition awareness project include selecting a topic, conducting

research, planning activities, presenting the project, implementing it, collecting data, and reflecting on the results.	
structured test with 20 multiple-choice questions on the topic "Metabolism, nutrition and climate change". Correct answers are indicated in parentheses: Questions: - What is metabolism? a) The process of conversion of nutrients into energy b) The process of oxygen production in the lungs c) The process of digesting food d) The process of producing vitamins in the body (Correct answer: a) - What are the three main macronutrients? a) Proteins, carbohydrates, vitamins b) Carbohydrates, proteins, fibers c) Carbohydrates, proteins, fats d) Vitamins, fats, fibres (Correct answer: c) - How can climate change affect food production? a) It has no impact on food production b) Can increase food production c) It can cause famines and reduce production d) It can only affect food prices (Correct answer: c) - What are some of the consequences of climate change on human nutrition? a) Increased access to nutritious food b) Reduction of the risks of nutritional deficiencies c) Increased risk of nutritional deficiencies and disease d) Increased life expectancy (Correct answer: c) - What is meant by "food waste"? a) Excessive consumption of food b) The use of non-nutritious foods c) Food thrown away or wasted d) The accumulation of food in the body (Correct answer: c) - What is the link between low-impact diets and sustainability? a) Low-impact diets are less sustainable b) There is no connection between diets and sustainability c) Low-impact diets are more sustainable d) Low-impact diets are harmful to the environment (Correct answer: c)	E.g. tests already prepared by textbooks or structured tests

7. What are some strategies to reduce the environmental impact of food choices?

- a) Eat more meat and dairy products
- b) Choose food transported from distant countries
- c) Reduce meat consumption, prefer local and seasonal products, reduce food waste
- d) Increase the consumption of packaged foods

(Correct answer: c)

8. What does "vegan diet" mean?

- a) A diet based only on foods of animal origin
- b) A diet that includes meat and fish but excludes dairy products
- c) A diet that excludes all animal products
- d) A diet that includes only meat and fish

(Correct answer: c)

9. What is the difference between a "sustainable diet" and an "unsustainable diet"?

- a) There is no difference between the two
- b) A sustainable diet is based only on organic food
- c) A sustainable diet considers the balance between nutrition and environmental impact, while a non-sustainable diet does not
- d) An unsustainable diet is a low-impact diet

(Correct answer: c)

10. What is the importance of a balanced diet for metabolism?

- a) A balanced diet has no impact on metabolism
- b) A balanced diet only provides energy
- c) A balanced diet provides all the nutrients necessary for proper metabolism
- d) A balanced diet slows down the metabolism

(Correct answer: c)

11. What is climate change?

- (a) Seasonal variations in temperatures
- b) Daily weather fluctuations
- c) Long-term changes in Earth's climate patterns, such as global warming
- (d) Extreme weather events

(Correct answer: c)

12. How can global warming affect the availability of drinking water?

- a) It has no effect on the availability of drinking water
- b) Can increase the availability of drinking water
- c) May reduce the availability of drinking water due to salinization and changes in rainfall patterns
- d) It is not related to the availability of drinking water

(Correct answer: c)

13. What are some diseases related to malnutrition?
- a) Flu and common cold
 - b) Malaria and HIV
 - c) Vitamin D deficiency and protein malnutrition
 - d) Cancer and arthritis
- (Correct answer: c)
14. How can sustainable food production help mitigate the effects of climate change?
- a) It has no impact on climate change
 - b) Increases greenhouse gas emissions
 - c) Promotes responsible agricultural practices and reduces the use of resources
 - d) It has no effect on the environment
- (Correct answer: c)
15. What are the most energy-efficient food sources?
- (a) Processed foods
 - (b) Red meat
 - c) Local products
 - (d) Legumes and cereals
- (Correct answer: d)
16. How can you help reduce food waste?
- a) Eat more
 - b) Throw away excess food
 - c) Plan meals, store leftovers, and donate excess food
 - d) Always buy packaged food
- (Correct answer: c)
17. What can individuals do to promote food sustainability in their community?
- a) They can't do anything
 - b) Supporting farmers from distant locations
 - c) Supporting local farmers, participating in farmers' markets, raising awareness and participating in awareness-raising projects
 - d) Only buy food online
- (Correct answer: c)
18. Explain the importance of biodiversity in food production.
- a) Biodiversity is not important for food production
 - (b) Biodiversity ensures the genetic diversity of crops and animals, helping to prevent the loss of essential food varieties
 - c) Biodiversity is only important for wild animals
 - d) Biodiversity slows down food production
- (Correct answer: b)
19. What is the main objective of an environmental and nutritional awareness project?
- a) Promote a vegan diet

- b) Raising awareness about greenhouse gas emissions
 - c) Educate and sensitize the community on the interconnection between nutrition and climate change
 - d) Fighting climate change individually
- (Correct answer: c)

20. What are the key steps in planning and implementing an environmental and nutritional awareness project?

- a) There is no specific process
 - b) Select a topic, plan the activities, present the project and that's it
 - c) Select a topic, research, plan activities, implement the project, collect data and reflect
 - d) Implement the project before conducting research
- (Correct answer: c)

Skills acquired

From the lecture on "Metabolism, Nutrition and Climate Change" and the proposed activities, students can acquire a number of important skills, including:

1. Understanding Key Concepts: Students develop a fundamental understanding of metabolism, nutrition, and climate change, including the interconnections between these aspects.
2. Nutritional knowledge: They learn to identify the main nutrients and their functions in the human body, as well as recognize the importance of a balanced diet for health.
3. Environmental awareness: They understand the impact of climate change on food production, the availability of drinking water, and food sustainability.
4. Food sustainability awareness: They understand how food choices can affect the environment and can identify strategies to reduce environmental impact through their food choices.
5. Research skills: They learn to conduct independent research on topics related to nutrition, climate change, and sustainability.
6. Presentation skills: They improve their presentation skills through the preparation and delivery of environmental and nutritional awareness projects.
7. Project Planning and Management: They gain skills in planning, implementing, and managing outreach projects, developing organizational and time management skills.
8. Communication skills: They learn to communicate effectively with the public through the creation of informational materials, presentations, and other outreach activities.
9. Awareness of social issues: They develop a greater awareness of social issues related to nutrition and the environment and gain the ability to promote positive social change through action.

10. Teamwork and leadership: They collaborate in groups to plan and implement outreach projects, developing teamwork and leadership skills.

11. Critical reflection: They can critically reflect on their design experience and the impact of their activities on the community and the environment.

These skills are not only relevant for academic learning, but also for everyday life and to contribute to a sustainable future. Students become more aware and active citizens, capable of making informed decisions about their diet and promoting environmental sustainability in their community.

Lesson No. 5 – eSports and Environmental Sustainability

Lesson Plan

Keywords: eSports, environmental sustainability, Green Gaming, carbon footprint, renewable energy in eSports

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities
School: first two years of secondary school.

Objectives
Main Objective: Students will understand the importance of environmental sustainability and learn how the eSports industry can contribute to the fight against climate change. Specific objectives: Understanding Climate Change: Students will be able to define climate change and explain its main causes. Environmental Awareness in Esports: Students will be able to identify environmental challenges related to the eSports industry, such as the energy used for servers and online competitions. Environmental Impact Analysis: Students will be able to analyze the environmental impact of their online activities and eSports competitions. Strategies for sustainability in video games: Students will be able to identify strategies adopted by the video game industry to promote environmental sustainability. Promoting sustainable actions: Students will develop a plan to promote sustainable actions within their eSports communities. Creative Presentation: Students will prepare a creative presentation or video illustrating how the eSports industry can contribute to the fight against climate change.

Here is a lesson structure divided into various stages to teach students about the connection between e-sports and environmental sustainability in relation to climate change: Step 1: Introduction (10 minutes) Greetings and welcome to the students. Presentation of the topic of the lesson: "eSports and environmental sustainability". Open discussion: "What do you know about climate change? What are the main causes?" Step 2: Understanding Climate Change (15 minutes) Explanation of climate change, its causes and effects. Class discussion: "What are some of the consequences of climate change that you are aware of?" Step 3: Environmental Awareness in E-Sports (10 minutes) Introduction to environmental challenges related to e-sports, such as power consumption for servers and online competitions. Presentation of concrete examples of environmental impact in the e-sports sector. Step 4: Environmental Impact Analysis (10 minutes) Group activities: Students discuss and share their views on analyzing the environmental impact of their online activities and the video games they play. Step 5: Strategies for sustainability in video games (10 minutes) Discussion on the strategies adopted by the video game industry to promote sustainability, such as energy optimization in games and the use of servers powered by renewable sources. Step 6: Promote sustainable actions (5 minutes)	Sustainability news in esportsInternational Journal of Esportshttps://www.ijesports.org/html https://esportsinsider.com/2021/03/gef-joins-sports-for-climate-action-initiative https://www.esportsbets.com/news/sustainable-gaming-companies/	Lectures and dialogues

Brainstorm ideas: Students share tips on how to promote sustainable actions within their e-sports communities. Step 7: Creative Presentation (10 minutes) Assignment: Students will work in groups to prepare a short creative presentation or video illustrating how the e-sports industry can contribute to the fight against climate change. Phase 8: Conclusions and final discussion (5 minutes) Presentation of creative group presentations. Final discussion: "What are the main lessons learned today about environmental sustainability in e-sports?" Step 9: Homework (5 minutes) Assign students to write a short article or reflection on strategies to promote sustainability in the e-sports industry. Conclusion of the lesson (5 minutes) Summary of the main objectives achieved during the lesson. Thanking the students for their active participation. This lesson structure should engage students in an interactive and educational way, helping them understand the connection between e-sports and environmental sustainability in relation to climate change.		
Slide 1: Introduction Title: E-sports and environmental sustainability Subtitle: Fighting Climate Change Through Play Content: Welcome to our lesson on how e-sports can contribute to environmental sustainability. Slide 2: Main Objective Title: Main Objective	https://www.oasisconsortium.com/insights/finding-firm-ground-building-a-sustainable-esports-industry	Slides for lectures

Content: Understand the importance of environmental sustainability and the role of e-sports in the fight against climate change.

Slide 3: Specific Objectives

Title: Specific objectives

Contents:

1. Understand climate change.
2. Environmental awareness in e-sports.
3. Analyze the environmental impact.
4. Strategies for sustainability in video games.
5. Promote sustainable actions.
6. Creative presentation.

Slide 4: Understanding Climate Change

Title: Understanding Climate Change

Content: definition, causes and effects of climate change.

Slide 5: Environmental Awareness in Esports

Title: Environmental Awareness in E-Sports

Content: Environmental challenges related to e-sports, including servers and online competitions.

Slide 6: Environmental Impact Analysis

Title: Environmental Impact Analysis

Content: Discussion and analysis of the environmental impact of online activities and video games.

Slide 7: Strategies for Sustainability in Video Games

Title: Strategies for sustainability in video games

Content: How the video game industry promotes sustainability through energy optimization and other strategies.

Slide 8: Promoting Sustainable Actions

Title: Promoting sustainable actions

Content: Ideas and tips for promoting sustainable actions in e-sports communities.

Slide 9: Creative Presentation

Titolo: Creative Presentation Content: Assignment: Create a presentation or video that demonstrates how e-sports can contribute to environmental sustainability. Slide 10: Conclusions and final discussion Title: Conclusions and final discussion Content: Presentation of creative group presentations and discussion of lessons learned. Slide 11: Homework Titolo: Homework Assignment Content: Assignment to write a short article or reflection on strategies to promote sustainability in the e-sports industry. Slide 12: Conclusion of the lesson Title: Conclusion of the lesson Contents: Summary of achievements and acknowledgments for participating. Be sure to use relevant images, graphics, or videos to make your slides more engaging and interactive. In addition, during the class, you can incorporate discussions, real-life examples, and hands-on activities to keep students interested and educated on the topic of environmental sustainability in e-sports.		

Activity	Methodology
Activity: Awareness campaign on environmental sustainability in e-sports Objective: Students will work in groups to create an awareness campaign on environmental sustainability in e-sports. The goal is to educate others, including members of their e-sports communities, on how they can help reduce the environmental impact of this industry. Arrangement: Group training: Divide the class into small groups. Make sure there are members with different skills and interests within each group. Research: Each group will need to conduct in-depth research on environmental sustainability in e-sports. They should collect data, information, and concrete examples on the topic.	Group work or word café

Development of educational materials: Groups will need to create educational materials for their awareness campaign. These materials may include: Informative posters. Websites or blogs with articles and graphics. Educational videos or infographics. Printed flyers or brochures. Campaign planning: Each group will need to plan how to disseminate their educational material. They can do this through social media, local or online events, e-sports forums, or other relevant channels. Campaign implementation: Groups will carry out their awareness campaign for a predetermined period. They can engage members of their e-sports communities, organize workshops or webinars, or invite environmental sustainability experts to share their knowledge. Evaluation: At the end of the campaign, the groups will evaluate the effectiveness of their efforts. They can collect feedback from participants and analyze how many people have been reached with their message. Final report: Each group will have to submit a final report that includes a summary of the activities carried out, the results achieved and the lessons learned during the process. This activity will not only allow students to deepen their understanding of sustainability in e-sports, but it will also actively engage them in promoting sustainable practices within their gaming communities and beyond. In addition, it will promote the development of their research, communication, and teamwork skills.	

Checks	Typology
Structured assessment with 10 correct questions and answers: Question 1: What is the main objective of the lesson on "E-sports and environmental sustainability"? Answer: The main goal is to understand the importance of environmental sustainability and how the e-sports industry can contribute to the fight against climate change. Question 2: What is climate change? Answer: Climate change is long-term changes in global weather patterns, often caused by human activities, that lead to an increase in the Earth's average temperatures.	Short Answer Verification

Question 3: What is a common environmental challenge related to e-sports?

Answer: A common challenge is power consumption for servers and online competitions.

Question 4: What should students do in the activity "Promoting sustainable actions"?

Answer: Students should develop a plan to promote sustainable actions in their e-sports communities.

Question 5: What is the goal of the "Creative Presentation" activity?

Answer: The goal is to create a presentation or video that illustrates how e-sports can contribute to environmental sustainability.

Question 6: What kind of educational material could be created during the awareness-raising campaign activity?

Answer: Materials such as informational posters, websites, educational videos, flyers, or brochures.

Question 7: Why is it important to raise awareness about sustainability in e-sports?

Answer: It is important because it can help reduce the environmental impact of the e-sports industry and promote more sustainable behaviors.

Question 8: What are some strategies for promoting sustainability in video games?

Answer: Some strategies include energy optimization of games and the use of servers powered by renewable sources.

Question 9: What should groups do after implementing their awareness campaign?

Answer: They should evaluate the effectiveness of their efforts and submit a final report.

Question 10: What is the role of e-sports in the fight against climate change?

Answer: E-sports can contribute to the fight against climate change by promoting sustainable practices and raising awareness of the importance of environmental sustainability.

Structured assessment with 20 correct questions and answers:

ES. Tests already prepared from

Question 1: What is climate change?

Answer: Climate change is long-term changes in global weather patterns, often caused by human activities, that lead to an increase in the Earth's average temperatures.

Question 2: What is the main objective of the lesson on "E-sports and environmental sustainability"?

Answer: The main goal is to understand the importance of environmental sustainability and how the e-sports industry can contribute to the fight against climate change.

Question 3: What is a common environmental challenge related to e-sports?

Answer: A common challenge is power consumption for servers and online competitions.

Question 4: What is one of the tasks assigned during the activity "Promoting sustainable actions"?

Answer: Students should develop a plan to promote sustainable actions in their e-sports communities.

Question 5: What is the goal of the "Creative Presentation" activity?

Answer: The goal is to create a presentation or video that illustrates how e-sports can contribute to environmental sustainability.

Question 6: What are some strategies to promote sustainability in video games?

Answer: Some strategies include energy optimization of games and the use of servers powered by renewable sources.

Question 7: Why is it important to raise awareness about sustainability in e-sports?

Answer: It is important because it can help reduce the environmental impact of the e-sports industry and promote more sustainable behaviors.

Question 8: What should groups do after implementing their awareness campaign?

Answer: They should evaluate the effectiveness of their efforts and submit a final report.

textbooks or
structured
assessment

Question 9: What is the role of e-sports in the fight against climate change?

Answer: E-sports can contribute to the fight against climate change by promoting sustainable practices and raising awareness of the importance of environmental sustainability.

Question 10: What are the educational materials that could be created during the awareness campaign activity?

Answer: Materials such as informational posters, websites, educational videos, flyers, or brochures.

Question 11: What is one of the main effects of climate change?

Answer: A common effect of climate change is the increased frequency and intensity of extreme weather events.

Question 12: What does "energy optimization" mean in the context of video games?

Answer: It means designing and operating games to use less electricity, thus reducing environmental impact.

Question 13: What is one of the tasks assigned during the activity "Promoting sustainable actions"?

Answer: Students should develop a plan to promote sustainable actions in their e-sports communities.

Question 14: What are some of the renewable energy sources that can be used to power online game servers?

Answer: Some renewable energy sources include solar, wind, and hydropower.

Question 15: Why is it important for e-sports players to be aware of the environmental impact of their online activities?

Answer: It is important for players to adopt more sustainable behaviors and reduce the overall environmental impact of the e-sports industry.

Question 16: What should groups do during the awareness-raising campaign?

Answer: Groups should create educational materials and distribute them to raise awareness about sustainability in e-sports.

Question 17: What is the relationship between the e-sports industry and environmental sustainability?

Answer: The e-sports industry can contribute to environmental sustainability by promoting sustainable practices and reducing resource consumption.

Question 18: What are some of the renewable energy sources that can be used to power online game servers?

Answer: Some renewable energy sources include solar, wind, and hydropower.

Question 19: What is one of the tasks assigned during the activity "Promoting sustainable actions"?

Answer: Students should develop a plan to promote sustainable actions in their e-sports communities.

Question 20: What should groups do after implementing their awareness campaign?

Answer: They should evaluate the effectiveness of their efforts and submit a final report.

Multiple-choice test with 10 questions and the correct answers indicated with an "X":

Question: What is one of the main goals of environmental sustainability in e-sports?

- A) Increase energy consumption.
- B) Reduce the use of natural resources.
- C) Increase online contests.
- D) Promote pollution.

Answer: X) B) Reduce the use of natural resources.

Question: What is climate change?

- A) Extreme weather events.
- B) Genetic mutations in plants.
- C) Daily temperature variations.
- D) Long-term changes in global weather patterns.

Answer: X) D) Long-term changes in global weather patterns.

Question: What is an environmental challenge related to e-sports?

- A) Collection of toxic waste.
- B) Excessive power consumption for servers.
- C) Low community involvement.
- D) Internet access problems.

E.g. tests prepared by the teacher or multiple-choice tests

Answer: X) B) Excessive power consumption for servers.

Question: What should students do during the "Promoting Sustainable Actions" activity?

- A) Play online.
 - B) Develop a plan to promote sustainable actions.
 - C) Ignoring environmental issues.
 - D) Buying products that are not sustainable.
- Answer: X) B) Develop a plan to promote sustainable actions.

Question: What is one of the goals of the "Creative Presentation" activity?

- A) Create a music video.
 - B) Produce a documentary.
 - C) Create a presentation or video about sustainability in e-sports.
 - D) Write a novel.
- Answer: X) C) Create a presentation or video about sustainability in e-sports.

Question: What are some strategies for promoting sustainability in video games?

- A) Increase energy consumption.
 - B) Reduce the use of natural resources.
 - C) Completely ignore sustainability.
 - D) Use non-renewable energy.
- Answer: X) B) Reduce the use of natural resources.

Question: What should groups do after implementing their awareness campaign?

- A) Rest and relaxation.
 - B) Evaluate the effectiveness of their efforts and submit a final report.
 - C) Change the subject.
 - D) Abandon the project.
- Answer: X) B) Evaluate the effectiveness of their efforts and submit a final report.

Question: What is the role of e-sports in the fight against climate change?

- A) Contribute to an increase in greenhouse gases.
 - B) Don't influence climate change.
 - C) Promote sustainable behaviour and raise awareness.
 - D) They have no role.
- Answer: X) C) Promote sustainable behaviors and raise awareness.

Question: What is one of the main effects of climate change?

A) Decline in biodiversity.
B) Increase in natural resources.
C) Improvement of air quality.
D) Improvement of water quality.
Answer: X) A) Decrease in biodiversity.

Question: What are some of the renewable energy sources that can be used to power online game servers?

A) Coal and natural gas.
B) Oil and coal.
C) Solar, wind and hydropower.
D) Petrol and diesel.
Answer: X) C) Solar, wind and hydropower.

Skills acquired

After participating in the class on "E-sports and environmental sustainability", students should have acquired several skills, including:

Understanding Climate Change: Students should have a basic understanding of climate change, including its causes and effects.

Environmental awareness: Students should be aware of environmental challenges related to e-sports, such as the intensive use of electricity for servers.

Environmental impact analysis: Students should be able to analyze the environmental impact of their online activities and e-sports competitions, identifying how these activities may contribute to climate change.

Knowledge of sustainability strategies: Students should be familiar with some of the strategies adopted by the video game industry to promote environmental sustainability, such as energy optimization and the use of renewable energy sources.

Sustainability Promotion Skills: Students should be able to develop plans and strategies to promote sustainable actions within their e-sports communities and beyond.

Creative Communication Skills: Through the "Creative Presentation" activity, students should have developed skills in creating creative learning materials such as presentations or videos.

Critical thinking: Students should be able to think critically about the environmental impact of their online activities and evaluate strategies to reduce this impact.

Collaboration skills: During the awareness campaign activity, students should have developed teamwork and collaboration skills by working together to create and disseminate educational materials.

Evaluation and presentation of results: Students should be able to evaluate the effectiveness of their awareness campaign and submit final reports on the results achieved.

Awareness of environmental responsibility: Students should be more aware of their responsibility to help reduce the environmental impact of their daily activities, including online gaming and e-sports.

These competencies will enable students to become more informed and responsible citizens regarding environmental sustainability, as well as to apply that knowledge and skills in their involvement in the e-sports community and their daily lives.

Lesson No. 6 - Plogging and Orienteering

Lesson plan

Keywords: Plogging, Orienteering, outdoor fitness, environmental conservation, navigation

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities

School: first two years of secondary school.

Objectives
Main objectives: 1. Understand the concept of climate change: Students should gain a basic understanding of what climate change is, its causes, and its effects. 2. Promote physical activity: Encourage students to participate in fun and engaging physical activities that contribute to their physical well-being. 3. Raise awareness of environmental importance: Participants should become more aware of the importance of environmental conservation and their role in it. Specific objectives: 1. Knowledge of basic concepts: Students should be able to explain what climate change is, its root causes, and its effects on the Earth. 2. Orientation skills: Learning the basics of orienteering, including using a compass, reading topographic maps, and calculating distances. 3. Plogging skills: Learn the meaning of the term "plogging" and how to practice it effectively, including picking up trash while running or walking. 4. Environmental awareness: Understand the importance of waste reduction and recycling in the fight against climate change.

5. Collaboration and teamwork: Collaborate with classmates in orienteering and plogging, developing teamwork skills.

Lesson content	References	Methodology
Step 1: Introduction (15 minutes) - Presentation of the concepts of climate change, its causes and effects. - Discussion of how climate change affects our way of life. Step 2: Introduction to Orienteering (20 minutes) - Explanation of the basics of orienteering, including the compass and topographic map reading. - Practical exercise with maps and compass in the classroom. Step 3: Introduction to Plogging (20 minutes) - Explanation of the concept of plogging and its benefits. - Demonstrate how to safely and effectively practice plogging. Step 4: Practical activity - Orienteering (20 minutes) - Organize an outdoor orienteering competition on the school premises or in a nearby park. - Students work in teams and use the skills learned in Phase 2. Step 5: Practice Activity - Plogging (10 minutes) - Organize a short outdoor plogging session, encouraging students to pick up litter along the orienteering course. Step 6: Discussion and Conclusion (5 minutes) - Bring students together and discuss their experiences in orienteering and plogging. - Reinforce the importance of caring for the environment and how these activities can contribute to the fight against climate change.	https://ecobnb.com/blog/2023/02/plogging-sport-environmental-protection/ https://www.oriengine.it/it/pagina/origreen https://zeenews.india.com/india/what-is-plogging-and-how-its-helping-in-fighting-climate-change-2237995.html?fromapp=yes	Lectures

Assignment of tasks: Ask students to keep a journal of their efforts to reduce waste and be more environmentally friendly in their daily lives.		
Slides for the lecture "Plogging and Orienteering: Fighting climate change through physical activity": Slide 1: Introduction Title: "Plogging and Orienteering: Fighting Climate Change through Physical Activity" Subtitle: "Understanding, Participating, Making a Change" Image: Planet Earth icon with a hot sun. Objective: Introduction to the topic of climate change and the importance of sustainable physical activity. Slide 2: Climate Change Title: "Climate Change: What Is It?" Contents: Definition of climate change. Main causes (greenhouse gas emissions, deforestation, pollution). Effects (rising temperatures, melting glaciers, extreme weather events). Slide 3: Importance of Physical Activity Title: "Physical Activity and Environment" Contents: Explanation of the importance of physical activity for individual health. Discussion on the importance of sustainable physical activity for the environment. Connection between an active lifestyle and the fight against climate change. Slide 4: Orienteering - Basics Titolo: "Orienteering: Fundamentals" Contents: Definition of orienteering. Using the compass: how it works. Reading topographic maps: symbols and legend.	Sustainability » Outdoor Education New ZealandOutdoor Education New Zealandhttps://eonz.org.nz » Sustainability	Slides for lectures, add images.

Slide 5: Orienteering - Practical exercise

Title: "Practical orienteering exercise"

Contents:

Illustrated images of compass and map.

Demonstration of how to use the compass to find a specific destination on the map.

Practical exercise in the classroom.

Slide 6: Plogging - What It Is and Why It Matters

Title: "Plogging: Combining Fitness and Environmental Cleanliness"

Contents:

Definition of plogging.

Health and environmental benefits.

Statistics on plastic pollution in the environment.

Slide 7: How to Plog

Title: "How to Make Plog Effectively"

Contents:

Images of people practicing plogging.

Instructions on how to safely collect waste.

Recommendations for clothing and tools needed.

Slide 8: Practical activity - Orienteering

Title: "Orienteering in action"

Contents:

Instructions for students of the outdoor orienteering competition.

Rules and objectives of the race.

Team formation and distribution of maps and compasses.

Slide 9: Practice Activity - Plogging

Titolo: "Plogging in Action"

Contents:

Explanation of the plogging teams.

Default route for garbage collection.

Distribution of garbage bags and gloves.

Slide 10: Discussion and Reflection

Title: "Climate change and our responsibility"

Contents:

Team meetings to discuss their experiences.

Discussion on collected waste and its environmental impact.
Reflection on the importance of individual and collective commitment in the fight against climate change.

Slide 11: Homework and Conclusion

Title: "What to do after class"

Contents:

Homework: Keep a diary of sustainability-related activities.

Encouragement to prepare a short presentation or poster on the importance of personal contributions to the fight against climate change.

Slide 12: Questions and acknowledgments

Title: "Questions and Acknowledgments"

Contents:

Invite students to ask questions.

Thank you for your participation and commitment to the lesson.

Slide 13: Contact Information

Title: "Contact Information and Additional Resources"

Contents:

Teacher's email address for further questions.

Recommendations for additional resources on sustainability and physical activity.

Slide 14: End

Title: "Thank you for participating!"

Contents:

Final thanks and encouragement to put into practice what has been learned in the fight against climate change.

Activity	Methodology
Attività extracurricolare: "Sustainable Plogging and Orienteering Week" Objective: To promote environmental awareness and sustainable physical activity among students through a series of extracurricular events dedicated to plogging and orienteering.	Hands-on outdoor activity

Activity Details: Day 1: Preparatory Workshop Organize an interactive workshop where students learn additional orienteering skills and improve their recording skills. Discussion about local environmental challenges and how plogging and orienteering activities can help address them. Announcement of details for the "Sustainable Plogging and Orienteering Week". Days 2-5: Hands-on activities Each day during this week, students participate in a different hands-on activity, such as: Day 2: Orienteering competition in the local park. Day 3: Plogging along a local beach or river. Day 4: Orienteering in a nearby forest. Day 5: Plogging in a densely populated urban area. Students are encouraged to involve friends and family in activities to further spread environmental awareness. Day 6: Conclusion and award ceremony Organize a closing event to celebrate the success of the "Sustainable Plogging and Orienteering Week". Reward the most active participants and those who collected the most waste during plogging activities. Share success stories and personal reflections about the week. Long-term activities: sustainability project After the "Sustainable Plogging and Orienteering Week", she encourages students to work together on long-term sustainability projects. They could plan regular plogging actions in their community, organize fundraisers for environmental causes, or promote sustainability within their schools. This extracurricular activity extends learning from the classroom to practical, ongoing commitment to environmental sustainability through physical activity. It also promotes community involvement and environmental education among students.	

Checks	Typology
Semi-structured test with 20 questions and answers: What is climate change and what are some of its main causes? Answer: Climate change is a long-term change in Earth's weather patterns. Some of its main causes include the greenhouse effect caused by greenhouse gas emissions, deforestation, and air pollution.	Semi-structured verification

What does the term "plogging" mean?

Answer: Plogging is an activity that combines jogging (running) with picking up trash along the way.

What is the goal of orienteering?

Answer: The goal of orienteering is to navigate through an unfamiliar environment using a compass and a map to reach specific control points in the shortest possible time.

Why is sustainable physical activity important to combat climate change?

Answer: Sustainable physical activity promotes an active lifestyle that reduces the use of polluting means of transport and contributes to reducing greenhouse gas emissions.

What are some of the skills required for orienteering?

Answer: Some of the skills required for orienteering include using a compass, reading topographic maps, and calculating distances.

What are the health benefits of plogging?

Answer: Plogging offers health benefits such as improved cardiorespiratory endurance, muscle training, and contributing to environmental cleanliness.

What does reading a topographic map mean in orienteering?

Answer: Reading a topographic map in orienteering involves interpreting the geographic and topographical details of the surrounding area, including elevations, streams, and landmarks.

What are some precautions to take when making a plog?

Answer: Some precautions include using gloves when collecting waste, properly disposing of collected waste, and avoiding contact with hazardous materials.

What does "sustainability" mean in environmental terms?

Answer: Environmental sustainability refers to the ability to use natural resources in a way that ensures that they are available for future generations.

What are some of the consequences of climate change?

Answer: Some consequences of climate change include rising global temperatures, rising sea levels, ocean acidification, and more frequent extreme weather events.

Answers:

Climate change is a long-term change in Earth's weather patterns.

Some of the main causes include the greenhouse effect caused by greenhouse gas emissions, deforestation, and air pollution.

Plogging is an activity that combines jogging (running) with picking up trash along the way.

The goal of orienteering is to navigate through an unfamiliar environment using a compass and map to reach specific control points in the shortest amount of time.

Sustainable physical activity promotes an active lifestyle that reduces the use of polluting means of transport and contributes to reducing greenhouse gas emissions.

Some of the skills required for orienteering include using a compass, reading topographic maps, and calculating distances.

Plogging offers health benefits such as improved cardiorespiratory endurance, muscle training, and contributing to environmental cleanliness.

Reading a topographic map in orienteering involves interpreting the geographical and topographical details of the surrounding area, including elevations, streams, and landmarks.

Some precautions include using gloves when collecting waste, properly disposing of collected waste, and avoiding contact with hazardous materials.

Environmental sustainability refers to the ability to use natural resources in a way that ensures that they are available for future generations.

Some consequences of climate change include rising global temperatures, rising sea levels, ocean acidification, and more frequent extreme weather events.

Structured test with 20 questions and correct answers:

Questions:

What is climate change?

Answer: Climate change is a long-term change in Earth's weather patterns, including rising global temperatures and associated effects.

What does orienteering represent?

Answer: Orienteering is an activity in which participants navigate through an unfamiliar environment using a compass and map to reach specific checkpoints.

ES. Tests already prepared from textbooks or structured test

What is the main goal of plogging? Answer: The main goal of plogging is to combine physical activity, such as jogging, with picking up trash along the way. What does the greenhouse effect represent? Answer: The greenhouse effect is a process in which certain substances trap heat in the Earth's atmosphere, contributing to the rise in global temperatures. What are some of the main causes of climate change? Answer: Some of the major causes of climate change include greenhouse gas emissions, deforestation, and air pollution. What does "environmental sustainability" mean? Answer: Environmental sustainability refers to the responsible use of natural resources to ensure their availability for future generations. What are some skills needed for orienteering? Answer: The skills needed for orienteering include using a compass, reading topographic maps, and calculating distances. What are the health benefits of plogging? Answer: The health benefits of plogging include improved cardiorespiratory endurance, muscle training, and environmental cleansing. What should students wear when practicing plogging? Answer: Students must wear garbage collection gloves and clothing suitable for physical activity. What does sustainable orienteering stand for? Answer: Sustainable orienteering is an approach that considers the environmental impact of activities and promotes responsible environmental management.	
Crossword style test with 20 correct questions and answers (indicated by "X"): What is climate change? A. Daily climate change.	E.g. tests prepared by the teacher or multiple-choice tests

- X B. Long-term change in Earth's weather patterns.
- C. A new fashion trend.

What does orienteering represent?

- A. A type of physical training.
- X B. An activity that uses a compass and a map to reach checkpoints.
- C. A board game.

What is the main goal of plogging?

- A. Lose weight.
- B. Take photos while running.
- X C. Combine physical activity with garbage collection.

What does the greenhouse effect represent?

- A. A garden with lots of plants.
- X B. A process in which certain substances trap heat in the Earth's atmosphere.
- C. A visual effect caused by sunlight.

What are some of the main causes of climate change?

- A. Climatic composition.
- X B. Greenhouse gas emissions, deforestation and air pollution.
- C. Urban growth.

What does "environmental sustainability" mean?

- A. Extravagant living.
- X B. Use natural resources responsibly to ensure their future availability.
- C. Consume more resources than necessary.

What are some skills needed for orienteering?

- X A. Use a compass, read topographic maps, and calculate distances.
- B. Artistic design.
- C. Kitchen.

What are the health benefits of plogging?

- A. No health benefits.
- X B. Improved cardiorespiratory endurance, muscle training, and environmental cleanliness.
- C. Improved vision.

What should students wear when practicing plogging?

- A. Dress Up.
- X B. Gloves for garbage collection and clothing suitable for physical activity.
- C. Swimwear.

What does sustainable orienteering stand for?

- A. An approach to sustainable cooking.
- X B. An approach to orienteering that considers the environmental impact of activities and promotes responsible environmental management.
- C. A new kind of dance.

Skills acquired

From the lesson on "Plogging and Orienteering" focused on climate change, students can acquire a number of key skills. These skills include:

Understanding Climate Change: Students develop a fundamental understanding of climate change, including its causes and effects on the environment and society.

Orientation skills: They learn the basics of orienteering, including using a compass, reading topographic maps, and calculating distances, thereby developing navigation skills.

Effective Blogging: They gain practical skills for effective plogging, including the ability to safely pick up trash during physical activity.

Environmental Awareness: Students develop a greater awareness of the importance of environmental conservation and their role in effecting positive change through sustainable physical activity.

Teamwork: They collaborate with classmates during orienteering and plogging activities, improving their teamwork and communication skills.

Health awareness: They understand the health benefits of sustainable physical activity such as plogging and how an active lifestyle can contribute to their well-being.

Environmental responsibility: they learn the meaning of individual responsibility in waste management and pollution reduction, contributing to the fight against climate change.

Civic engagement: Students are encouraged to actively engage with the community through plogging and environmental awareness, becoming responsible citizens and committed to environmental protection.

These skills not only help students better understand climate change and the importance of sustainability, but they also prepare them to become responsible advocates for sustainable behaviors and environmental conservation.

Lesson No. 7 - Sustainable Mobility

Lesson plan

Keywords: sustainable mobility, green transport, public transport, electric vehicles, active transport

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities

School: first two years of secondary school.

Objectives
Main objectives: Environmental Awareness: Provide students with a deeper understanding of climate change and the role that sustainable mobility can play in reducing greenhouse gas emissions. Promoting sustainable mobility: Encourage students to consider more environmentally friendly transport alternatives and understand the benefits of 'sustainable mobility' for the environment. Specific objectives: Understanding climate change: Explain key concepts related to climate change, such as the greenhouse effect, global temperature rise, and their impact on the planet. Understanding sustainable mobility: introduce the concept of "sustainable" or "soft" mobility, explaining various eco-friendly modes of transport, such as bicycles, electric scooters, public transport, carpooling, etc. Environmental Impact Assessment: Teach students to assess the environmental impact of different modes of transportation by analyzing the CO2 emissions and other air pollutants associated with each option. Promote bicycles as a means of transport: focus on bicycles as one of the most environmentally friendly options for "sustainable mobility". Explain the health, environmental, and traffic congestion benefits associated with bicycle use. Road Safety Awareness: Ensure that students understand the importance of road safety when using alternative modes of transportation such as electric bicycles or scooters. Practical skills development: Provide students with the opportunity to practice using bicycles or other "sustainable mobility" methods in a safe and controlled environment if possible. Planning a sustainable trip: Teach students how to plan a sustainable trip, considering factors such as distance, safety, accessibility, and environmental impact. Discussion and reflection: Promote discussion among students about the advantages and disadvantages of "sustainable mobility" and the actions they can take to promote a more sustainable lifestyle.

Creating awareness: Emphasize the importance of education and awareness in promoting sustainable mobility and contributing to the fight against climate change.

Promote action: Encourage students to actively engage in promoting 'sustainable mobility' in their community, for example through awareness campaigns or events.

These goals can serve as the basis for designing an engaging lesson on sustainable mobility and climate change in physical education.

Lesson content	References	Methodology
1. Introduction (10 minutes) Greeting and presentation of the lesson objective. Guided discussion: "What do you know about climate change?" 2. Climate change (10 minutes) Explanation of climate change, the greenhouse effect and their impacts. Examples of how human activities affect climate. 3. Sustainable mobility (15 minutes) Definition and explanation of "sustainable mobility". Discussion on eco-friendly modes of transport: bicycles, e-scooters, carpooling, public transport, etc. Benefits of "sustainable mobility" for the environment. 4. Environmental Impact Assessment (10 minutes) Practical activity: comparison of CO2 emissions between different modes of transport. Discussion of the results and reflection. 5. Bicycle Promotion (10 minutes) Presentation of the health and environmental benefits of bicycle use.	Sustainable Mobility and Climate Week 2022Climate Chancehttps://www.climate-chance.org > ... Transport & ClimateICLEIhttps://sustainablemobility.iclei.org > ... https://www.researchgate.net/publication/358462567_Cambiamenti_climatici_infrastrutture_e_mobilita_Ministero_delle_infrastrutture_e_della_mobilita_sostenibili_Mi	Lectures or dialogues

Discussion on how bicycles can help reduce CO2 emissions.

6. Road safety (5 minutes)

Brief discussion on road safety when using bicycles or other "sustainable mobility" methods. Example of appropriate clothing and safety equipment.

7. Hands-on activity (5 minutes)

If possible, allow students to practice with electric bikes or scooters in a safe, supervised area.

8. Plan a sustainable trip (5 minutes)

Demonstration of how to plan a sustainable trip, considering distance, safety and accessibility.

9. Discussion and reflection (10 minutes)

Group discussion on the advantages and disadvantages of "sustainable mobility". Reflection on how students can contribute to promoting "sustainable mobility" in their community.

10. Conclusion (5 minutes)

Summary of the key points of the lesson. Encouragement for students to take concrete actions to reduce environmental impact through "sustainable mobility".

11. Homework (5 minutes)

Assign a homework assignment related to promoting sustainable mobility (e.g., write a short essay or create a poster).

12. Closing (2 minutes)

Thank students for their participation and encourage them to spread awareness about "sustainable mobility" among their friends and family.

This lesson structure should provide a solid foundation for teaching sustainable mobility and climate change in physical education, engaging

students in hands-on activities and meaningful discussions.		
Slides for the lecture on "Sustainable Mobility and Climate Change": Slide 1: Introduction Titolo: Welcome to the Lesson on Sustainable Mobility and Climate Change Slide 2: Lesson Objectives Title: Main and Specific Objectives Main: Environmental awareness and promotion of sustainable mobility. Specific: Understanding climate change, learning about sustainable mobility, assessing environmental impact, promoting bicycles, developing practical skills, planning a sustainable trip, discussion and reflection, creating awareness, promoting action. Slide 3: Climate Change Titolo: What Are Climate Changes? Content: Explain the greenhouse effect, the increase in global temperature and their impact on the planet. Slide 4: The Role of Sustainable Mobility Title: What is sustainable mobility? Content: Define and explain "sustainable mobility", including the various eco-friendly modes of transport. Slide 5: Environmental Benefits Title: Advantages of sustainable mobility Content: List the environmental benefits of sustainable mobility, such as the reduction of CO2 emissions. Slide 6: Environmental Impact Assessment Title: Emissions Comparison Content: Practical activity comparing CO2 emissions between different modes of transport.	Sustainable mobility and climate economics Request PDFResearchGate https://www.researchgate.net › ...	Slides for frontal action, add images and/or charts

Slide 7: Promoting Bicycles

Titolo: Bicycle as a Sustainable Mode

Content: Present the health and environmental benefits of bicycle use.

Slide 8: Road Safety

Title: Bicycle Safety

Content: Brief discussion on road safety when using bicycles.

Slide 9: Practical activity

Title: Practicing sustainable mobility

Content: If possible, allow students to practice with bicycles or scooters in a safe area.

Slide 10: Planning a Sustainable Trip

Title: How to Plan a Sustainable Travel

Content: Demonstrate how to plan a sustainable trip, considering various factors.

Slide 11: Discussion and reflection

Title: Benefits and Actions

Content: Group discussions on the benefits of sustainable mobility and the actions students can take.

Slide 12: Conclusion

Title: Lesson Summary

Content: Summarize the key points of the lesson and encourage students to take concrete action.

Slide 13: Homework

Titolo: Homework Assignment

Content: Assign a homework assignment related to the promotion of sustainable mobility.

Slide 14: Closing

Title: Thank you for your participation!

Content: To thank students and encourage them to spread awareness about sustainable mobility.

Slide 15: Questions and final discussion

Title: Questions and Discussion Content: Invite students to ask questions and participate in a short final discussion. These slides should provide a clear organization for your PE class on sustainable mobility and climate change, ensuring that the main and specific objectives are adequately covered. You can also add images or charts to improve students' comprehension if desired.		

Activity	Methodology
Activity: Sustainable Mobility Project Objective: Students will develop a sustainable mobility project for their community, applying what they have learned during the lesson. Arrangement: Preliminary research (1-2 weeks): Ask students to review the current state of mobility in their community. What are the main challenges of traffic and air pollution? What transportation options are currently available? Project development (2-3 weeks): Divide students into groups or allow them to work individually, depending on class size. Ask them to develop a sustainable mobility project that addresses the challenges identified in their community. They may consider introducing bike lanes, promoting carpooling, encouraging the use of public transport, or other innovative solutions. Projects should include detailed plans, cost estimates, environmental and social benefits, as well as an outreach plan. Project presentations (1-2 weeks): Each group or student must present their project to the class. Presentations should include a full description of the project, expected benefits, and promotion strategies. Discussion & Feedback (1 week): After each presentation, allow other students to ask questions and provide constructive feedback. Final assessment (1 week): Evaluate projects based on their feasibility, originality, relevance to the community, and completeness of the implementation plan. Implementation (time varies):	Research project

If possible, encourage students to work with local authorities or community organizations to implement their project. Final Report (1-2 weeks): At the end of the activity, ask students to submit a final report summarizing the experience, including progress in implementing the project (if applicable). This activity not only gives students the opportunity to apply what they have learned during the lesson, but also actively engages them in finding real solutions for sustainable mobility in their community. It also promotes civic engagement and concrete actions to tackle climate change.	

Checks	Typology
Structured quiz with 20 correct answers 1. What is "soft mobility"? Correct answer: "Soft mobility" refers to the use of sustainable and low-carbon modes of transportation such as bicycles, electric scooters, carpooling, public transportation, etc. 2. What are the main effects of climate change? Correct answer: The main effects of climate change include global temperature rise, sea level rise, heat waves, heavy rainfall, and ocean acidification. 3. What are the causes of the greenhouse effect? Correct answer: The greenhouse effect is mainly caused by emissions of greenhouse gases such as carbon dioxide (CO2) and methane (CH4) that trap heat in the Earth's atmosphere. 4. What are some environmental benefits of "soft mobility"? Correct answer: Some environmental benefits of "soft mobility" include reducing CO2 emissions, decreasing air pollution, and conserving natural resources. 5. How can bicycles help reduce CO2 emissions? Correct answer: Bicycles are human-powered and do not emit greenhouse gases during use, thus contributing to the reduction of CO2 emissions. 6. What should we consider when planning sustainable trips?	Structured test with 20 questions

Correct answer: When planning a sustainable trip, we should consider the distance to be traveled, the safety of the route, accessibility to sustainable modes of transportation, and the environmental impact.

7. Why is road safety important when riding a bike?

Correct answer: Road safety is important for preventing accidents and injuries when riding a bike by ensuring that cyclists wear helmets and obey traffic rules.

8. What concrete actions can be taken to promote "soft mobility" in the community?

Correct answer: Concrete actions may include the promotion of cycle paths, the organisation of awareness-raising campaigns on 'soft mobility' and the creation of bicycle or scooter rental services.

9. What is the primary goal of climate change?

Correct answer: The main goal of climate change is to raise awareness of environmental issues and promote sustainable solutions.

10. What does "greenhouse effect" mean?

Correct answer: The greenhouse effect is a natural process that traps heat in the Earth's atmosphere, helping to maintain adequate temperatures for life on Earth.

11. What are some alternatives to private car driving to reduce environmental impact?

Correct answer: Some alternatives include carpooling, using public transportation, cycling, electric scooters, and walking.

12. What is the most common and significant greenhouse gas associated with human activity?

Correct answer: Carbon dioxide (CO₂) is the most common and significant greenhouse gas associated with human activity.

13. What is the main factor contributing to the increase in CO₂ emissions?

Correct answer: The burning of fossil fuels such as coal, oil, and natural gas is the main contributing factor to the increase in CO₂ emissions.

14. How can students help promote sustainable mobility in their community?

Correct answer: Students can promote sustainable mobility by raising awareness, participating in awareness-raising initiatives, and adopting sustainable transport methods.

15. What are the health benefits of "soft mobility"?

Correct answer: "Soft mobility" can improve health through regular exercise, reduced stress, and decreased air pollution.

16. What are some examples of eco-friendly modes of transport?

Correct answer: Some examples include bicycles, electric scooters, public transportation, and carpooling.

17. How can cycle paths help to promote 'soft mobility'?

Correct answer: Bike lanes provide a safe environment for cyclists and encourage the use of cycling as a sustainable mode of transportation.

18. What are some strategies to raise awareness of "soft mobility" in the community?

Correct answer: Some strategies include organizing awareness-raising events, distributing informational materials, and organizing bike rides or walks.

19. What are the risks associated with cycling?

Correct answer: Risks include car accidents, injuries, bike theft, and inclement weather.

20. Why is it important to promote sustainable mobility in response to climate change?

Correct answer: Promoting sustainable mobility helps reduce greenhouse gas emissions, thereby limiting the exacerbation of climate change and improving air quality.

Structured quiz with 20 questions and correct answers:

1. What is "soft mobility"?

Correct answer: "Soft mobility" refers to the use of sustainable, low-carbon modes of transportation, such as bicycles, electric scooters, carpooling, public transportation, etc.

2. What are the main effects of climate change?

Correct answer: The main effects of climate change include global temperature rise, sea level rise, heat waves, heavy rainfall, and ocean acidification.

E.g. tests already prepared from textbooks or structured tests.

3. What are the causes of the greenhouse effect?

Correct answer: The greenhouse effect is mainly caused by emissions of greenhouse gases, such as carbon dioxide (CO₂) and methane (CH₄), which trap heat in the Earth's atmosphere.

4. What are some environmental benefits of "soft mobility"?

Correct answer: Some environmental benefits of "soft mobility" include reducing CO₂ emissions, decreasing air pollution, and conserving natural resources.

5. How can bicycles help reduce CO₂ emissions?

Correct answer: Bicycles are human-powered and do not emit greenhouse gases during use, thus contributing to the reduction of CO₂ emissions.

6. What should we consider when planning sustainable trips?

Correct answer: When planning a sustainable trip, we should consider the distance to be traveled, the safety of the route, accessibility to sustainable modes of transportation, and the environmental impact.

7. Why is road safety important when riding a bike?

Correct answer: Road safety is important for preventing accidents and injuries when riding a bike by ensuring that cyclists wear helmets and obey traffic rules.

8. What concrete actions can be taken to promote "soft mobility" in the community?

Correct answer: Concrete actions may include the promotion of cycle paths, the organisation of awareness-raising campaigns on 'soft mobility' and the creation of bicycle or scooter rental services.

9. What is the primary goal of climate change?

Correct answer: The main goal of climate change is to raise awareness of environmental issues and promote sustainable solutions.

10. What does "greenhouse effect" mean?

Correct answer: The greenhouse effect is a natural process that traps heat in the Earth's atmosphere, helping to maintain adequate temperatures for life on Earth.

11. What are some alternatives to private car driving to reduce environmental impact?

Correct answer: Some alternatives include carpooling, using public transportation, cycling, electric scooters, and walking.

12. What is the most common and significant greenhouse gas associated with human activity?

Correct answer: Carbon dioxide (CO₂) is the most common and significant greenhouse gas associated with human activity.

13. What is the main factor contributing to the increase in CO₂ emissions?

Correct answer: The burning of fossil fuels such as coal, oil, and natural gas is the main contributing factor to the increase in CO₂ emissions.

14. How can students help promote sustainable mobility in their community?

Correct answer: Students can promote sustainable mobility by raising awareness, participating in awareness-raising initiatives, and adopting sustainable transport methods.

15. What are the health benefits of "soft mobility"?

Correct answer: "Soft mobility" can improve health through regular exercise, reduced stress, and decreased air pollution.

16. What are some examples of eco-friendly modes of transport?

Correct answer: Some examples include bicycles, electric scooters, public transportation, and carpooling.

17. How can cycle paths help to promote 'soft mobility'?

Correct answer: Bike lanes provide a safe environment for cyclists and encourage the use of cycling as a sustainable mode of transportation.

18. What are some strategies to raise awareness of "soft mobility" in the community?

Correct answer: Some strategies include organizing awareness-raising events, distributing informational materials, and organizing bike rides or walks.

19. What are the risks associated with cycling?

Correct answer: Risks include car accidents, injuries, bike theft, and inclement weather.

20. Why is it important to promote sustainable mobility in response to climate change?

Correct answer: Promoting sustainable mobility helps reduce greenhouse gas emissions, thereby limiting the exacerbation of climate change and improving air quality.

Here is the multiple-choice test with correct answers indicated with "X":

1. What is "soft mobility"?
 - A. High-speed driving
 - B. Use of sustainable means of transport (X)
 - C. Use of a luxury car
2. What are the main effects of climate change?
 - A. Global temperature rise (X)
 - B. Decrease in oil reserves
 - C. Sea level rise
3. What are the causes of the greenhouse effect?
 - A. Greenhouse gas emissions (X)
 - B. The use of solar panels
 - C. Deforestation
4. What are some benefits of "soft mobility" for the environment?
 - A. Reduction of CO2 emissions (X)
 - B. Increased air pollution
 - C. Conservation of natural resources
5. How can bicycles contribute to the reduction of CO2 emissions?
 - A. They do not emit CO2 during use (X)
 - B. They emit more CO2 than cars
 - C. They use fuel like cars
6. What should we consider when planning a sustainable trip?
 - A. The safety of the route
 - B. Accessibility to sustainable means of transport (X)
 - C. Environmental impact
7. Why is road safety important when riding a bike?
 - A. To prevent accidents and injuries (X)
 - B. To speed up your journey
 - C. To save money
8. What concrete actions can be taken to promote "soft mobility" in the community?
 - A. Promoting cycle paths (X)

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- B. Organise awareness-raising campaigns (X)
- C. Create bike or scooter rental services

9. What is the main goal of climate change?

- A. Increasing Environmental Awareness (X)
- B. Reducing road traffic
- C. Encourage the use of the car

10. What does "greenhouse effect" mean?

- A. Natural process of trapping heat in the atmosphere (X)
- B. Atmosphere Cooling Process
- C. Air Filtration Process

11. What are some alternatives to private car driving to reduce environmental impact?

- A. Carpooling (X)
- B. Public transport (X)
- C. Use of the bicycle (X)

12. What is the most common and significant greenhouse gas linked to human activity?

- A. Carbon dioxide (CO₂) (X)
- B. Oxygen (O₂)
- C. Nitrogen (N₂)

13. What is the main factor contributing to the increase in CO₂ emissions?

- A. Burning of fossil fuels (X)
- B. Use of solar energy
- C. Waste recycling

14. How can students help promote sustainable mobility in their community?

- A. Raising Awareness (X)
- B. Participating in awareness-raising initiatives (X)
- C. Using only luxury cars

15. What are the health benefits of "soft mobility"?

- A. Improved health through regular exercise (X)
- B. Stress Reduction (X)
- C. Increased air pollution

16. What are some examples of environmentally friendly means of transportation?

- A. Bicycle (X)
- B. Electric Scooter (X)
- C. Public transport (X)

17. How can cycle paths help to promote 'soft mobility'?

- A. Providing a safe environment for cyclists (X)

- B. Encouraging the use of the car
- C. Increasing road traffic

18. What are some strategies to raise awareness of "soft mobility" in the community?

- A. Organisation of awareness-raising events (X)
- B. Distribution of information material (X)
- C. Organisation of cycling or walking tours

19. How can cycle paths help to promote "soft mobility"?

- A. Providing a safe environment for cyclists (X)
- B. Encouraging the use of the car
- C. Increasing road traffic

20. What are some strategies to raise awareness of "soft mobility" in the community?

- A. Organisation of awareness-raising events (X)
- B. Distribution of information material (X)
- C. Organisation of cycling or walking tours

Competenze acquisite

From the lecture on "soft mobility" and climate change, students should have acquired a range of skills and knowledge, including:

Environmental awareness: students will have developed a greater awareness of climate change, its effects, and the importance of sustainable actions to mitigate them.

Knowledge of sustainable mobility: Students now understand what "soft mobility" means and are familiar with various sustainable transportation options.

Understanding the Greenhouse Effect: Students have gained a basic understanding of the greenhouse effect and how greenhouse gas emissions contribute to climate change.

Environmental Impact Assessment: Students learned how to assess the environmental impact of different modes of transportation and recognize those with low carbon emissions.

Promoting sustainable mobility: Students have gained skills in promoting sustainable mobility in their community through awareness and activism.

Sustainable travel planning: Students can plan sustainable trips, taking into account factors such as distance, safety, and accessibility to sustainable transportation.

Road Safety: Students learned the basics of road safety when using bicycles or other environmentally friendly means of transportation.

Health promotion: Students understand the health benefits associated with using "soft mobility," such as regular exercise and stress reduction.

Active participation: Students developed practical skills through hands-on activities and planning sustainable mobility projects for their community.

Knowledge of CO2 emissions: Students are able to understand the role of CO2 emissions in climate change and identify ways to reduce them.

Promoting environmental awareness: Students can promote environmental awareness and educate others about the benefits of sustainable mobility.

These skills gained from the class are essential for tackling climate change and promoting a sustainable lifestyle, contributing to a greener and more sustainable future for all.

Lesson No. 8 - Summer Sports and Climate Change

Lesson plan

Keywords: summer sports, climate change, heatwaves, adaptation strategies, athletes' health

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities

School: first two years of secondary school.

Objectives
Objective: Understand the importance of climate change and its impact on summer sports.
Specific objectives:
Knowledge of climate change: Students will be able to define climate change and explain its main causes.
Impact of climate change on summer sports: Students will identify how climate change affects summer sports, including hiking, swimming, cycling, and others.
Adaptation strategies: Students will discuss strategies for adapting to climate change while engaging in summer sports.
Promoting Sustainability: Students will propose ways to promote sustainability in summer sports, while reducing environmental impact.
Physical activities related to summer sports: Students will actively participate in various outdoor physical activities related to summer sports to experience the effects of climate change firsthand.
Discussion and reflection: Students will engage in a guided discussion about their experience during physical activities and the implications of climate change on summer sports.

Announcement of conclusions:

Students will communicate their conclusions and ideas on how to address the effects of climate change in summer sports through a presentation or written assignment.

Lesson content	References	Methodology
Lecture on "Summer Sports and Climate Change": Step 1: Introduction (5 minutes) - Greeting and presentation of the main objective of the lesson. - Brief discussion on students' knowledge of climate change and summer sports. Phase 2: Theoretical discussion (15 minutes) - Explanation of climate change and its root causes, using images or graphs if necessary. - Discussion on the overall impacts of climate change on our environment. Step 3: Impact on summer sports (15 minutes) - Detailed discussion of the effects of climate change on summer sports, highlighting specific examples. - Open-ended questions to engage students and stimulate reflection. Step 4: Adaptation strategies (10 minutes) - Presentation of strategies and tips on how to adapt to climate change during sports activities. - Discussion of precautions to be taken in extreme weather conditions. Step 5: Promoting Sustainability (10 minutes) - Conversation about how athletes can help promote sustainability, such as reducing waste or using eco-friendly equipment. Step 6: Outdoor physical activities (30 minutes) - Active participation in various outdoor sports activities, such as hiking, swimming or cycling, with a focus on climate change and the surrounding environment. Step 7: Post-activity discussion (10 minutes)	summer-sport-climate-change-paul-jurbala-cheryl-mallen https://link.springer.com/article/10.1007/s12662-021-00786-8 https://www.ohga.it/la-crisi-climatica-cambiera-il-nostro-modo-di-fare-sport/	Lectures or dialogues

- Discussion among students about their experience during outdoor sports activities and the observed climate changes. - Comparison of feelings before and after the activity. Step 8: Reflection and presentation (10 minutes) - Individual reflection by students on the importance of considering climate change during summer sports. - Preparation of short presentations or written assignments on the topic. Step 9: Conclusion and homework (5 minutes) - Lesson summary and key points. - Assigning homework, such as researching sustainable initiatives related to summer sports or collecting temperature data over the course of a week. Closing of the lesson (5 minutes) - Thank the students for their participation and attention. - Announcement of any future topics or activities related to climate change and summer sports.		
Slides for the lecture "Summer Sports and Climate Change": Slide 1: Introduction Titolo: Summer Sports and Climate Change Objective: To understand the importance of climate change and its impact on summer sports. Slide 2: What is climate change? Titolo: What is Climate Change? Definition - Climate change refers to long-term changes in the average weather conditions of a region. The main causes include the greenhouse effect and air pollution. Slide 3: Causes of Climate Change Title: Causes of climate change Main causes: greenhouse gas emissions, deforestation, air pollution.	https://ebrary.net/214736/health/summer_sport_climate_change	Slides for presentation of the lecture.

Graph: Visual representation of the main sources of greenhouse gas emissions.

Slide 4: General impact of climate change

Title: General impact of climate change
Effects: Rising temperatures, changes in precipitation patterns, sea level rise.
Consequences: melting glaciers, animal extinctions, extreme weather events.

Slide 5: Impact on Summer Sports

Titolo: Impact on Summer Sports
Examples: Explanation of how climate change affects sports such as hiking, swimming, cycling, surfing, and others.

Slide 6: Adaptation Strategies

Title: Adaptation Strategies
Tips: Tips on how to adapt to climate change during sports activities, such as using sunscreen, staying hydrated, and wearing appropriate clothing.

Slide 7: Promoting Sustainability

Title: Promoting Sustainability
Role of athletes: How athletes can contribute to sustainability, such as reducing waste, using eco-friendly equipment, and respecting the environment.

Slide 8: Outdoor Physical Activities

Titolo: Outdoor Physical Activities
Examples: Description of the outdoor physical activities we will undertake today, such as hiking and swimming.

Slide 9: Post-Activity Discussion

Titolo: Post-Activity Discussion
Questions: Guiding questions to stimulate discussion among students about their experiences during outdoor activities and observed climate changes.

Slide 10: Reflection and Presentation

Title: Reflection and Presentation
 Individual reflection: Students reflect individually on the importance of considering climate change during summer sports.
 Assignment or presentation: Students prepare a short presentation or written assignment on the topic.

Slide 11: Conclusions and homework

Title: Conclusions and homework
 Key Points: Summary of the key points of the lesson.
 Homework: Assigning homework, such as researching sustainable initiatives related to summer sports or collecting temperature data over a week.

Slide 12: Closing the lecture

Title: Closing of the lecture
 Thanksgiving: Thank students for their participation and attention.
 Future Announcement: Any future topic or activity related to climate change and summer sports.

Activity	Methodology
Name of the activity: "Sustainability in the summer sports project" Description: This extracurricular activity invites students to put into practice what they have learned about sustainability and the environment during the main lesson on summer sports and climate change. The aim is to encourage students to become active agents of change and promote sustainability within their sports community. Activity Details: Team formation: Interested students are divided into teams, each with a captain in charge. Selecting a summer sport: Each team chooses a summer sport of their interest, such as cycling, swimming, tennis, or any other summer sport. Environmental impact analysis: Teams conduct research to identify the environmental impact of practicing their chosen sport, highlighting the negative aspects related to climate change.	Group work or word café.

Proposed improvements: Each team develops a plan to make the practice of their chosen sport more sustainable. For example, they can suggest ways to reduce carbon emissions, minimize waste, or promote eco-friendly practices within their sports team. Implementing changes: Teams put their improvement plans into action, working with their respective sports teams or local communities to make positive changes. Monitoring and evaluation: For a predetermined period, teams track the progress and results of their sustainability projects. Presentation of results: At the end of the activity, each team presents the results of their project, sharing the positive changes they have made to their summer sport and the community.	

Checks	Typology
Structured test with 20 questions on the topic "Summer sports and climate change". Correct answers are indicated in parentheses. What is climate change? (Long-term changes in a region's average weather conditions) (Correct answer) What are some of the main causes of climate change? (Greenhouse gas emissions, deforestation, air pollution) (Correct answer) What is one of the main effects of climate change? (Rising temperatures) (Correct answer) What is the greenhouse effect? (Heat retention in the atmosphere) (Correct answer) What is the main goal of summer sports and climate change? (Understanding the importance of climate change and its impact on summer sports) (Correct answer) What are some examples of summer sports? (Hiking, swimming, cycling) (Correct answer) What is a strategy for adapting to climate change during sports activities? (Using sunscreen) (Correct answer) How can athletes contribute to sustainability? (Reduction of waste and use of eco-friendly equipment) (Correct answer) What does "Promoting Sustainability" involve? (Promoting eco-friendly and responsible practices within sport) (Correct answer)	Structured test with 20 questions.

Why is it important to consider climate change in the practice of summer sports? (Because they affect environmental conditions and sports activities) (Correct answer) What should athletes do to adapt to climate change during sports activities? (Wear appropriate clothing, stay hydrated) (Correct answer) What is one of the negative effects of climate change on summer sports? (Increased risk of dehydration) (Correct answer) What is one of the main greenhouse gases responsible for climate change? (Carbon dioxide - CO2) (Correct answer) What does "greenhouse effect" mean? (Heat retention in the atmosphere) (Correct answer) What could be an example of a sustainable initiative in a summer sport like cycling? (Use of bicycles and eco-friendly equipment) (Correct answer) What is one of the effects of climate change on swimming? (Changes in water temperature) (Correct answer) What should hikers do to reduce their environmental impact while hiking? (Carry out the garbage and respect the flora and fauna) (Correct answer) What is one of the effects of climate change on surfing? (Variations in Wave Patterns) (Correct answer) How can athletes promote sustainability? (Educate others and participate in environmental awareness projects) (Correct answer) Why is it important to reduce greenhouse gas emissions? (To slow down climate change and preserve the environment) (Correct answer)	
Structured test with 10 questions on the topic "Summer sports and climate change", together with the correct answers indicated with an "X": What is climate change? a) A short-term change in atmospheric temperature. (b) A long-term change in the average weather conditions of a region. c) An extreme weather event. Correct answer: b) X What are some of the main causes of climate change?	E.g. tests already prepared by textbooks or multiple-choice questions.

- a) Volcanic eruptions.
 - b) Use of solar panels.
 - c) Greenhouse gas emissions.
- Correct answer: c) X

What does the greenhouse effect represent?

- a) Heat loss to the atmosphere.
 - b) Heat retention in the atmosphere.
 - c) Increased solar radiation.
- Correct answer: b) X

What is one of the effects of climate change?

- a) Decrease in average temperatures.
 - b) Melting of glaciers.
 - c) Increased rainfall.
- Correct answer: b) X

What is the main focus of the lesson on summer sports and climate change?

- a) Learn to practice summer sports.
 - b) Understand the importance of climate change and its impact on summer sports.
 - c) Learn the rules of the summer games.
- Correct answer: b) X

What is an example of a summer sport?

- a) Alpine skiing.
 - b) Escursionism.
 - c) Ice skating.
- Correct answer: b) X

What should athletes do to adapt to climate change during sports activities?

- a) Drink more energy drinks.
 - b) Wear appropriate clothing and stay hydrated.
 - c) Avoid sports activities in hot weather.
- Correct answer: b) X

What does "sustainability promotion" mean in summer sports?

- a) Advertising for summer sports.
 - b) Promote eco-friendly and responsible practices within sport.
 - c) Organisation of sustainable sporting events.
- Correct answer: b) X

What is one of the effects of climate change on swimming? a) Improved swimmers' performance. b) Changes in water temperature. c) Increased availability of swimming pools. Correct answer: b) X Why is it important to consider climate change in the practice of summer sports? a) Because it makes sport more fun. b) Because they affect environmental conditions and sporting activities. c) Because it is a legal obligation. Correct answer: b) X	
Simple multiple-choice test with 10 correct questions and answers indicated with an "X": What is climate change? a) A short-term change in atmospheric temperature. (b) A long-term change in the average weather conditions of a region. c) An extreme weather event. Correct answer: b) X What are some of the main causes of climate change? a) Volcanic eruptions. b) Use of solar panels. c) Greenhouse gas emissions. Correct answer: c) X What does the greenhouse effect represent? a) Heat loss to the atmosphere. b) Heat retention in the atmosphere. c) Increased solar radiation. Correct answer: b) X What is one of the effects of climate change? a) Decrease in average temperatures. b) Melting of glaciers. c) Increased rainfall. Correct answer: b) X What is the main focus of the lesson on summer sports and climate change?	E.g. tests prepared by the teacher with a simple multiple-choice test.

- a) Learn to practice summer sports.
 - b) Understand the importance of climate change and its impact on summer sports.
 - c) Learn the rules of the summer games.
- Correct answer: b) X

What is an example of a summer sport?

- a) Alpine skiing.
 - b) Escursionism.
 - c) Ice skating.
- Correct answer: b) X

What should athletes do to adapt to climate change during sports activities?

- a) Drink more energy drinks.
 - b) Wear appropriate clothing and stay hydrated.
 - c) Avoid sports activities in hot weather.
- Correct answer: b) X

What does "sustainability promotion" mean in summer sports?

- a) Advertising for summer sports.
 - b) Promote eco-friendly and responsible practices within sport.
 - c) Organisation of sustainable sporting events.
- Correct answer: b) X

What is one of the effects of climate change on swimming?

- a) Improved swimmers' performance.
 - b) Changes in water temperature.
 - c) Increased availability of swimming pools.
- Correct answer: b) X

Why is it important to consider climate change in the practice of summer sports?

- a) Because it makes sport more fun.
 - b) Because they affect environmental conditions and sporting activities.
 - c) Because it is a legal obligation.
- Correct answer: b) X

Skills acquired

After participating in the class on "Summer Sports and Climate Change", students will have acquired a range of skills and knowledge, including:

Understanding Climate Change: Students will be able to define climate change and understand its root causes.

Environmental awareness: they will have developed a greater awareness of the importance of preserving the environment and how climate change affects our planet.

Knowledge of impacts: they will be able to identify how climate change affects summer sports, including

its effects on temperatures, weather conditions, and the surrounding environment.

Adaptation strategies: They will have learned practical strategies for adapting to climate change during sports activities, such as wearing appropriate clothing and staying hydrated.

Promoting sustainability: They will be aware of the role of athletes in promoting sustainability by reducing waste and using eco-friendly equipment.

Active participation: They will have actively participated in various outdoor sports activities, experiencing first-hand the effects of climate change.

Reflection and communication: they will be able to reflect on their experiences during physical activities and communicate their conclusions and ideas on managing the effects of climate change in summer sports.

Social and ecological sensitivity: They will be more sensitive to social and ecological issues, including ways in which they can help mitigate the effects of climate change.

These skills acquired from the lesson will be useful not only in the field of summer sports but also in everyday life, encouraging more sustainable and responsible behaviors towards the environment.

Lesson No. 9 - Winter Sports and Climate Change

Lesson plan

Keywords: winter sports, climate change, snow melt, winter recreation, adaptation strategies

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities

School: first two years of secondary school.

Objectives
Main objectives:
1. Understand the impact of climate change on winter sports.
2. Explore the challenges and opportunities that climate change presents for winter sports.

3. Promote awareness and the importance of sustainability in winter sports activities.

Specific objectives:

Understanding Climate Change:

- Explain what climate change is and its root causes.
- Identify how climate change is affecting winter seasons in different regions of the world.
- Compare historical climate data with current data to highlight climate trends.

Impact on winter sports:

- Discuss how climate change is affecting snow availability and the length of winter seasons.
- Examine the effects of extreme weather events, such as global warming, on ski slopes and other winter sports venues.
- Analyze the economic, social and environmental implications of climate change on winter sports.

Sustainability in winter sports:

- Identify sustainable practices that can be adopted in winter sports, such as the use of eco-friendly equipment, recycling, and waste reduction.
- Promote personal responsibility for the preservation of the environment while practicing winter sports.
- Engage students in a discussion about how they can contribute to sustainability in winter sports.

Lesson content	References	Methodology
Introduction (10 minutes): - Presentation of the topic: Introduction to climate change and its impact on winter sports. - Discussion of why the study of this topic is important. Theoretical part (20 minutes): - Explanation of climate change, its causes, and scientific evidence. - Discussion on the effects of climate change on winter seasons and winter sports. Practical activity (20 minutes): - Simulation of a winter sports activity (e.g. a ski race in a snowy area).	https://www.theguardian.com/environment/2023/feb/27/big-irony-as-winter-sports-sponsored-by-climate-polluters-report-finds#:~:text=Winter%20sports%20are%20being%20sponsored,fuel%20companies%2C%20carmakers%20and%20airlines. https://www.ilmeteo.net/notizie/attu	Lectures

- Discussion on the perception of the challenges that climate change can create for this activity. Discussion on sustainability (15 minutes): - Introduction of sustainable practices in winter sports. - Brainstorm how students can contribute to sustainability in these activities. Conclusions and reflections (10 minutes): - Summary of the main concepts learned during the lesson. - Encouragement for students to reflect on how they can help mitigate the effects of climate change in winter sports. Homework (5 minutes): - Assigning homework, such as researching sustainable initiatives in winter sports or gathering news about climate change and winter sports. This class is intended to educate students about climate change, make them understand the importance of sustainability in winter sports, and encourage them to consider how they can protect the environment while participating in these activities.	alita/crisi-climatica-neve-e-sport-invernali-quale-futuro.html	
Slide 1: Introduction - Title: Winter sports and climate change - Subtitle: Understanding the impact of climate change on our winter activities. - Content: Introduction to the topic and main objectives of the lesson. Slide 2: Lesson Objectives - Title: Main and Specific Objectives -Contents: - Main objective 1: Understanding climate change. - Main Objective 2: Explore the impact of climate change on winter sports.	https://www.neefusa.org/story/climate-change/future-winter-sports-and-recreation	Slides for lecture, add suitable images.

- Main objective 3: Promote sustainability in winter sports.
- Specific goals for each main goal.

Slide 3: Climate Change

- Titolo: What is Climate Change?
- Contents:
 - Definition of climate change.
 - Main causes of climate change.
 - Scientific evidence of climate change.

Slide 4: Impact on winter sports

- Title: How Does Climate Change Affect Us?
- Contents:
 - Effects of climate change on winter seasons.
 - Impact on ski slopes and winter sports facilities.
 - Economic, social and environmental implications.

Slide 5: Climate data

- Title: Climate Data Analysis
- Contents:
 - Comparison of historical and current climate data.
 - Highlight climate trends in winter regions.

Slide 6: Hands-On Activity

- Title: Simulating a winter sports activity
- Contents:
 - Description of the simulation activity.
 - Discussion of perceived challenges related to climate change during the activity.

Slide 7: Sustainability in winter sports

- Title: Sustainable Practices
- Contents:
 - Introduction to sustainable practices in winter sports.
 - Examples of eco-friendly equipment and waste reduction.

Slide 8: Engaging Students

- Title: What can we do?

-Contents:
- Engage students in a discussion about how they can contribute to sustainability in winter sports.

Slide 9: Conclusions and reflections

- Titolo: Review of Key Concepts
-Contents:
- Summary of the main objectives and the specific objectives.
- Encouragement for students to reflect on the importance of the lesson.

Slide 10: Homework

- Title: Homework
-Contents:
- Assigning homework, such as researching sustainable initiatives in winter sports or gathering news about climate change and winter sports.

Slide 11: Questions and discussion

- Title: Answering Your Questions
-Contents:
- Open the floor to discussion and questions from students.

Slide 12: Thank You

- Title: Thank you for your participation
-Contents:
- Express gratitude to students for their active participation in the lesson.

Be sure to include relevant images, charts, and diagrams in your slides as needed to make the lesson more engaging and visual. In addition, you can further customize the slides with specific details according to your preferences and the level of the students.

Activity	Methodology
Hands-on activity: Simulation of conferences on winter sports and climate change	Role-playing

Objective of the activity: Students will participate in a simulation of a conference focused on the relationship between winter sports and climate change, taking on roles such as representatives of environmental organizations, renowned athletes, winter sports event organizers, and policymakers. The aim is to discuss the environmental challenges related to winter sports and propose sustainable solutions. Procedure: 1. Role Assignment: Students are divided into groups and assigned specific roles, such as representatives of environmental organizations, famous athletes, winter sports event organizers, and politicians. 2. Preparatory research: Each group conducts in-depth research on their assigned role, understanding the environmental impacts of winter sports, the challenges faced, and the sustainable solutions adopted globally. 3. Mock Conference: Students come together in a mock conference. Each group presents the information collected, discussing the environmental impacts of winter sports and proposing innovative solutions to mitigate these impacts. 4. Discussion and Questions: After each presentation, other groups ask questions and engage in discussions on the points raised, critically examining the proposed solutions. 5. Collective Action Plan: At the end of the simulated conference, all students work together to create a collective action plan. This plan should include sustainable winter sports strategies, individual commitments, and recommendations for event organizers, athletes, and governments. 6. Presentation and discussion of the action plan: Each group presents the collective action plan and discusses it with the class. Students are encouraged to provide feedback and suggest further improvements to the plan. 7. Individual reflection: Students write individual reflections on the lessons learned during the activity and the actions they can take to promote sustainability in winter sports and in their daily lives. This activity not only provides a comprehensive understanding of the environmental impacts of winter sports, but also promotes collaboration, critical research, and creative thinking in the search for sustainable solutions.	

Checks	Typology
Structured test with 20 questions and correct answers Questions: 1. What is climate change? 2. What are the main causes of climate change? 3. How does climate change affect the winter seasons? 4. What types of sports activities are commonly associated with the winter seasons? 5. What is the effect of climate change on the condition of the ski slopes? 6. What is the scientific evidence of climate change? 7. What is one of the main greenhouse gases responsible for global warming? 8. What is the greenhouse effect? 9. How can climate change affect the availability of snow for skiing? 10. What are some sustainable practices that can be adopted in winter sports? 11. What does "waste reduction" mean in terms of sustainability in winter sports? 12. What is the main goal in adopting sustainable practices in winter sports? 13. What does "environmental conservation" mean in the context of winter sports? 14. What is one of the benefits of using eco-friendly equipment in winter sports? 15. Why is it important to promote sustainability in winter sports? 16. How can winter sports enthusiasts personally contribute to sustainability? 17. What is the main objective of the practical activity of the lesson?	Structured test with 20 questions.

18. How does the hands-on activity help students better understand the effects of climate change on winter sports?

19. What does it mean to "design a sustainability plan" in the post-class activity?

20. What is the value of designing a sustainability plan for an imaginary ski resort?

Correct answers:

1. Climate change refers to long-term alterations in Earth's climate patterns.
2. The main causes of climate change include human activities such as greenhouse gas emissions and deforestation.
3. Climate change can affect the winter seasons by causing warmer temperatures and extreme weather.
4. Winter sports include skiing, snowboarding, ice skating, biathlon, etc.
5. Climate change can lead to less predictable ski slope conditions, such as snow scarcity or early thawing.
6. Scientific evidence of climate change includes an increase in global average temperatures and the retreat of glaciers.
7. One of the main greenhouse gases responsible for global warming is carbon dioxide (CO₂).
8. The greenhouse effect is the process in which certain gases trapped in the Earth's atmosphere capture solar heat, contributing to global warming.
9. Climate change can reduce the availability of snow causing average temperatures to rise.
10. Sustainable practices include the use of eco-friendly equipment, energy conservation, and waste reduction in winter sports.
11. "Waste reduction" refers to minimizing the use of resources such as water and energy in the context of sustainability in winter sports.
12. The main goal in adopting sustainable practices in winter sports is to reduce environmental impact and conserve natural resources.
13. "Environmental conservation" in the context of winter sports means the protection of the natural ecosystems in which such sports take place.

14. One of the benefits of using eco-friendly equipment in winter sports is the reduction of pollution and resource consumption. 15. It is important to promote sustainability to preserve ideal winter conditions for sports and protect the environment. 16. Winter sports enthusiasts can personally contribute to sustainability through eco-friendly practices and responsible consumption of resources. 17. The main objective of the practical activity of the lesson is to allow students to experience the effects of climate change on winter sports. 18. The hands-on activity helps students better understand the effects of climate change because it directly involves them in simulating a hands-on experience. 19. "Designing a sustainability plan" means developing a plan that incorporates eco-friendly practices to make an imaginary ski resort more sustainable. 20. Developing a sustainability plan is valuable because it can help mitigate the impacts of climate change on ski resorts and winter sports while promoting sustainability.	
Multiple-choice test with 10 questions on winter sports and climate change, along with the correct answers indicated in parentheses: Questions: 1. What is one of the main greenhouse gases responsible for global warming? (a) Nitrogen b) Oxygen c) Carbon dioxide (CO₂) (correct) d) Argon 2. What does the acronym CO₂ stand for? (a) Central Office 2 b) Carbon Oxygen 2 c) Carbon dioxide (CO₂) (correct)	E.g. tests prepared by the teacher

d) Oxygen Cycle 2

3. What is the greenhouse effect?

a) A large greenhouse for plants

b) Cooling of the planet

c) The process in which certain gases trap solar heat in the Earth's atmosphere (correct)

d) Planetary warming due to ozone

4. What does "waste reduction" mean in terms of sustainability in winter sports?

a) Use of multiple resources

b) Minimize the use of resources such as water and energy (correct)

c) Intentionally wasting resources

d) Increased consumption of resources

5. What is one of the benefits of using eco-friendly equipment in winter sports?

(a) Increased pollution

b) Higher costs

(c) Reduction of pollution and resource consumption (correct)

d) No benefit

6. What does "environmental conservation" mean in the context of winter sports?

(a) Protection of the natural ecosystems in which winter sports take place (correct)

b) Restrict access to play areas

c) Polluting the environment

d) Do nothing for the environment

7. Why is it important to promote sustainability in winter sports?

a) Because it makes winter sports more expensive

b) Because it preserves the ideal conditions for sport and protects the environment (correct)

c) Because it makes more money for ski resorts

d) Because it's a temporary trend

8. What is the main objective of the practical activity of the lesson?

a) Learn to ski

b) Running a ski race

c) Experiencing the effects of climate change on winter sports (correct)

d) Hiking in the mountains

9. What does it mean to "design a sustainability plan" in the post-class activity?

a) Construction of a ski slope

b) Choosing the right clothing for skiing

c) Develop a plan that incorporates eco-friendly practices to make an imaginary ski resort more sustainable (correct)

d) Plan a ski holiday

10. How can climate change affect the practice of winter sports?

a) It can make winter sports more fun

b) May cause reduced snow availability, warmer temperatures, and unpredictable weather conditions (correct)

c) It doesn't affect winter sports at all

d) It can make winter sports disappear completely

Correct answers:

1. c) Carbon dioxide (CO₂)

2. c) Carbon dioxide (CO₂)

3. c) The process in which certain gases trap solar heat in the Earth's atmosphere
4. b) Minimize the use of resources such as water and energy
5. (c) Reduction of pollution and consumption of resources
6. (a) Protecting the natural ecosystems in which winter sports take place
7. b) Because it preserves ideal conditions for sport and protects the environment
8. c) Experiencing the effects of climate change on winter sports
9. c) Develop a plan that incorporates eco-friendly practices to make an imaginary ski resort more sustainable
10. b) May cause reduced snow availability, warmer temperatures, and unpredictable weather conditions

Skills acquired

Understanding Climate Change: Students would develop a deeper understanding of climate change, including its causes, effects, and scientific evidence.

Impact awareness: They would be aware of the impact of climate change on winter seasons and winter sports, including challenges that may arise, such as snow scarcity.

Knowledge of winter sports: They would have a more in-depth knowledge of winter sports, including the types of sports activities associated with the winter seasons and the ideal conditions to practice them.

Sustainability: Students would learn sustainable practices that can be adopted in winter sports, such as using eco-friendly equipment, saving energy, and reducing waste.

Personal responsibility: They would develop a greater awareness of personal responsibility in environmental conservation while practicing winter sports.

Analytical skills: they would be able to analyze how climate change affects the conditions of ski slopes and ski resorts.

Presentation skills: Students participating in the design of a sustainability plan for a ski resort would have developed presentation and communication skills.

Critical thinking: They would be able to think critically about environmental challenges and sustainable solutions associated with winter sports and climate change.

Group work: Students involved in the hands-on activity of designing the sustainability plan would gain teamwork and collaboration skills.

Environmental awareness: They would be more aware of the importance of protecting the environment and the effect of human actions on climate change.

These skills would enable students to be more informed, aware and responsible towards the environment and to contribute more actively to sustainability in winter sports and in their daily lives.

Lesson No. 10 - Organization of major sporting events and their impact on climate change

Lesson plan

Keywords: sporting events, climate change, carbon emissions, sustainability measures, environmental impact assessment

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities
School: first two years of secondary school.

Objectives
General objectives: 1. Understanding the connection: Enable students to understand the connection between major sporting events and their impact on climate change and the environment. 2. Environmental Awareness: Raise students' awareness of the importance of environmental sustainability in large-scale sporting events and how they can help mitigate climate change. 3. Promote activism: Inspire students to become environmental activists and sustainability advocates in organizing sporting events. Specific objectives: 1. Event analysis: Analyze specific examples of major sporting events and study how they are organized and what environmental impacts they generate. 2. Environmental Impact Assessment: Understand how to conduct an environmental impact assessment of a sporting event, including methods for calculating carbon emissions and other environmental influences. 3. Sustainability in practice: Review case studies of sustainable sporting events and analyze the practices they have adopted to reduce environmental impact, such as the use of renewable energy, recycling, and waste reduction. 4. Stakeholder Engagement: study the involvement of stakeholders, including athletes, organizers, sponsors, and spectators, in promoting eco-sustainability in sporting events.

5. Developing Innovative Solutions: Encourage students to develop innovative solutions and creative ideas to reduce the environmental impact of sporting events, thereby promoting long-term sustainability in the sports industry.

Lesson content	References	Methodology
1. Introduction (10 minutes) - Presentation of the objectives of the lessons. - Contextualization of the topic and motivation. 2. Overview of sporting events (15 minutes) - Discussion of sporting events and their role in modern society. - List some examples of major international sporting events. 3. Environmental impact of sporting events (20 minutes) - Explanation of the negative impact on climate change: greenhouse gas emissions, resource consumption, waste management, etc. - Presentation of data or real cases of events with high environmental impact. 4. Key Concepts (10 minutes) - Definition of ecological footprint, carbon footprint and sustainability. - Discussion of how these concepts apply to sporting events. 5. Success Stories (15 minutes) - Case studies of major sporting events with low environmental impact (e.g. Tokyo 2020 Olympics). - Discussion of strategies used to reduce environmental impact. 6. Practical group activity (15 minutes) - Students are divided into groups. - Each group receives a fictional case of a sporting event and must develop a sustainability plan.	https://climate-pact.europa.eu/news-and-events/news/sport-key-player-climate-action-2023-05-12_en	Lectures with final reflections.

- The plan should include measures to reduce carbon emissions, sustainable waste management and resource efficiency. 7. Presentation of the plans (10 minutes) - Each group presents their sustainability plan to the class. - Discussion and feedback. 8. Reflection and conclusions (5 minutes) - Key questions: What did you learn today? What actions can we take to promote sustainability in sporting events? - Summary of the main objectives of the lesson. 9. Homework (5 minutes) - Give students a homework assignment, such as writing a short essay or research paper on climate change and sporting events. 10. Closing (5 minutes) - Thank students for their participation and commitment. - Inform about the topics of the next lesson or homework. This lesson structure provides a balance between theory, class discussions, hands-on activities, and reflection, allowing students to gain a comprehensive understanding of the topic and the actions they can take to promote sustainability in sporting events.		
slides for the lecture "Organization of major sporting events and their impact on climate change": Slide 1: Title Title: Organization of major sporting events and their impact on climate change Objective: Understand the importance of sustainability in sporting events.	https://www.un.org/development/desa/dspd/2022/02/addressing-climate-change-through-sport/	Slides for lectures.

Slide 2: Introduction

Welcome to today's class!

Lesson Objectives: Understand the organization of sporting events and their environmental impact.

Slide 3: Overview of Sporting Events

Definition of sporting events and their relevance in modern society.

Examples of major international sporting events.

Slide 4: Environmental impact of sporting events

How sporting events contribute to climate change.

Greenhouse gas emissions, resource consumption, waste management.

Slide 5: Key Concepts

Ecological footprint: what does it represent?

Carbon footprint: how is it calculated?

Sustainability: why is it important for sporting events?

Slide 6: Success Stories

Real-world case study: Tokyo 2020 Olympics as an example.

Strategies adopted to reduce environmental impact.

Slide 7: Group Activity

Creation of workgroups.

Each group receives a case of a sporting event and develops a sustainability plan.

Slide 8: Presentation of Plans

Each group presents their plan to the class.

Discussion and feedback from the class.

Slide 9: Reflection and Conclusions

Key questions: What did you learn? What actions can we take to promote sustainability in sporting events?

Summary of the main objectives of the lesson. Slide 10: Homework Homework assignment: Write a short essay or research paper on climate change and sporting events. Slide 11: Closing Thank you for your participation and student commitment. Information about the topics of the next lesson or homework. You can accompany these slides with relevant images, graphs, and real data about sporting events and their environmental impact to make the lesson more engaging and informative.		

Activity	Methodology
Activity: "Analysis of a major sporting event" Description: Students will be tasked with selecting and analyzing a major recent or historic sporting event to assess its environmental impact and sustainability measures. Phases of the activity: 1. Event Selection (Homework) Each student must choose a major sporting event of their interest. It could be the Olympics, the World Cup, the World Championships, etc. 2. Research and analysis (homework) Students should gather information about the history and organization of their chosen sporting event. They should look for data on the environmental impact of the event (carbon emissions, water consumption, waste management, etc.) and the sustainability measures implemented. 3. Preparing a Presentation (in Class) Students should create a short presentation (5-10 minutes) that includes: - An overview of the chosen sporting event. - Environmental impact data (if available). - Description of the sustainability strategies implemented. - Personal assessment of the effectiveness of sustainability measures.	File Sharing

4. Presentation to other students (in class) Students will present their analyses to the class, sharing what they have learned about the chosen sporting event. After each presentation, there will be time for questions and discussions. 5. Discussion and comparison (in class) After the presentations, start a classroom discussion where students can compare the sporting events they have analyzed and discuss the effectiveness of sustainability measures. Ask them to reflect on how such events can affect awareness of climate change. 6. Making recommendations (homework) Students should write a short report recommending specific measures to make the sporting event they analyzed more sustainable in the future. This activity encourages students to independently explore the environmental impact of sporting events and apply the knowledge gained during the lesson. It also promotes critical reflection and awareness of sustainability in global sporting events.	

Checks	Typology
Unstructured assessment with 10 correct answers Question 1: What is climate change? Answer 1: Climate change refers to long-term alterations in Earth's weather patterns, including rising global average temperatures, caused primarily by greenhouse gas emissions. Question 2: What is the main goal of organizing sustainable sports events? Answer 2: The main objective is to reduce the negative environmental impact of such events through sustainable measures. Question 3: What does the ecological footprint represent? Answer 3: The ecological footprint measures the area of land and water needed to support a specific lifestyle or human activity, taking into account the resources consumed and the waste produced. Question 4: What is a "carbon footprint"?	Short Answer Verification

Answer 4: The "carbon footprint" represents the amount of carbon emissions (often in terms of carbon dioxide) produced by a business, event, or individual.

Question 5: What are some strategies to reduce the environmental impact of a major sporting event?

Answer 5: Some strategies may include the use of renewable energy sources, waste recycling, eco-friendly public transportation, and environmental awareness campaigns.

Question 6: What are some of the main sources of greenhouse gas emissions in sporting events?

Answer 6: The main sources are transportation, energy, waste management, and catering.

Question 7: Can you give an example of a major sporting event that has implemented significant sustainability measures?

Answer 7: An example is the organization of the Tokyo 2020 Olympics, which implemented sustainability measures such as the use of green hydrogen and the efficient use of resources.

Question 8: How can a major sporting event raise awareness of climate change?

Answer 8: Through awareness campaigns, environmental education initiatives, and the promotion of sustainable behaviors among viewers.

Question 9: What can individuals do to contribute to greater sustainability in sporting events?

Answer 9: Individuals can use public transportation, reduce waste, adhere to the event's environmental rules, and support sustainability initiatives.

Question 10: What is the main message to be taken from today's lesson?

Answer 10: The main message is that it is possible to organize large sporting events in a sustainable way, and everyone can contribute to reducing the environmental impact of such events.

Structured test with 10 correct questions and answers on the organization of major sporting events and their impact on climate change:

E.g. tests already prepared by

Question 1: What does climate change represent?

Answer 1: Climate change represents long-term alterations in Earth's weather patterns, often caused by increased greenhouse gas emissions.

Question 2: What is one of the main objectives of organizing sustainable sports events?

Answer 2: One of the main objectives is to reduce the negative environmental impact of such events through sustainable measures.

Question 3: Define "ecological footprint".

Answer 3: The ecological footprint represents the area of land and water needed to support a specific lifestyle or human activity, taking into account the resources consumed and the waste produced.

Question 4: What is the "carbon footprint"?

Answer 4: The "carbon footprint" represents the amount of carbon emissions (often in terms of carbon dioxide) produced by a business, event, or individual.

Question 5: What are some common strategies to reduce the environmental impact of a major sporting event?

Answer 5: Some common strategies include the use of renewable energy sources, waste recycling, eco-friendly public transportation, and environmental awareness.

Question 6: What are the main sources of greenhouse gas emissions in sporting events?

Answer 6: The main sources are transportation, energy, waste management, and catering.

Question 7: Can you give an example of a major sporting event that has implemented significant sustainability measures?

Answer 7: An example is the organization of the Tokyo 2020 Olympics, which implemented sustainability measures such as the use of green hydrogen and the efficient use of resources.

Question 8: How can a major sporting event raise awareness of climate change?

Answer 8: Through awareness campaigns, environmental education initiatives, and the promotion of sustainable behaviors among viewers.

Question 9: What can individuals do to contribute to greater sustainability in sporting events? Answer 9: Individuals can use public transportation, reduce waste, adhere to the event's environmental rules, and support sustainability initiatives. Question 10: What is the main message of the lesson? Answer 10: The main message is that it is possible to organize large sporting events in a sustainable way, and everyone can contribute to reducing the environmental impact of such events.	
Simple multiple-choice test with 10 correct questions and answers: 1. Climate change is mainly caused by: ☒ Increase in greenhouse gas emissions ☐ Volcanic activity ☐ Natural climate fluctuations ☐ Poor water management 2. What is one of the main objectives of organising sustainable sporting events? ☐ Maximize profits ☐ Reduce local community involvement ☐ Increasing air pollution ☒ Reducing environmental impact 3. What does the ecological footprint represent? ☐ A mark left by an animal ☐ The area occupied by a building ☒ The area of land and water needed to sustain a specific human lifestyle ☐ Daily energy consumption 4. What does the "carbon footprint" represent? ☐ The amount of carbon dioxide in the atmosphere ☒ The amount of greenhouse gas emissions produced by an activity ☐ The Carbon Size in a Diamond ☐ Nitrogen balance in an ecosystem 5. What are some common strategies for reducing the environmental impact of a major sporting event? ☐ Increasing the use of non-renewable energy	E.g. multiple-choice tests prepared by the teacher

- ☐ Ignoring Waste Recycling
- ☐ Use only private means of transport
- ☒ Use renewable energy sources

6. What are the main sources of greenhouse gas emissions from sporting events?

- ☐ Athlete's Diet
- ☐ Lawn Maintenance
- ☒ Transport, energy, waste management, catering
- ☐ Changes in athletes' uniforms

7. Can you give an example of a major sporting event with significant sustainability measures?

- ☐ Table Tennis Championship
- ☐ Chess Marathon
- ☒ Olympics at Tokyo 2020
- ☐ Parcheesi World Cup

8. How can a major sporting event raise awareness of climate change?

- ☐ Can't
- ☐ Through rock concerts
- ☐ Selling Sports Cars
- ☒ Through environmental awareness and education campaigns

9. What can people do to contribute to greater sustainability at sporting events?

- ☐ Use private transportation
- ☐ Litter everywhere
- ☐ Ignoring environmental regulations
- ☒ Using public transport

10. What is the main message of the lesson?

- ☐ Organizing more expensive sporting events
- ☐ No need to worry about the environment
- ☒ Sustainability is important in sporting events
- ☐ The lesson is over

Make sure you've answered each question correctly.

Skills acquired

1. Understanding Climate Change: Students will gain a deeper understanding of climate change, its causes, consequences, and impact on society.
2. Environmental awareness: They will develop a greater sensitivity to environmental issues and will be able to recognize the link between human activities, such as sporting events, and the environment.
3. Knowledge of sustainability strategies: They will learn about strategies used to make sporting events more sustainable, such as the use of renewable energy sources, waste recycling, and energy efficiency.
4. Critical analysis skills: They will be able to critically evaluate past and current sporting events to identify areas where improvements can be made in terms of sustainability.
5. Presentation skills: They will have the opportunity to develop presentation skills through the development and sharing of their sustainability plans for fictional sporting events.
6. Creative thinking: They will be encouraged to think creatively to come up with innovative solutions to reduce the environmental impact of sporting events.
7. Collaboration: Group activities will help them develop collaboration skills and work in teams to achieve common goals.
8. Awareness of individual responsibilities: Students will gain a greater awareness of their individual responsibilities in adopting sustainable behaviors at sporting events and in daily life.
9. Active learning: They will have the opportunity to actively engage in learning through classroom discussions, hands-on activities, and case study analysis.
10. Promoting sustainability: They will be able to promote sustainability at sporting events and within their community by raising awareness and encouraging sustainable actions.

These skills will not only contribute to understanding the importance of sustainability in sporting events, but will also prepare students to be more aware and active citizens in the fight against climate change and in promoting sustainable behaviors.

Physics

a cura di Celar Yavuzyilmaz

Lesson No. 1 - Effects of carbon footprint - Physics

Lesson plan

Keywords: greenhouse gases, atmosphere, emissions

Schedule: lesson 40+40 minutes, activity 1 or 2 hours, validation 45 minutes

School: Scientific High School

Greenhouse gases are gases that absorb and emit infrared radiation in the range of wavelengths emitted by the Earth.

The atmosphere, gaseous or air, is the layer of gas and vapor that surrounds any celestial body. Emissions are defined; caused by the combustion of fuel and the like; synthesis, decomposition, evaporation and similar processes; air pollutants emitted into the atmosphere by a plant as a result of the accumulation, separation, transport and other mechanical processes of substances.

Objectives
1. List the effects of the carbon footprint. 2. Provides information on emissions 3. It defines what the atmosphere is. 4. Understands the harmful effects of greenhouse gases.

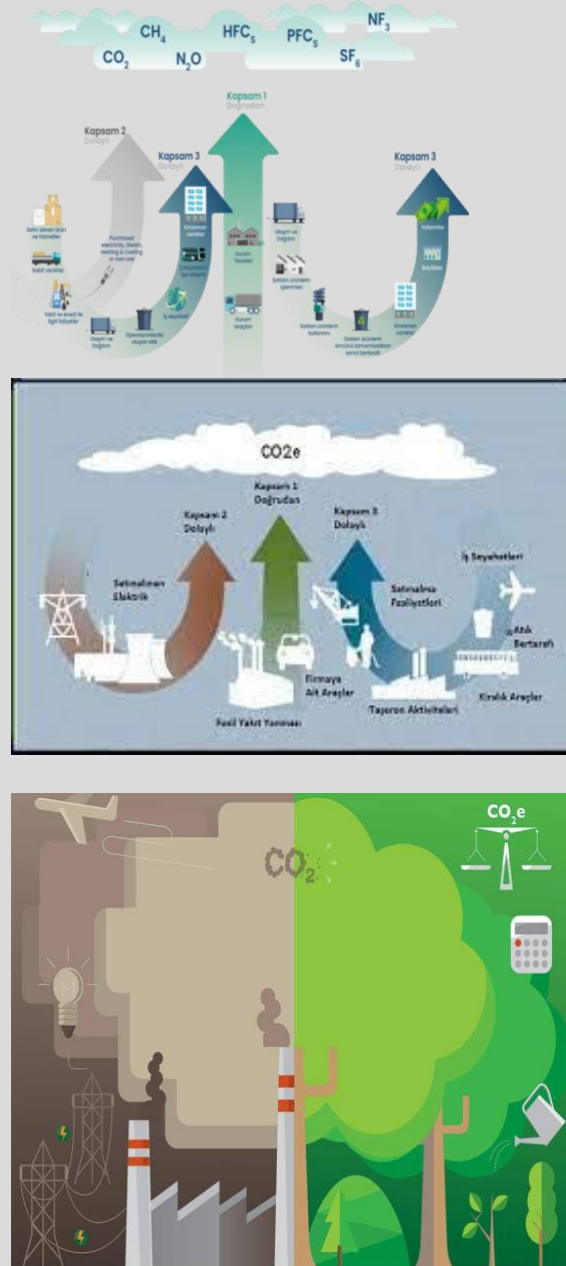
Contents	References	Methodology
Introduction (5 minutes): The equivalent of greenhouse gases released into the atmosphere as a result of the activities carried out by an individual, country or organization, in terms of carbon dioxide, is called a carbon footprint.		Conference
Summary of prior knowledge (10 minutes): Remember concepts or information learned in previous lessons related to the current topic.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Conference

Establish a connection between past and present content.

Presentation of new content (20-30 minutes):

What is a carbon footprint example? The primary carbon footprint refers to the emission values released as a result of energy consumption while meeting daily needs. For example, the amount of carbon dioxide released from burning fossil fuels used in transportation vehicles such as cars and airplanes falls under the category of direct (primary) carbon footprint. . Why is carbon footprint dangerous? The carbon footprint causes significant damage such as increased greenhouse gas emissions, increased acid rain formation, shortening the global warming process, and climate change. What happens if the carbon footprint increases? Increasing carbon footprint harms the environment and increases the climate crisis. To avoid this situation, we need to gain awareness at both the individual and institutional levels. Does planting trees reduce your carbon footprint? Due to their shadows, trees help nature save water by minimizing the amount of evaporation

Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).



Conference

within the area they affect. Trees that give food protect you from the amount of carbon footprint produced by shopping by providing natural, especially seasonal foods. Why is it important to reduce your carbon footprint? Identify cost savings: Reducing your carbon footprint also means reducing energy consumption and other costs. By identifying areas where you can reduce your carbon emissions, you can save money on your energy bills and other expenses.



Summary and conclusion (5 minutes):

The carbon footprint is the equivalent of greenhouse gases, in terms of carbon dioxide, released into the atmosphere as a result of the activities carried out by an individual, a country or an organization. In the natural process, nature maintains the balance of greenhouse gases in the atmosphere.

Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).



Enter only the methodology used (there will be a link with the explanation of the methodology)

Activity	Methodology
Carbon Footprint Research	Teamwork

Verification	Typology
Why is it important to reduce your carbon footprint? Answer: Reducing your carbon footprint is crucial because it helps fight climate change. Excessive carbon emissions lead to global warming, which has serious consequences such as extreme weather events, sea level rise, and ecosystem disruption	Verification of open-ended questions prepared by the teacher

Skills acquired

Understanding the physics of greenhouse gases and their impact on climate
Analyze the carbon footprint of human activities and products
Develop awareness of environmental consequences and mitigation strategies

Lesson n. 2 - Electricity and Nature - PHYSICS

Lesson plan

Keywords: Electric Current, Static Electricity, Lightning

Timetable: lesson 40+40 minutes, activity 1 or 2 hours, test 45 minutes

School: High School

Electric current: The transfer of electrical energy between charges as a result of the vibrational movement of negative charges is called electric current.

Static electricity: The electrical energy resulting from the friction of charged substances with each other is called static electricity.

Lightning: Lightning is static electricity that jumps through charged clouds as they approach each other.

Lightning: The power that occurs when a high amount of electrical charge accumulated in clouds jumps to earth is called lightning.

Objectives

1. Explain the difference between thunder and lightning.
2. Knows ways to protect yourself from the negative effects of lightning.

Contents

References

Methodology

Introduction (5 minutes):

Natural phenomena such as thunder and lightning were the best examples of electricity in nature

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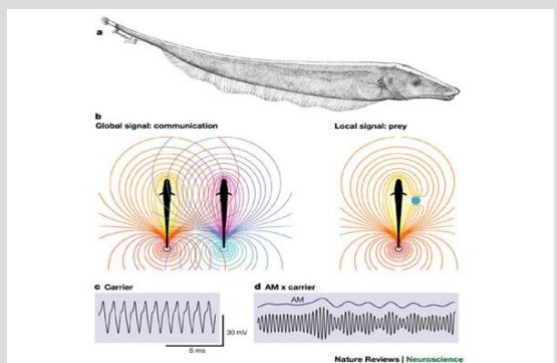
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Conference

Summary of prior knowledge (10 minutes): Global warming occurs due to the increase in temperature at the Earth's surface due to the greenhouse effect of gases emitted by human activities into the atmosphere. With global warming, glaciers are melting and carbon dioxide created by the old forests inside the glaciers is being released.		Conference
Presentation of new content (20-30 minutes): The Surprising Spider Feature: Cobwebs Research on garden cobwebs has shown that the sticky strands of spider webs are sensitive to electrically charged objects and move towards these objects or creatures. The research, published in the journal Scientific Reports, explains that many species of flying insects create a large electrical charge during their flight. It is argued that the electrical charge created by these insects, such as honey bees, during flight makes it easier for them to be attracted to webs and become prey. Victor Ortega Jimenez of the University of California, USA, who took part in the research, said: "Electrically charged insects can cause the	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.). https://www.basarisiralamalari.com/elektrik-akimi-konu-anlatimi/ https://www.elektrikport.com/universite/dogadaki-gizem-elektrik/8681#ad-image-0 http://www.elemasyon.com/statik-elektrik-nedir/ 	Conference Presentation Discussion

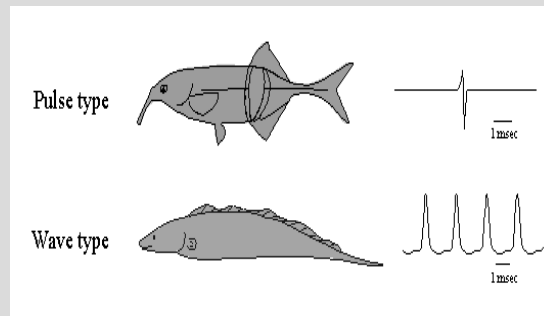
spider's web to deteriorate... If the insects fly too close to the web, they can be trapped by the electrostatic effect." Wanting to develop this idea, Jimenez and his colleague Robert Dudler collected webs belonging to the spider species *Araneus diadematus*.

Honey bees have an electrical charge of 200 volts:
The most prominent example of insect species that create an electrical charge during flight are honey bees. Honey bees can create an electrical charge of up to 200 volts and thus attract pollen from negatively charged flowers. Based on previous research, bees were known to build up an electrical charge in their bodies as they buzz and fly. Bees create an electromagnetic field that extends from their wings to their bodies by flapping their wings an average of 12,000 times per minute. They do not conduct electricity because they have a waxy shell-like structure. While one of the world's fastest computers can perform 16 billion arithmetic operations per second, the honey bee has the ability to perform 10 trillion operations in the same amount of time, while consuming less than 10



microwatts of energy. Their wireless communication is thought to be because of these capabilities.

Electricity production from the mustard plant: In the Indian state of Rajasthan, clean energy is obtained by producing electricity from mustard waste grown by farmers. A great deal of work has been done on clean energy production in recent years. Many countries have accelerated the development of alternative ways to obtain clean energy and minimize harm to nature. This application carried out in India is one of the examples of studies conducted in the field of clean energy. Fish and electricity Another natural habitat where electricity exists is underwater. The electricity produced by the fish in the water brings great convenience to their lives. They have been seen to make great use of electricity in communication, perception and hunting. The electric eel, which has a high electrical power, is a source of great curiosity. Most of its body is covered with electrical organs (electroplax) that are actually transformed into high-voltage muscles. These organs are made



up of numerous electricity-generating elements, each of which produces low voltage. This happens just like a battery system connected in series. In an electric eel, between 5,000 and 6,000 electric plates can together produce a voltage of 500 volts, 500 watts of electricity.		
Summary and conclusion (5 minutes): Electricity occurs in nature as a result of natural events. As a result, injuries and fatalities can occur. For example, flammable liquids can ignite with static electricity and start a fire. This is an invisible danger and precautions must be taken.		Conference

Activity	Methodology
Prepare your lightning visual	Poster design
Discuss the difference between thunder and lightning	Teamwork
Finding Ways to Protect Yourself from the Negative Effects of Lightning	Teamwork

Verification	Typology
1- What are the ways to protect yourself from lightning? Answer: To protect yourself from lightning, you can stay indoors, avoid open areas and refrain from the use of electrical appliances. Lightning Auctions on buildings also help to redirect lightning strikes safely in the earth	Tests of open-ended questions prepared by the teacher
2- How can the negative effects of lightning be prevented? Answer: The negative effects of lightning can be mitigated by implementing lightning protection systems, such as lightning rods and surge	Tests of open-ended questions prepared by the teacher

protectors, to safeguard buildings and electrical systems

Skills acquired

Understanding the Principles of Electricity
Analysis of electrical circuits in natural systems
Applications of Electrical Physics in the Environment

Lesson No. 3 - Energy and Nature - Physics

Lesson plan

Keywords: greenhouse effect, global warming, acid rain, air pollution
Timetable: lesson 40+40 minutes, activity 1 or 2 hours, test 45 minutes
School: High School

The greenhouse effect: This is the process by which radiation from a planet's atmosphere heats the planet's surface to a higher temperature than normal.

Global warming: it is the periodic warming of the atmosphere due to the greenhouse effect and is a natural process.

Acid rain: This is the name given to the fall of acidic chemicals on the earth in the form of rain, snow, fog, dew, or dry particles.

Air pollution: it is the amount and density of foreign substances in the air that negatively affects the health of living beings and exceeds normal.

Objectives

1. Define what the greenhouse effect is.
2. Tell about the types of pollution in nature.
3. It provides information about global warming.
4. Understands the topic of acid rain.
5. Provides information on air pollution.

Contents

References

Methodology

Introduction (5 minutes):

<https://ekolojist.net/doga-dostu-enerjiler-nelerdir/>

Question
Discussion

Why is our world so polluted?

English translation of the website:
[https://ekolojist-net.translate.goog/doga-dostu-enerjiler-nelerdir/? x tr sl=tr& x tr tl=en& x tr hl=en& x tr pto=nui](https://ekolojist-net.translate.goog/doga-dostu-enerjiler-nelerdir/?x_tr_sl=tr&x_tr_tl=en&x_tr_hl=en&x_tr_pto=nui)

Why is it so difficult for living things to survive and live healthily?

Summary of prior knowledge (10 minutes):

Conference

As events such as air pollution, environmental

pollution, the greenhouse effect, global warming, and acid rain continue to increase day by day, and as people do not take responsibility, they make our world uninhabitable.

Presentation of new content (20-30 minutes):

The earth is heated by the sun's rays reflected off the earth rather than the sun's rays falling on it. These reflected rays are captured by gases in the atmosphere, particularly carbon dioxide, methane, and water vapor, thus warming the earth. The retention of rays by these gases is called the greenhouse effect. Increasing the amount of these gases in the atmosphere greatly increases the warming of the Earth.

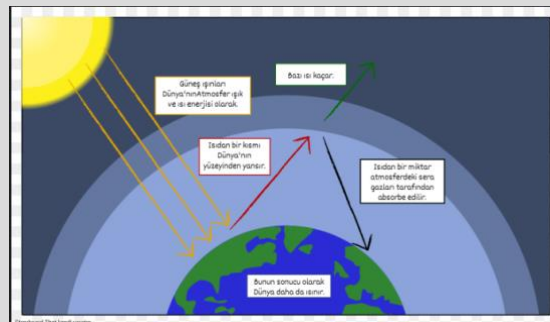
Climate change refers to global warming and its effects on the Earth's climate system.

Acid rain is the name given to the fall of acidic chemicals on the earth in the form of rain, snow, fog, dew, or dry particles.

It is formed when sulfur dioxide, nitrogen dioxide, and carbon dioxide gases diffused in the atmosphere are absorbed by water droplets in clouds after undergoing chemical

https://en.wikipedia.org/wiki/Greenhouse_effect

https://en.wikipedia.org/wiki/Air_pollution



Conference
Presentation
Discussion

transformations. These droplets then fall to the ground through rain and snow. This increases the acidity of the soil and disrupts the chemical balance of freshwater resources. The pH of rain that occurs at a typical diameter concentration in the air is about 5.6. Therefore, rainfall with a pH of less than 5.6 is considered acid rain. Air pollution; It is the presence of foreign substances in the form of solids, liquids and gases in the atmosphere in quantity, density and for a long time that will harm human health, living life and ecological balance. The air layer is polluted by waste generated during production and consumption activities resulting from various human activities, negatively affecting life on earth. Polluted air causes an increase in respiratory diseases in humans.		
Summary and conclusion (5 minutes): With this practice, the topic of energy and nature is evaluated as a whole in order to provide people with new skills, regardless of their age and educational background, and to strengthen their personal development.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Conference

Activity	Methodology
Greenhouse Effect Poster	Design of posters

Verification	Typology
1-Which of the following does not contribute to the reduction of greenhouse gases in the atmosphere? A) Increase practices for heating with less energy B) Expanding the use of solar and nuclear energy C) Use of systems that produce less carbon in thermal power plants D) Increase the use of energy resources such as biodiesel instead of fossil fuels (E) Expansion of hydroelectric power stations in place of river power stations Answer: And	Tests of multiple-choice questions prepared by the teacher
2- What events will be caused by climate change? Answer: Climate change can lead to events such as more frequent and severe hurricanes, droughts, heat waves, and disruptions to ecosystems and agriculture	Tests of open-ended questions prepared by the teacher

Skills acquired
Understanding Energy Transfer in Natural Systems Analysis of the principles of energy conservation Application of physics to environmental issues

Lesson No. 4 - Energy Resources – Physics

Lesson plan

Keywords: Solar Energy, Wind Energy, Geothermal Energy, Non-Renewable Energy Sources

Times: 40+40 minutes, events 1 or 2 hours, verification 45 minutes.

School: High School

Solar energy, the energy emitted by the Sun and reaching the Earth, is the radiant energy released by the fusion process in the sun's core.

Wind energy is the natural movement of air or other gases relative to the surface of the planet.

Geothermal energy is the heat contained in the earth's crust.

Non-renewable energy sources are nuclear, oil, coal, and natural gas.

Objectives
1. It defines what solar energy is. 2. Indicate the types of non-renewable energy resources. 3. Provides information on wind energy.

4. Understands the topic of geothermal energy.
5. Provides information about energy sources.

Contents	References	Methodology
Introduction (5 minutes): What happens if our energy resources run out? What would the Earth be like without the Sun?	https://www.google.com/search?q=the+sun&tbm=isch&ved=2ahUKEwiv6T98LiBAxX2gv0HHbYMDMoQ2-cCegQIABAA&oq=the+sun&gs_lcp=CgNpbWcQA1AAWABgrAhoAHAAeACAAQCIQCSAQCYAQCGAQGgAQtn3Mtd2l6LWltZ8ABAQ&sclient=img&ei=S7wKZe3tJvaF9u8Ptpmw0Aw&bih=714&biw=1536&safe=active	Question Brainstorming
Summary of prior knowledge (10 minutes): Energy is all around us, and the Universe is made of energy. Everything that exists has some form of energy. But since it's an abstract concept, it's hard to define.		Conference
Presentation of new content (20-30 minutes): Solar energy is a technology based on obtaining energy from sunlight. The energy emitted by the Sun and reaching the Earth is the radiant energy released by the fusion process in the Sun's core. It results from the process of fusion of hydrogen gas in the Sun which is transformed into helium. Geothermal energy is used through hot water rising to the surface of the earth. Thermal springs, which have been used since ancient times, are the first areas of use of geothermal energy.	https://en.wikipedia.org/wiki/Energy_source	Conference Discussion

Geothermal energy can be used in heating applications or in electricity generation, depending on the temperature of the source. Power plants for the production of electricity began to be established from the beginning of the 20th century. But because it's not very well known, it only gets a 0.05% share of the world's overall energy production.

Geothermal energy;
Since the resource is very large compared to the world's energy consumption and provided that the hot water used is reinjected underground, it is considered among the renewable energies.

Wind energy is a clean, abundant, renewable resource that can be used almost anywhere in the world. The wind turbine is a system that converts the kinetic energy of the wind first into mechanical energy and then into electrical energy.

Non-renewable energy sources are divided into two groups: nuclear sources and fossil fuels. It is estimated that these resources may be depleted in the near future. Nuclear, oil, coal, and natural gas are the main non-renewable

energy sources. Among alternative energy sources, wind is an energy source that can be at least as useful as hydrogen energy. In addition to being clean, plentiful, and renewable, it is a resource that can be used almost anywhere in the world. Non-renewable energy sources are divided into two groups: nuclear sources and fossil fuels. It is estimated that these resources may be depleted in the near future. Nuclear, oil, coal and natural gas are the main sources of non-renewable energy Non-renewable energy sources: These are resources that are depleted as they are used and also harm the environment. •Fossil fuels: Substances such as coal, natural gas, and oil are depleted as they are used and cause damage to the environment and air every time they are used. •Nuclear energy: This is produced by burning a substance called uranium, which is used to produce electricity.		
Summary and conclusion (5 minutes): Energy resources are resources that provide energy by any means.	https://en.wikipedia.org/wiki/Energy_source	Discussion

Activity	Methodology

Search for energy sources	Teamwork
Creating a view of non-renewable energy sources	Poster design

Verification	Typology
1-Which of the following is not one of the components of the wind turbine? A.Torre B.Tail C.Ali D. Shaft E. Pump Answer: D	Tests of multiple-choice questions prepared by the teacher
2-Which of the following is one of the disadvantages of wind energy? A. Since wind energy does not involve any chemical process to produce energy, it does not create water and air pollution. B. Since no greenhouse gases are produced, it does not contribute to global warming. C. Wind energy is not an uninterrupted source of energy. D. Wind is abundant and free in the atmosphere. Wind energy is a renewable and sustainable source of energy And. For remote or small-scale settlements where electricity cannot reach by cable, wind turbines provide an alternative for local electricity production. Answer: C	Tests of multiple-choice questions prepared by the teacher

Skills acquired

Understanding Energy Sources and Conversion Assessing the environmental impact of energy production Energy Efficiency and Sustainability Analysis

Lesson No. 5 - Forest fires - Physics

Lesson plan

Keywords: ecosystem, flammable material, vegetation.

Lesson times 40+40 minutes, activities 1 or 2 hours, test 45 minutes

School: High School

Ecosystem is the name given to the limited environment in which living and non-living creatures continue their lives by interacting with each other in their environment.

Flammable materials are the substances that burn due to combination with oxygen when heated to the point of combustion and emit heat into the surrounding environment when burned.

Vegetation consists of plant communities that can be named separately due to their distinctive structural characteristics in any region.

Objectives
1. Defines what a forest fire is. 2. Explain forest fires and forest ecosystems. 3. Examine the effects of forest fires. 4. Understands the relationship between fire and vegetation. 5. Provides information on the factors influencing forest fires.

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Present the goal of the lesson and what students will learn.		Question Discussion Brainstorming
Summary of prior knowledge (10 minutes): Remember concepts or information learned in previous lessons related to the current topic. Establish a connection between past and present content.	https://en.wikipedia.org/wiki/Wildfire	conference
Presentation of new content (20-30 minutes): Ecosystem dynamics are under the influence of many internal and external factors, from the level of the simple organism to the level of the ecosystem. One of the most effective of these factors is forest fires, which modify and maintain the ecosystem structure, composition and richness of species. In many forest ecosystems around the	 https://en.wikipedia.org/wiki/Wildfire	Conference Presentation discussion

world, fire is an integral part of the system.

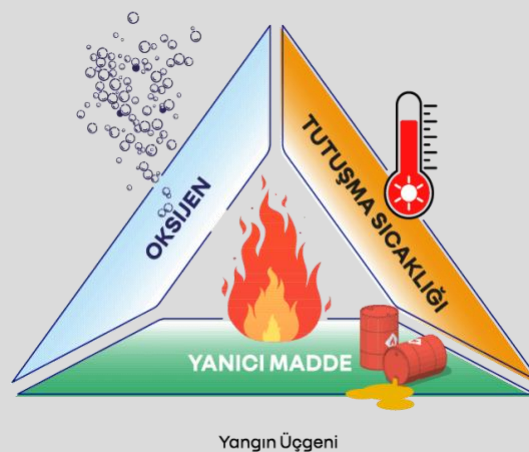
Fire has a wide variety of effects in the forest. In simpler terms, fire burns, spreads, and releases energy. These impacts have important ecological and economic consequences.

1. The most important effect of fire on forests is that it reduces organic material to ashes. This feature of fire is used to burn and eliminate forest residues and often excess material on the ground.

2. The extreme heat that occurs during a fire kills the living vegetation of the forest and animals and modifies the physical and especially chemical properties of the soil.

3. Residual minerals formed after a fire cause chemical effects. The relationship of these substances with the soil produces important results. The relationship of fire to vegetation (plant) occurs as a result of the burning of some or all of the vegetation. As a result of this relationship, if the entire forest is burned and ashes remain, there is no need to thoroughly investigate the relationship between fire and vegetation.

However, in many cases, fire does not completely burn vegetation, but only



A Russian firefighter extinguishes a forest fire

damages part of it. In this case, it becomes difficult to decide whether the damaged vegetation will survive or not.

Some of the things we need to do to protect forests from fires;

- Glass and glass shards should not be disposed of in forests. (The glass draws sunlight to the grass like a magnifying glass. The grass will ignite, causing the grass to catch fire and thus causing a fire.)
- Barbecue ash must not be spilled without extinguishing it. Because there is a possibility that the grass will catch fire and cause a fire.
- When we see a fire, we need to call the fire department's emergency number.
- Environmental officials and organizations should raise public awareness and organize seminars and conferences on this topic.
- We should not light a fire in the forest. If we have to, we should light it in a grass-free area by placing stones around the fire.

Extinguishing
Fighting forest fires depends on the technologies available in the area where the fire occurs. The techniques used in less developed countries can be as simple as throwing sand

or beating fire with sticks or palm leaves. In more developed countries, the methods of suppression change due to the increase in technological capacity. Silver iodide can be used to promote snowfall, flame retardants, and water can be dropped on fires by drones, planes, and helicopters. Complete fire suppression is no longer an expectation, but most wildfires are usually extinguished before they get out of control. Although more than 99% of the 10,000 new fires each year are contained, fires that escape extreme weather conditions are difficult to suppress without a change in weather conditions. Wildfires in Canada and the United States burn an average of 54,500 square kilometers (13,000,000 acres) per year. First of all, fighting fires can be deadly. The burning front of a forest fire can also change direction unexpectedly, and the fire can spread between them. Intense heat and smoke can cause disorientation and loss of perception of the direction of fire, which can make fires particularly dangerous.		
Summary and conclusion (5 minutes): As a result of intensive research on the subject,	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	conference

fires are seen not only as a factor that upsets the natural balance; It has made it necessary to be considered as a natural and integral component of the ecosystem. In fire-adapted ecosystems, fire creates a new beginning in a forest community that becomes increasingly stable, and species diversity begins to decline, causing changes in species diversity and allowing the system to renew itself. For this reason, the continuity and efficiency of the system can be maintained by creating effects similar to the natural intervention process through the controlled use of fire, which is part of the system in fire-dependent ecosystems.

Activity	Methodology
Give a presentation on forest fires	presentation

Checks	Typology
Which of the following is a fire caused by negligence? a) Fires caused by cigarette fires b) Stubble fires (c) Fires arising from the power transmission line d) Fires caused by shepherd's fire e) With a fire caused by a picnic fire Answer: A	Multiple choice questions prepared by the teacher
Why do forests burn? Answer: Forests can catch fire from natural causes such as lightning, but they also burn due to human activities, including negligence, arson, and deforestation	Tests of open-ended questions prepared by the teacher

What are the causes of forest fires?	Tests of open-ended questions prepared by the teacher
Answer: Wildfires can result from various factors, including dry weather, lightning, human activities such as campfires and discarded cigarettes, and deforestation.	

Skills acquired

Understand the physics of combustion and fire behavior
Analyze the factors influencing the spread and control of forest fires
Develop critical thinking and problem-solving skills for fire management

Lesson No. 6 - Global warming - Physics

Lesson plan

Keywords: climate change, greenhouse effect, global warming.

Timetable: lesson 40+40 minutes, activity 1 or 2 hours, test 45 minutes

School: High School

Climate change refers to a large-scale, long-term change in weather patterns and average temperatures on the planet.

The greenhouse effect is the process by which radiation from a planet's atmosphere heats the planet's surface to a higher temperature than normal.

Global warming refers to the warming of the Earth's surface temperature, caused primarily by the increase in greenhouse gases in the atmosphere.

Objectives
1. Knows the harmful effects of the greenhouse effect.
2. Provides information on climate change.
3. Understands the problem of global warming.

Contents	References	Methodology
Introduction (5 minutes): Climate change, the effects of which are increasing day by day, is dragging living life on Earth towards its sixth extinction. However, it is in our hands to minimize the effects of the destruction caused and that will be caused by		Conference

this large-scale change and improve our common future.		
Summary of prior knowledge (10 minutes): Energy resources are resources that allow energy to be produced by any means.		Conference
Presentation of new content (20-30 minutes): Climate change has always existed throughout the history of the world. However, the rise in global temperatures we have witnessed over the past 150 years is now at an abnormal level due to human-induced activities. Climate change, the effects of which are increasing day by day, is dragging living life on Earth towards its sixth extinction. However, it is in our hands to minimize the effects of the destruction caused and that will be caused by this large-scale change and improve our common future. Climate change refers to a large-scale, long-term change in weather patterns and average temperatures on the planet. Scientists have developed an understanding of Earth's climate system through years of observations,	https://ecording.org/iklim-degisikligi-nedir/ https://ecording.org/en/iklim-degisikligi-nedir/  	Conference Presentation Discussion

theory development, and model building. Today, we are confident that climate change is happening and that it is the result of greenhouse gas emissions from human activities.

This result refers to the long-term change in average weather patterns around the world. As humanity has contributed to the release of carbon dioxide and other greenhouse gases into the air since the mid-1800s, global temperatures have risen, causing long-term climate change.

The effects of the global climate crisis are being felt today and will continue to increase in the future. Actions to reduce global greenhouse gas emissions are sufficient to help limit changes in the climate system.

Causes of global climate change: greenhouse effect Life on Earth exists thanks to a combination of three factors: our distance from the Sun, the chemical composition of the atmosphere, and the existence of the water cycle. In particular, the atmosphere ensures that our planet has a climate suitable for sustaining life, thanks to the natural greenhouse effect.



Effect of greenhouse gases and climate change:

When the sun's rays reach the Earth's surface, they are partially absorbed and the rest are reflected outside. These rays would scatter into space without the presence of an atmosphere. Instead, most are trapped by gases in the atmosphere, called greenhouse gases because of the effect they produce, and returned to Earth. This captured heat is added directly to the heat absorbed by the Sun's rays. It goes without saying that if the natural greenhouse effect did not exist, the average temperature of the planet would be around -18°C instead of the current average of about 15°C .

What can we do to say "stop" to climate change?

The destruction caused and will be caused by climate change means code red for humanity. But there's still time. The quickest way to deal with the buildup of carbon dioxide in the atmosphere is to stop adding more.

From the buildings we live in, to the electricity and heat we produce for our industry, to the oil

we burn to power our cars, trucks and planes; Many vital parts of our economy emit large amounts of greenhouse gases. However, there are many ways to reduce the carbon emissions of these industries.

We can replace high-emitting fuels like coal, oil, and gas with near-"carbon-free" renewable energy alternatives like solar and wind power. We can also upgrade our buildings and infrastructure so that we spend less energy to build and use them. The IPCC, the world's leading scientific organization in climate change assessment, warns that global greenhouse gas emissions must peak by 2025 and, if limited, must be reduced by 43% by 2030.

Again, according to the IPCC, we have no chance of preventing the Earth's average temperature from rising by 1.5°C by 2030. However, if we reduce our carbon emissions by about half by 2030 and emit no more carbon emissions than the planet can absorb each year by 2050, we can keep the temperature increase in question to 1.5°C in 2030.

Summary and conclusion
(5 minutes):

Global warming occurs due to the increase in temperature at the Earth's surface due to the greenhouse effect of gases emitted by human activities into the atmosphere. With global warming, glaciers are melting and carbon dioxide created by the old forests inside the glaciers is being released.



Conference

Activities (one or more)	Methodology
Preparing Greenhouse Effect Images	Design of porters
Research on the negative effects of global warming	Teamwork

Checks	Typology
1- What are the negative effects of global warming? Answer: The negative effects of global warming include rising temperatures, melting ice sheets, rising sea levels, more frequent and severe weather events, and threats to biodiversity	Tests of open-ended questions prepared by the teacher
2- How to prevent global warming? Answer: To prevent global warming, we need to reduce carbon emissions by using cleaner energy sources, conserving energy, promoting sustainable practices, and protecting forests and ecosystems	Tests of open-ended questions prepared by the teacher

Skills acquired

Understanding the Physics of Climate Change Analysis of the effects of greenhouse gases Climate modelling and forecasting

Lesson No. 7 - Physics and Nature

Lesson plan

Keywords: natural sciences, reality, facts.

Timetable: lesson 40+40 minutes, activity 1 or 2 hours, test 45 minutes

School: High School

Natural sciences are sciences that deal with natural phenomena.

Fact: Something that is accepted to exist, be true, or happen.

Objectives
1. Define what a fact is. 2. Tell about the types of natural sciences. 3. It provides information about reality. 4. Understands the subject of physics and nature.

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Present the goal of the lesson and what students will learn.		
Summary of prior knowledge (10 minutes): Derived from the Greek words "nature" (phusis) and natural knowledge (phusike), it is a natural science that studies matter, its movement, and its behavior, along with related concepts such as space and time, energy, and force. The main goal of physics, one of the basic disciplines of the natural sciences, is to understand how the universe behaves.	https://www.bilgiustam.com/fizik-en-eski-doga-bilimi/ IN ENGLISH https://www.bilgiustam.com.translate.goog/fizik-en-eski-doga-bilimi/? x tr sl=ro& x tr tl=tr& x tr hl=en-US& x tr pto=wapp	Conference
Presentation of new content (20-30 minutes): Natural sciences are sciences that deal with natural phenomena. Its subject is natural reality (reality). Everything that exists independently of human thought is a natural reality. Physics in particular, chemistry, which studies matter,	https://en.wikipedia.org/wiki/Natural_science 	Conference

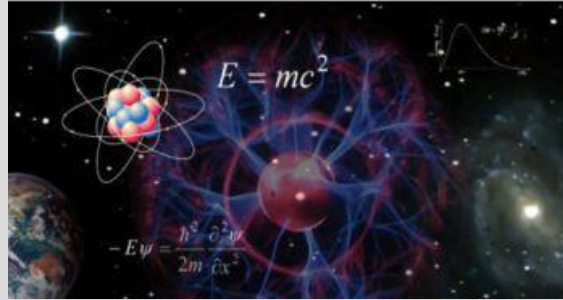
biology, which studies living things, astronomy, which studies celestial bodies, and earth sciences, which study the Earth, are the fundamental fields of the natural sciences.

In science, the natural sciences consist of natural rules of rational study or laws. The term is distinguished from the social sciences by the application of scientific methods to human behavior and by the use of different methods of studying nature from formal sciences and scientific methods.

The natural sciences are factual. It examines the chains of events and phenomena that can exist in nature at any given time. He achieves the laws of nature by examining the cause-effect relationship between phenomena. Factuality means verifying the laws attained through experiment and observation, again by experiment and observation. The natural sciences use the inductive method. The general laws of nature are reached by single events and facts.

The natural sciences are self-explanatory. Its purpose is not only to understand, but also to

https://en.wikipedia.org/wiki/History_of_physics



explain. Explanation; It is about revealing in a comprehensible way the basic elements that make up a phenomenon or entity (theory). The natural sciences must explain every reality they comprehend by a definition, a law, or a formula.

Physics is a field of study that is the product of philosophy, which is why it was called natural philosophy until the 19th century. The famous physicist Isaac Newton (1642-1726) also titled his seminal work "Mathematical Principles of Natural Philosophy" and considered himself a natural philosopher. Today, physics; It is defined as a branch of science that studies matter, energy, and the relationship between them. Physics is, in a sense, the oldest and most fundamental theoretical science; His discoveries are relevant to every field of the natural sciences because matter and energy; They are the basic elements of nature. Other branches of science are generally limited to their own fields and can be considered as separate from physics later and allowed to become a branch of science. In the 16th century, physics was separated from the natural sciences, and

with the rapid increase in knowledge after the Renaissance period, sub-branches such as mechanics, optics, acoustics, and electricity emerged. Today, physics is divided into two: classical physics and modern physics.		
Summary and conclusion (5 minutes): Physics is a natural science that seeks to explain natural events in the universe and the laws that create the interactions between these events, based on reason and logic, and uses experimental and mathematical methods in doing so.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Conference

Activity	Methodology
Enter the activity to be carried out by describing it (workshop, games, group work, etc.).	Enter the methodology used. If you don't find it in the list, create a new one by writing the text and share it so that it can be included in the methodologies.

Checks	Typology
Does physics study natural facts? Answer: Yes, physics studies natural facts and seeks to understand the fundamental principles that govern the behavior of the physical universe	Tests of open-ended questions prepared by the teacher
Which of the following statements is false as far as physics is concerned? - a- It emerged as a result of people's curiosity about natural events. - b- Study the properties of matter - c- It paved the way for the invention of devices used in the field of medicine - d- Examine the details of the combustion event - e- Supported theories that predict that the universe is expanding	Tests of multiple-choice questions prepared by the teacher

Skills acquired

Explore the fundamental principles of physics underlying natural phenomena
Develop observational and analytical skills to explain natural events
Understand the role of physics in understanding and preserving the natural world

Lesson No. 8 – Energy Saving**Lesson plan**

Keywords: environment, savings, natural resources

Timetable: lesson 40+40 minutes, activity 1 or 2 hours, test 45 minutes

School: High School

Natural resources are natural riches that have no human influence and are formed according to certain conditions in the natural environment.

Environment; It is the external environment with which living creatures on Earth maintain their relationships throughout their lives.

Savings: Use time, talent, assets, and of course money efficiently and without wasting.

Atmosphere: The air mass that surrounds the world where people, animals, plants, and other living things live, and is made up entirely of various gases, is called the atmosphere.

Objectives

1. Provides the definition of energy conservation.
2. Indicates losses of steam, gas, air, heat, and electrical power.
3. Provides information on losses that may occur due to excessive energy use.
4. Understands the issue of energy resources.
5. Provides information on examples of energy savings.

Contents	References	Methodology
Introduction (5 minutes): What is energy saving?		Question Discussion
Summary of prior knowledge (10 minutes): Energy conservation is an effort to reduce energy consumption by using less of an energy service. Energy savings can be achieved by using energy more efficiently (by spending less energy on the same job) or by reducing the amount of		Conference

energy used (e.g., driving less).

Presentation of new content (20-30 minutes):

Saving energy doesn't mean sustaining limited resources for as long as possible; This means that you are doing nothing but prolonging a crisis until energy resources are depleted. Savings is the process of reducing the demand for a limited supply and allowing that supply to begin to rebuild. Often the best way to do this is to replace the energy used with an alternative source.

When it comes to fossil fuels, energy conservation can also include finding new ways to tap into the Earth's supply so that widely used oil fields are not completely dried up. This is not an overnight process; To replenish natural resources, it is necessary to remove the excess demand over supply for over 100 years to allow nature to recover.

Another concept that comes to mind when talking about energy saving is energy efficiency. These two concepts are related, but definitely not in the same sense. While energy conservation is the behavior that helps



<https://www-zorluenerji-com-en.translate.goog/en/electricity-trade/free-consumerism/how-save-eder? x tr sl=en& x tr tl=en& x tr hl=en-US& x tr pto=wapp>

Conference

use less available energy, energy efficiency refers to the development or use of technologies and software that require less energy to perform the same function. However, with the use of energy, the following problems are encountered; • Natural resources are rapidly depleting, • The environment is polluted, • The climate is changing, • High energy costs are high.		
Summary and conclusion (5 minutes): Energy savings can be achieved by using energy more efficiently or by reducing the amount of energy used. Energy-saving measures can improve environmental quality, national security, individuals' financial security, and earnings by reducing energy needs in buildings.		Conference

Activity	Methodology
Energy Saving Poster	Poster design

Verification	Typology
Which of the following features does not save energy? A) We should unplug the devices we don't use. B) We should use energy-saving light bulbs. C) We should turn off the lights in rooms we don't use. D) We should turn on all the chandelier lamps in a room to have a better view. Answer: D	Tests of multiple-choice questions prepared by the teacher
I – Increasing efficiency in the use of energy	Tests of multiple-choice questions prepared by the teacher

II – Reduce the amount of energy expended per transport unit (passenger or cargo) III – Increasing the number of vehicles used in transport Which of these should be implemented as part of energy-saving measures in the transport sector? A. Just me B. I and II C. I and III D. II and III E. I, II and III Answer: B	

Skills acquired

Applying the principles of physics to energy saving and efficiency
Analysis of energy-saving technologies and practices
Develop practical skills to reduce energy consumption

Lesson No. 9 - Radioactivity and its effects

Lesson plan

Keywords: nuclear reactions, nuclear weapons, carcinogen, radiation

Times: Lesson 40+40 minutes, activity 1 or 2 hours, test 45 minutes.

School: High School

Nuclear reaction: Unlike chemical reactions, nuclear reactions occur as a result of changes in particles in the nuclei of atoms with each other or as a result of an external effect.

A nuclear weapon is a weapon with a high destructive power obtained by using nuclear reaction and nuclear fission together or by a much stronger fusion.

Carcinogen: A substance that has the ability to cause human or animal cancer.

Radiation: The emission or transfer of energy in the form of electromagnetic waves or particles.

Objectives
1. List nuclear reactions. 2. Provides information on the effects of radioactivity 3. It defines what a nuclear weapon is. 4. Understands the harmful effects of radiation.

Contents	References	Methodology
Introduction (5 minutes): What effects can radiation have on		Question Brainstorming

humans? What changes occur in living things exposed to radiation?		
Summary of prior knowledge (10 minutes): Radioactivity or nuclear decay is the spontaneous disintegration of the atomic nucleus by the emission of particles or electromagnetic radiation and is a type of energy. It occurs during nuclear reactions. It can pass through the human body and many objects.		Conference
Presentation of new content (20-30 minutes): Radioactivity or nuclear decay is the spontaneous disintegration of the atomic nucleus by the emission of particles or electromagnetic radiation and is a type of energy. It occurs during nuclear reactions. It can pass through the human body and many objects. Not only can it easily pass through soil, rocks, and especially lead. Objects that emit radiation are called radioactive. Where is radioactivity found? Other natural sources of radiation are the sun, air, water, and soil. Nuclear power plants, X-ray machines, cell phone transmitters, TV transmitters, remote control devices, electric heaters can be listed as examples of a long list of	https://en.wikipedia.org/wiki/Radioactive_decay https://nuken-tenmak-gov-tr.translate.goog/ogrenci/bolum1_02.html?x_tr_sl=tr&x_tr_tl=en&x_tr_hl=en-US&x_tr_pto=wapp <u>RADIATION BASICS</u> <u>Radiation</u> – Energy in transit: – electromagnetic waves (gamma-γ or x-ray), or – high speed particles (alpha-α, beta-β, neutron-n, etc.) <u>Ionizing Radiation</u> – Radiation with sufficient energy to remove electrons during interaction with an atom, causing it to become charged or ionized – Can be produced by spontaneous radioactive decay or by accelerating charged particles across an electric potential (eg x-rays) Source: https://oslideshare.net/drbrirajeshben/pp-t-on-radiation-hazards-by-dr-brojesh-k-ben (Presentation of Radiation Hazards by Dr. Ben Brajesh, page 2)	Conference

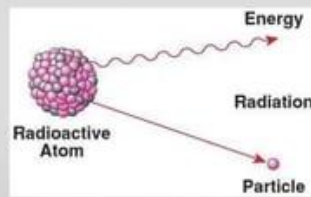
artificial radiation sources.

Nuclear weapons release very large amounts of radiation very quickly with the aim of destroying structures and killing people. The greatest and most painful experience etched in the memory of mankind is the Second World War of the American Army. These are the bombs dropped on Hiroshima and Nagasaki at the end of World War II (1945). On the other hand, nuclear weapons, World War II. It formed the basis of the Cold War, which took place between the capitalist and socialist blocs, particularly the United States and the Soviet Union, from World War II until the late 1980s. The mutual nuclear threats that have continued for many years have created a frightening experience for humanity.

Nuclear reactors are used to produce electricity. These also emit large amounts of radiation, so they are carefully constructed to prevent radiation from escaping from the reactor. However, many people fear that if there is a problem in the reactors, radiation can spread into the environment and harm

Radioactivity

- **Unstable** nucleus **spontaneously** emits small particles and/or energy in order to attain a more stable nuclear state.



Source:

<https://www.slideshare.net/Beageek/brief-history-of-radioactivity>

(Brief Introduction to the History of Radioactivity by Selene Reyes, page 2)



Source:

<https://www.sabah.com.tr/egitim/radyasyonun-canlilara-etkisi-nelerdir-3857787>

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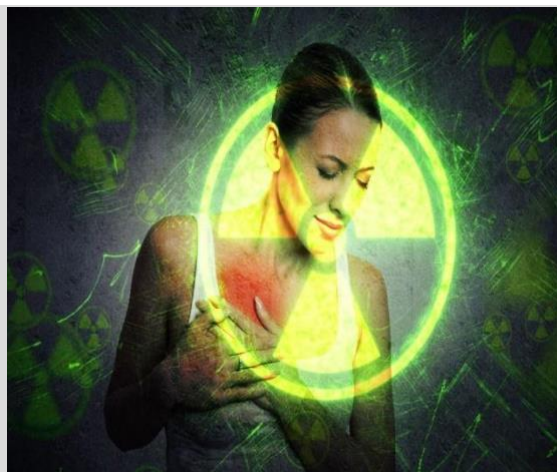
<https://iasbh.tmgrup.com.tr/a194ad/650/344/0/9/350/194?u=http://i.sabah.com.tr/sbh/2017/01/26/radyasyonun-canlilara-etkisi-nelerdir-1485428636408.jpg>

people and other living things. The great disaster that occurred in Chernobyl, Ukraine, on April 26, 1986, and whose carcinogenic effects are still felt today in a vast area that includes the Soviet Union, European countries and Turkey, is the main basis of this fear. On the other hand, nuclear reactor parts and waste are a big problem. Some parts can remain radioactive for hundreds or even thousands of years and harm the environment. For this reason, discussions about how they should be safely stored have lost none of their vibrancy even today.

Radioactivity is widely used in almost all scientific and technical fields. Nuclear reactions of radioactive isotopes are used as control tools in many branches of technology. In this control, the fact that a radioactive element has the same properties as all its non-radioactive isotopes is used in particular. Radioactive applications have been used in some branches of science as follows:

- Applications in chemistry:

A new branch of chemistry called Radiation Chemistry has developed. The subject of this branch is the

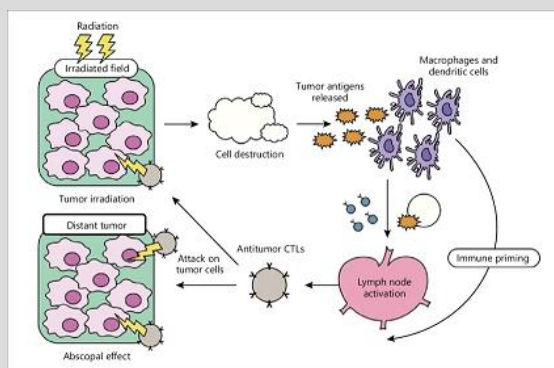


Source:

<https://www.kozmikanafor.com/etkisi-ve-tehlike-seviyeleriyle-radyasyon/>

Image:

<https://i0.wp.com/www.kozmikanafor.com/wp-content/uploads/2019/06/radyasyon-177635651001.jpg?w=1000&ssl=1>



Source:

<https://universitycancercenters.com/wp-content/uploads/2022/01/clinical-3.pdf>

(Systemic Immunostimulatory Effects of Radiation Therapy Improve Outcomes of Patients With Advanced NSCLC Receiving Immunotherapy Article by Mark A. D'Andrea, MD, FACRO and G. Kesava Reddy, PhD, MHA; page 3)

examination of new chemical reactions that develop under radiation. Very high radioactivity sources such as cobalt-60 are used in these processes.

- Applications in Biology and Agriculture:

The wider application of radioactivity is found in this field. When a low amount of carbon-14 is introduced into the plant, the carbon can be monitored in the body. Radioactive radiation has a great impact on living cells; First it changes and then kills these cells. These effects, which are very harmful to humans, are very useful in agriculture. Thus, a new type of tomato was developed that ripens very quickly.

- Medical Applications: It has become a method in the treatment of cancer and hard-to-destroy tumors; X-rays have been used for this purpose for a long time.

- Metallurgy applications: The solidification of steel by radioactivity, the kinetics of metallurgical reactions, etc., are used for examination. In this way, the diffusion of metals is easily monitored.

- Applications in History, Archaeology and Geology:

The date on which the wooden objects or textiles were made is determined precisely by the carbon-14 method. This method is very useful in the study of ancient civilizations.		
Summary and conclusion (5 minutes): Radioactive substances affect all organs of the body, but especially fast-growing cells respond immediately to radiation. For example, rashes, ulcerations, sterilization of reproductive cells, cataracts in the eyes, hair loss on the scalp, diarrhea in the intestines, and nausea are examples of these reactions. Hygiene is of great importance in protecting against internal radiation; Contaminated radioactive nuclei on the hands or in the mouth should be cleaned. Household hygiene and cleaning habits, including eating and drinking and oral hygiene, help protect against the harmful effects of radioactive substances.		

Activity	Methodology
Finding Ways to Protect Yourself from Radiation	Teamwork

Checks	Typology
Which of the following statements cannot be said about nuclear power plants? A) The cost of fuel is minimal. B) Establishment costs are low.	Tests of multiple-choice questions prepared by the teacher

C) Less waste is produced than natural gas and coal-fired power plants. D) Reduces greenhouse gases released into the atmosphere. E) Thousands of tons of coal are not burned and the environment is not polluted. Answer: D Nuclear power plants produce electricity with low greenhouse gas emissions, so the D claim is accurate	
What is the root cause of radioactivity? Answer: The main cause of radioactivity is the instability of atomic nuclei, which can result from having an excess of protons or neutrons	Tests of open-ended questions prepared by the teacher

Skills acquired

Understanding Radioactivity and Its Sources Analyze the impact of radiation on the environment Safety and radiation risk assessment expertise

Lesson No. 10 - Renewable and Non-Renewable Energy

Lesson plan

Keywords: solar energy, wind energy, hydrogen, fossil fuels

Schedule: lesson 40+40 minutes, activity 1 or 2 hours, validation 45 minutes

School: High School

Solar energy: This is the energy obtained from the sun, which is the source of energy for all the planets in the solar system.

Wind energy: The kinetic energy generated by the airflow that creates the wind is known as wind energy.

Water energy: In general terms, it is the energy produced by water.

Hydrogen energy is the chemical energy released as a result of the decomposition of hydrogen molecules.

Fossil fuels: Energy resources consisting of animals and plants that remain underground in rocks and soil for millions of years and fossilize under heat and pressure are called fossil fuels.

Objectives
1. Defines renewable and non-renewable energy sources. 2. Indicate the types of renewable and non-renewable energy resources. 3. Explain solar energy, wind energy, hydrogen, fossil fuels, and nuclear energy. 4. Includes biomass energy and geothermal energy. 5. Provides information about energy sources.

Contents	References	Methodology
Introduction (5 minutes): What are renewable and non-renewable energy sources?		Question Brainstorming
Summary of prior knowledge (10 minutes): As the population increases and technology develops, so does the amount of energy needed. At this stage, it is very important to know the answers to the questions "What are energy sources and what are their characteristics?" When choosing between renewable and non-renewable energy sources, knowing their characteristics and areas of use offers advantages in many respects.		Presentation
Presentation of new content (20-30 minutes): Renewable energy sources are energy sources whose reserves are not depleted because they can constantly renew themselves as they are used. Another important feature is that most of them exist in nature and do not harm nature or people during use. Although renewable energy sources are very diverse and contain a lot of energy, only a small amount can be used due to the costs of using and producing energy. These energies are as follows	 Source: https://solareyesinternational.com/the-future-of-solar-energy-in-the-us/ Image: https://solareyesinternational.com/wp-content/uploads/2023/03/Future-of-Solar-Energy-in-the-US.png https://en.wikipedia.org/wiki/Renewable_energy	Conference

- ☐ Solar energy
- ☐ Wind energy
- ☐ Water energy
- ☐ Wave energy
- ☐ Geothermal energy
- ☐ Ocean energy
- ☐ Energy from biofuels (organic fuels)
- ☐ Hydrogen energy

Non-renewable energy;
They are energy sources that are found in nature in a certain amount and are depleted over time.
Fossil fuels (coal, oil, natural gas)
Nuclear energy

What is Solar Energy:
It is the energy obtained from the sun, which is the source of energy for all the planets in the solar system.

What is wave energy: It is the mechanical energy created by the tides that occur in the seas and oceans.

What is geothermal energy: It is the energy produced using heat stored deep in the earth's crust.

What is biomass? What is biomass energy: it is the name given to the energy obtained from living remains that have not yet fossilized.

What is Hydropower?
What is Hydropower: It is energy converted using



Source:

<https://www.hurriyetdailynews.com/wind-power-capacity-increasing-fast-association-156095>

Image:

<https://image.hearing.com/e/hurriyet/75/0x0/5ef8a242b699de22DC015812.JPG>



Source:

<https://www.forbesindia.com/article/insead/a-nondisruptive-approach-to-the-environment/88849/1>

Image:

https://www.forbesindia.com/media/images/2023/Oct/img_220231_sustainability.jpg

https://en.wikipedia.org/wiki/Fossil_fuel

the energy of flowing water. What is biofuel: It is a type of renewable energy made from fossil fuels. <u>Fossil fuels</u> Brown coal, coal, coke and anthracite are fossil fuels. Mineral coal is mined underground. They contain high energy. The longer coal stays in the ground, the higher its energy content. Oil is formed by the fossilization of animals and plants in seas and lakes. Oil is extracted underground and processed in refineries to obtain liquid fuels such as gasoline, kerosene, diesel, and fuel oil. Gaseous fuels include liquefied petroleum gas, LPG, natural gas, and atmospheric gas. While coal and oil leave harmful CO and solid waste in the environment, natural gas is a clean energy source. Solid, liquid, and gaseous fossil fuels are depleted as they are used and are non-renewable energy sources as they take millions of years to form.		
Summary and conclusion (5 minutes): Renewable energy sources are energy sources whose reserves are not depleted		Conference

because they can constantly renew themselves as they are used. When choosing between renewable and non-renewable energy sources, knowing their characteristics and areas of use offers advantages in many respects.

Activity	Methodology
A presentation on renewable and non-renewable energy sources has been prepared.	Presentation

Verification	Typology
I. Fossil fuel oils II. Wind III. Sun Which of these are used in energy production? A) Only II B) Only III C) I and II D) I and III E) I, II and III Answer: And	Multiple-choice questions: open-ended tests prepared by the teacher

Skills acquired
Understand the physics behind generating energy from various sources Assessment of the environmental impact of renewable and non-renewable energy production Energy Efficiency and Sustainability Analysis

Geography

curated by Pietro Pitruzzello

Lesson No. 1 - Understanding the Atmosphere: Fundamentals and Climate Implications

Lesson plan

Keywords: climate change, greenhouse effect, air pollution, carbon dioxide (CO₂), climate models.
Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities
School: first two years of secondary school.

Objectives
Main objectives: 1. Understand the structure of the atmosphere: Students will gain a basic understanding of the structure and composition of the Earth's atmosphere, including its different layers and key features. 2. Recognize climate determinants: Students will identify the major factors that influence the Earth's climate and understand how the atmosphere plays a central role in this process. 3. Exploring Climate Variations: Students will be able to discuss natural and anthropogenic climate variations and their implications for the environment and society. Specific objectives: Structure of the atmosphere: Students will describe the different layers of the atmosphere (troposphere, stratosphere, mesosphere, and thermosphere) and understand how atmospheric conditions change with altitude. Composition of the atmosphere: Students will identify the primary components of the atmosphere (nitrogen, oxygen, argon, and other minor gases) and their significance for life on Earth. Role of the atmosphere in climate: Students will gain an understanding of the key processes that occur in the atmosphere that affect climate, such as the absorption and reflection of solar radiation, the greenhouse effect, and atmospheric circulation. Climate Factors: Students will identify and explain the primary factors that influence climate, including latitude, altitude, geographic location, ocean currents, and anthropogenic influence through greenhouse gas emissions. Climate variations: Students will be able to discuss natural climate variations, such as glaciations and extreme weather events, as well as climate variations caused by human activity, such as global warming. Environmental and societal implications: Students will explore the implications of climate change for the environment, including consequences for biodiversity, water resources, extreme weather events, and their impact on human communities, such as climate migration and changes in dietary habits.

Lesson content	References	Methodology
1. Introduction (10 minutes) - Welcome and introduction to the topic. - Explanation of the main and specific objectives of the lesson. - Brief discussion of why atmosphere and understanding climate are important. 2. Atmosphere Structure (20 minutes) - Multimedia presentation on the structure of the atmosphere, including its various layers (troposphere, stratosphere, mesosphere, thermosphere) and their characteristics. - Guided discussion on how weather conditions change with altitude. 3. Composition of the atmosphere (15 minutes) - Discussion of the main components of the atmosphere (nitrogen, oxygen, argon and other minor gases) and their significance. - Opportunity for students to ask questions and participate in the discussion. 4. The role of the atmosphere in climate (20 minutes) - Explanation of key processes influencing climate, such as the greenhouse effect, absorption and reflection of solar radiation, and atmospheric circulation. - Using charts and data to illustrate these concepts. 5. Climatic factors (15 minutes) - Discussion of the main factors influencing climate, such as latitude,	Hutpas://Climate.NASA.gov/ https://www.climate.gov/ https://www.climatecentral.org/	Lectures

altitude, geographic location, and ocean currents.

- Practical examples to demonstrate how these factors affect climate in different regions of the world.

6. Climatic variations (10 minutes)

- Exploration of natural climate variations and climate variations caused by human activity, such as global warming.
- Presentation of historical and recent data on climate change.

7. Implications for the environment and society (10 minutes)

- Discussion of the implications of climate change for the environment, including consequences for biodiversity, water resources and extreme weather events.
- Examining the impact on human communities, such as climate migration and changes in eating habits.

8. Conclusions and questions (10 minutes)

- Summary of the key points of the lesson.
- Invite students to ask questions or share further insights.
- Suggestions for further reading or resources.

9. Post-class activity (15 minutes, optional)

- Assigning post-class tasks or activities to strengthen understanding of the topic, such as researching specific climate events or presenting solutions for climate change.

This lesson structure should allow students to gain a comprehensive understanding of the atmosphere and its climate implications, while providing

opportunities for active engagement with the content and the opportunity to ask questions.		
Slides for the lecture "Understanding the Atmosphere: Fundamentals and Climate Implications": Slide 1: Introduction Titolo: Welcome to the Atmosphere and Climate Lesson Content: Main and specific objectives of the lesson Slide 2: Why is atmosphere important? Title: The Importance of Atmosphere and Climate Content: Explanation of the importance of understanding the atmosphere and climate for our daily lives and the environment. Slide 3: Atmosphere Structure Titolo: Earth's Atmosphere Structure Contents: Description of the main atmospheric layers (Troposphere, Stratosphere, Mesosphere, Thermosphere) with key characteristics. Slide 4: Composition of the atmosphere Titolo: Atmosphere Composition Content: Chemical composition of the atmosphere, including nitrogen, oxygen, argon, and other minor gases. Slide 5: The Role of the Atmosphere in Climate Title: The role of the atmosphere in climate Contents: Explanation of key processes such as the greenhouse effect, solar radiation absorption, and atmospheric circulation.		Slides to present the lesson, add images.

Slide 6: Climatic Factors

Title: Determinants of climate

Content: Discussion of how latitude, altitude, geographical location, and ocean currents affect climate.

Slide 7: Climatic variations

Title: Natural and anthropogenic climatic variations

Content: Exploration of natural climatic variations (ice ages) and variations caused by human activity (global warming).

Slide 8: Implications for the environment

Title: Climate implications for the environment

Content: Discussion of the consequences of climate change on the environment, including impacts on biodiversity and water resources.

Slide 9: Implications for society

Title: Climate implications for society

Content: Examination of the impact of climate change on human communities, such as climate migration and food challenges.

Slide 10: Conclusions and questions

Title: Summary and Questions

Content: Summary of key points from the lesson and invitation for students to ask questions or share reflections.

Slide 11: Post-Class Activity (Optional)

Title: Post-Class Activities

Content: Suggestions for further reading, assignments, or post-class activities to strengthen understanding of the topic.

Slide 12: Acknowledgments and Resources

Title: Awards and Additional Resources
Content: References to additional resources for further insight into the topic and gratitude for student participation.

This slide structure can serve as a guide for creating a comprehensive multimedia presentation for the atmosphere and climate lesson. Be sure to use relevant images, charts, and data to illustrate the concepts presented on each slide and encourage student interaction throughout the lesson.

Activity	Methodology
Post-class activity: "Exploring climate change in a specific region" Objective of the activity: Students will have the opportunity to apply the knowledge gained during the lecture to examine climate change in a specific region of the world and consider its implications for the environment and society. Arrangement: Region Selection: Each student or group of students should select a specific region of the world. This region can be freely chosen or assigned by the teacher. Data collection: Students should collect historical climate data for the selected region. This data can include average temperatures, precipitation, extreme weather events, and climate variations over the years. Data Analysis: Students should analyze the data collected to identify any significant climate trends. For example, they can experience rising average temperatures or an increase in the frequency of extreme weather events. Environmental Implications: Students are expected to discuss the implications of these climate trends for the environment in their chosen region. They can examine how climate change affects local flora, fauna, water resources, and ecosystems.	Teamwork

Societal implications: Students should examine how climate change affects society in the selected region. They can discuss impacts on human communities, such as food security, migration, and natural resources. Presentation of results: Students should present their findings in the form of a presentation, written report, or class discussion. During the presentation, they are expected to share data, climate trends, and identified environmental and social implications. Class discussion: At the end of the presentations, a class discussion can be organized where students can share their findings, compare regions selected by other students, and reflect on the importance of global climate change. This post-class activity will allow students to practically apply the knowledge gained during the lecture and develop a deeper understanding of climate challenges affecting specific regions of the world. It also encourages them to think critically and consider possible solutions to address climate change.	

Checks	Typology
Semi-structured assessment with 10 questions Section 1: Structure and Composition of the Atmosphere (5 questions) 1. What are the main layers of the Earth's atmosphere and in what order are they found from the surface to space? Answer: a) Troposphere, stratosphere, mesosphere, thermosphere (in order) 2. What are the primary components of the Earth's atmosphere and their relative percentages? Answer: b) Nitrogen (78%), Oxygen (21%), Argon (0.93%) 3. What causes weather to change with altitude? Answer: Conditions change due to decreasing atmospheric pressure and temperature as altitude increases. 4. In what layer of the atmosphere is the ozone layer located, and what is its significance? Answer: b) stratosphere; Important for absorbing harmful UV radiation from the sun. 5. How does the presence of nitrogen in the atmosphere affect life on Earth? Answer: Nitrogen is essential for life as it makes up a significant portion of organic molecules such as proteins and DNA.	Semi-structured verification

Section 2: The Role of the Atmosphere in Climate (5 questions)

6. Explain the greenhouse effect and how it contributes to global warming.

Answer: It is the warming effect caused by heat being trapped in the atmosphere due to greenhouse gases such as CO₂.

7. What are the primary processes that determine the Earth's climate?

Answer: a) Temperature and precipitation

8. How does global atmospheric circulation influence regional climate patterns?

Answer: c) Global atmospheric circulation influences regional climate patterns through the transport of heat and moisture.

9. What happens when solar radiation is absorbed or reflected from the Earth's atmosphere and surface?

Answer: b) It is absorbed by the surface and released as heat.

10. What is the difference between climate and weather?

Answer: Climate refers to the long-term average conditions of temperature, humidity, and other factors in a region, while weather refers to short-term conditions that can vary daily.

Section 3: Climatic Factors and Climate Variations (5 questions)

11. How does latitude affect temperature and climate?

Answer: b) Regions closer to the equator are warmer, while those closer to the poles are colder.

12. What role does altitude play in determining climate?

Answer: c) Altitude influences temperature and climatic conditions; Generally, as altitude increases, temperatures decrease.

13. How can ocean currents affect the climate of coastal regions?

Answer: c) Ocean currents can carry heat and affect temperatures and climate patterns in coastal regions.

14. What are natural climate variations, and what is a significant example?

Answer: c) Ice ages are an example of natural climatic variations.

15. What is the root cause of human-induced climate variations?

Answer: b) Greenhouse gas emissions, such as CO₂, are a significant cause of human-induced climate change.

Section 4: Implications for the environment and society (5 questions)

16. How can climate change affect biodiversity?

Answer: c) Climate change can lead to habitat loss and endangerment of species, threatening biodiversity. 17. What are some of the consequences of climate change on water resources? Answer: b) Climate change can lead to reduced availability of fresh water. 18. How can extreme weather events be linked to climate change? Answer: c) Extreme weather events, such as hurricanes and heat waves, may increase in frequency and intensity with climate change. 19. Explain the concept of climate migration and provide an example. Answer: b) Climate migration refers to the movement of human populations due to climate change; An example would be migration due to rising sea levels. 20. What are some strategies that human communities can adopt to address climate change? Answer: Strategies may include reducing greenhouse gas emissions, adapting to changing climate conditions, and adopting sustainable practices in agriculture and resource use. Feel free to use these questions to assess your students' understanding of the atmosphere and climate implications and adjust them as needed to your specific needs.	
Structured multiple-choice test. Section 1: Structure and Composition of the Atmosphere (4 questions) 1. Which layer of the Earth's atmosphere contains most of the clouds and weather phenomena? a) Troposphere b) Stratosphere c) Mesosphere d) Thermosphere Answer: a) Troposphere 2. What is the most abundant component of the Earth's atmosphere? a) Oxygen b) Nitrogen c) Carbon dioxide d) Argon Answer: b) Nitrogen 3. In which layer of the atmosphere is the ozone layer located? a) Troposphere b) Stratosphere	E.g. Tests already prepared by textbooks or structured multiple-choice tests.

- c) Mesosphere
 - d) Thermosphere
- Answer: b) Stratosphere

4. What is the significance of ozone in the stratosphere?

- a) Absorbs solar radiation
- b) Protects the Earth from harmful UV rays
- c) Causes the greenhouse effect
- d) Most abundant gas in the atmosphere

Answer: b) It protects the Earth from harmful UV rays

Section 2: The Role of the Atmosphere in Climate (4 questions)

5. What is the greenhouse effect?

- a) Expansion of the atmosphere due to global warming
- b) Absorption of solar radiation from the Earth's surface
- c) Effect that makes the Earth colder than it should be
- d) Warming caused by the concentration of CO₂ in the atmosphere

Answer: b) Absorption of solar radiation from the Earth's surface

6. What are the main factors that determine the climate of a region?

- (a) Temperature and precipitation
- b) Latitude and altitude
- c) Ocean currents and volcanoes
- (d) Atmospheric nitrogen and oxygen

Answer: a) Temperature and precipitation

7. What are the causes of global atmospheric circulation?

- a) Volcanic eruptions
- (b) The greenhouse effect
- c) Earth's rotation
- (d) CO₂ absorption

Answer: c) Earth's rotation

8. When solar radiation hits the Earth's surface, what happens to most of it?

- a) It is reflected in space
- b) It is absorbed by the surface and released as heat
- c) It is converted into chemical energy
- d) Turns into wind

Answer: b) It is absorbed by the surface and released as heat

Section 3: Climatic Factors and Climate Variations (4 questions)

9. How does latitude affect the average temperature of a region?

- a) Regions closer to the equator are colder
- b) Regions closer to the equator are warmer
- c) Latitude has no influence on temperature
- d) Latitude only affects precipitation

Answer: b) Regions closer to the equator are warmer

10. What is the main factor that determines the climate of a mountainous region?

- (a) Latitude
- b) Presence of oceans
- c) Altitude
- d) Distance from equator

Answer: c) Altitude

11. What is an example of natural climate variation?

- a) Global warming
- (b) Air pollution
- c) Ere glaciali
- (d) Greenhouse effect

Answer: c) Ice ages

12. Which of the following is a significant cause of human-induced climate change?

- a) Increased volcanic activity
- (b) Greenhouse gas emissions
- c) Variations in Earth's orbit
- d) Solar activity

Answer: b) Greenhouse gas emissions

Section 4: Implications for the environment and society (4 questions)

13. How can climate change affect biodiversity?

- a) Increasing species diversity
- b) Reducing extinctions
- c) Lead to habitat loss and species decline
- d) They have no effect on biodiversity

Answer: c) Lead to habitat loss and species decline

14. What are some of the consequences of climate change on water resources?

- a) Increased rainfall
- b) Reduced availability of fresh water
- c) Improvement of water quality
- (d) Increase in fishery resources

Answer: b) Reduced availability of fresh water

15. What are extreme weather events and how can they be linked to climate change?

- a) Unusual weather events unrelated to long-term climate
- b) Normal weather events that occur occasionally
- c) Events such as hurricanes and heat waves that may increase in frequency and intensity with climate change
- d) Meteorological events influenced only by natural causes

Answer: c) Events such as hurricanes and heat waves that may increase in frequency and intensity with climate change

16. What is climate migration?
- a) Seasonal movement of birds
 - b) Migration of the human population due to climate change
 - c) Relocation of weather stations
 - d) A type of insect migration
- Answer: b) Human population migration due to climate change

Feel free to use these questions to assess your students' knowledge of the atmosphere and climate implications and tailor them as needed to your specific needs.

Simple multiple-choice test with 20 questions about the atmosphere and climate implications.

E.g. tests prepared by the teacher

Section 1: Structure and Composition of the Atmosphere (4 questions)

1. Which layer of the Earth's atmosphere contains most of the clouds and weather phenomena?
- a) Troposphere
 - b) Stratosphere
 - c) Mesosphere
 - d) Thermosphere
2. What is the most abundant component of the Earth's atmosphere?
- a) Oxygen
 - b) Nitrogen
 - c) Carbon dioxide
 - d) Argon
3. In which layer of the atmosphere is the ozone layer located?
- a) Troposphere
 - b) Stratosphere
 - c) Mesosphere
 - d) Thermosphere
4. What is the significance of ozone in the stratosphere?
- a) Absorbs solar radiation
 - b) Protects the Earth from harmful UV rays
 - c) Causes the greenhouse effect
 - d) Most abundant gas in the atmosphere

Section 2: The Role of the Atmosphere in Climate (4 questions)

5. What is the greenhouse effect?
- a) Expansion of the atmosphere due to global warming
 - b) Absorption of solar radiation from the Earth's surface
 - c) Effect that makes the Earth colder than it should be
 - d) Warming caused by the concentration of CO₂ in the atmosphere

6. What are the main factors that determine the climate of a region?
- (a) Temperature and precipitation
 - b) Latitude and altitude
 - c) Ocean currents and volcanoes
 - (d) Atmospheric nitrogen and oxygen
7. What are the causes of global atmospheric circulation?
- a) Volcanic eruptions
 - (b) The greenhouse effect
 - c) Earth's rotation
 - (d) CO₂ absorption
8. When solar radiation hits the Earth's surface, what happens to most of it?
- a) It is reflected in space
 - b) It is absorbed by the surface and released as heat
 - c) It is converted into chemical energy
 - d) Turns into wind

Section 3: Climatic Factors and Climate Variations (4 questions)

9. How does latitude affect the average temperature of a region?
- a) Regions closer to the equator are colder
 - b) Regions closer to the equator are warmer
 - c) Latitude has no influence on temperature
 - d) Latitude only affects precipitation
10. What is the main factor that determines the climate of a mountainous region?
- (a) Latitude
 - b) Presence of oceans
 - c) Altitude
 - d) Distance from equator
11. What is an example of natural climate variation?
- a) Global warming
 - (b) Air pollution
 - c) Glaciations
 - (d) Greenhouse effect
12. Which of the following is a significant cause of human-induced climate change?
- a) Increased volcanic activity
 - (b) Greenhouse gas emissions
 - c) Variations in Earth's orbit
 - d) Solar activity

Section 4: Implications for the environment and society (4 questions)

13. How can climate change affect biodiversity?

- a) Increasing species diversity
- b) Reducing extinctions
- c) Lead to habitat loss and species decline
- d) They have no effect on biodiversity

14. What are some of the consequences of climate change on water resources?

- a) Increased rainfall
- b) Reduced availability of fresh water
- c) Improvement of water quality
- (d) Increase in fishery resources

15. What are extreme weather events and how can they be linked to climate change?

- a) Unusual weather events unrelated to long-term climate
- b) Normal weather events that occur occasionally
- c) Events such as hurricanes and heat waves that may increase in frequency and intensity with climate change
- d) Meteorological events influenced only by natural causes

16. What is climate migration?

- a) Seasonal movement of birds
- b) Migration of the human population due to climate change
- c) Relocation of weather stations
- d) A type of insect migration

Skills acquired

1. Understanding the Structure of the Atmosphere:

- Identification of the primary atmospheric layers and their characteristics.
- Explain how weather conditions change with altitude.

2. Knowledge of atmospheric composition:

- Recognize the main components of the atmosphere, including nitrogen, oxygen, argon and ozone.
- Understand the role of these components in the atmosphere.

3. Understanding the Role of the Atmosphere in Climate:

- Grasp key processes influencing climate, such as the greenhouse effect, solar radiation absorption, and atmospheric circulation.
- Recognize the importance of the atmosphere as a climate regulator.

4. Familiarity with climatic factors:

- Explain how latitude, altitude, geographic location, and ocean currents affect a region's climate.
- Identify the primary factors that determine the climate of specific areas.

5. Awareness of Climate Variations:

- Understand natural climate variations and climate change caused by human activity.
- Recognize the importance of studying and addressing climate change.

6. Understand the implications for the environment and society:

- Assess the impact of climate change on the environment, including the consequences for biodiversity and water resources.
- Examine the societal implications of climate change, such as climate migration and its impact on human communities.

7. Analytical and Presentation Skills:

- Collecting, analyzing, and presenting climate data for a specific region.
- Clearly communicate climate trends and environmental and social implications.

8. Pensiero critico e problem solving:

- Use critical thinking to understand the complex relationships between atmosphere, climate, and environment.
- Identify potential solutions to address climate change and its challenges.

These skills gained from the class are crucial for understanding climate dynamics and global environmental challenges, helping to increase awareness and the ability to engage in discussions about sustainability and environmental protection.

Lesson No. 2 - Rivers, Lakes and Seas: Impacts of Climate Change

Lesson plan

Keywords: sea level rise, floods, water flows, aquatic ecosystems, Climate adaptations

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities

School: first two years of secondary school.

Objectives
Lesson Objectives: 1. Understand the role of rivers, lakes, and seas in the terrestrial ecosystem. 2. Explore the effects of climate change on rivers, lakes, and seas. 3. Analyze the consequences of climate change for human life and the environment. 4. Identify actions that can be taken to mitigate the impacts of climate change on these aquatic ecosystems.

Lesson content	References	Methodology
Introduction (10 minutes): - Explain the importance of rivers, lakes, and seas in terrestrial ecosystems. - Present the goal of the lesson: to understand how climate change is affecting these ecosystems and what we can do about it.		Lectures or dialogues

Part 1: Rivers and Climate Change (15 minutes):

- Describe how climate change affects rivers, including changes in flow patterns and flooding.
- Discuss sea level rise and how it can affect saltwater intrusion into rivers.
- Explain how these changes can lead to more frequent flooding or droughts in riverine areas.

Part 2: Lakes and Climate Change (15 minutes):

- Illustrate how climate change can affect water temperature in lakes, with potential effects on fish life and water quality.
- Discuss shoreline erosion in lakes due to rising temperatures and rising sea levels.
- Explain how these changes may impact lake biodiversity and available water resources.

Part 3: Seas and Climate Change (15 minutes):

- Discuss ocean acidification caused by the absorption of atmospheric carbon dioxide.
- Explain how ocean acidification affects marine life, especially organisms with calcium carbonate shells.
- Describe sea level rise and ocean warming and their impact on the frequency of extreme weather events and marine biodiversity.

Part 4: Impacts on people and communities (10 minutes):

- List some of the ways in which the impacts of climate change on rivers, lakes, and seas can affect human life, such as threats to coastal communities, the availability of clean water, and agriculture.
- Discuss how these challenges can lead to forced migrations and conflicts.

Part 5: Mitigation and adaptation (15 minutes):

- Present some strategies to mitigate the impacts of climate change on rivers, lakes and seas, such as the sustainable management of water resources, the reduction of greenhouse gas emissions and the promotion of scientific research.
- Discuss the importance of adapting to new environmental conditions, such as building climate-resilient infrastructure.

Conclusion (10 minutes):

- Summarize the key concepts learned in the lesson. - Underline the importance of individual and collective responsibility in the fight against climate change to preserve our aquatic ecosystems. - Encourage students to ask questions and continue learning about this important topic. Hands-on activity (15 minutes): - Organize a classroom group discussion where students can share ideas on how they can help mitigate the impacts of climate change on rivers, lakes, and seas. - Ask students to conduct individual research on a specific case study related to the impacts of climate change on a specific aquatic ecosystem and present their findings to the class.		
Slides from the lecture on "Rivers, Lakes and Seas: Impacts of Climate Change": Slide 1: Introduction - Title: "Rivers, Lakes and Seas: Impacts of Climate Change" - Subtitle: "Understanding the Crucial Role of Aquatic Ecosystems" - Brief Summary: In this lesson, we will explore the importance of rivers, lakes, and seas, as well as how climate change affects these precious ecosystems. Slide 2: Lesson Objectives - Title: "Lesson Objectives" - Goal 1: "Understand the role of rivers, lakes and seas in terrestrial ecosystems". - Goal 2: "Explore the effects of climate change on these ecosystems". - Goal 3: "Analyze the consequences for human life and the environment". - Goal 4: "Identify actions to mitigate the impacts of climate change". Slide 3: Part 1 - Rivers and climate change - Title: "Part 1 - Rivers and Climate Change" - Point 1: "Variations in flow patterns". - Point 2: "More frequent floods or droughts". - Point 3: "Sea Level Rise and Saltwater Intrusion".		Slides for lectures

Slide 4: Part 2 - Lakes and climate change

- Title: "Part 2 - Lakes and Climate Change"
- Point 1: "Changes in water temperature".
- Point 2: "Coastal erosion in lakes".
- Point 3: "Impacts on biodiversity and water resources".

Slide 5: Part 3 - Seas and climate change

- Title: "Part 3 - Seas and Climate Change"
- Point 1: "Ocean acidification".
- Point 2: "Warming of the oceans".
- Point 3: "Impacts on marine biodiversity and extreme weather events".

Slide 6: Part 4 - Impacts on People and Communities

- Title: "Part 4 - Impacts on people and communities"
- Point 1: "Threats to coastal communities".
- Point 2: "Availability of drinking water".
- Point 3: "Forced migration and conflicts".

Slide 7: Part 5 - Mitigation and Adaptation

- Title: "Part 5 - Mitigation and adaptation"
- Point 1: "Sustainable management of water resources".
- Point 2: "Reducing greenhouse gas emissions".
- Point 3: "Promoting scientific research and climate-resilient infrastructure".

Slide 8: Conclusions

- Title: "Conclusions"
- Point 1: "Summary of key concepts".
- Point 2: "Individual and collective responsibility".
- Point 3: "Keep learning and acting."

Slide 9: Practical activity

- Title: "Practical Activity"
- Description: "Group discussion on mitigating climate change impacts on aquatic ecosystems and presentation of case studies."

These slides can serve as the basis for your lecture on rivers, lakes, and seas with reference to climate change. You can add additional details, images, or charts to emphasize key concepts and engage students more fully.

Activity	Methodology
Activity: "Designing a resilient aquatic ecosystem" Objective of the activity: Students will collaborate in groups to design a resilient aquatic ecosystem that can withstand the impacts of climate change. This activity encourages creativity, research, and critical thinking. Phases of the activity: 1. Group assignment: Divide the class into groups of 3-4 students each. Make sure the group members are diverse in terms of skills and knowledge. 2. Choose an aquatic ecosystem: Each group will choose a type of aquatic ecosystem to design. They can choose a river, a lake, or a part of the ocean, according to their choice. Ask them to justify their choice based on the potential impacts of climate change. 3. Research: Assign groups to conduct in-depth research on the chosen ecosystem and the expected effects of climate change on it. They should also identify the plant and animal species present in the ecosystem and consider how they will be affected by climate change. 4. Design the ecosystem resilient: Each group must design a detailed plan to make the chosen ecosystem more resilient to climate change. Students should include practical solutions such as biodiversity conservation, sustainable water resource management, and strategies to address specific challenges related to their ecosystem. 5. Submission of proposals: Each group will present their proposal to the class. The presentation should include a description of the ecosystem, an explanation of the expected impacts of climate change, and details of their design solution. Encourage students to use charts, diagrams, or templates to illustrate their ideas. 6. Discussion and feedback: After each presentation, open a class discussion to critically examine the proposals of the various groups. Ask other students to provide constructive feedback and share their opinions on each proposal. 7. Voting and Recognition: At the end of the presentations, a class secret ballot can be held to determine which proposal was considered the most effective and realistic. Reward the winning group with a special award. 8. Final Reflection: Conclude the activity by asking students to reflect on what they have learned about the resilience of aquatic ecosystems	Research, design and teamwork.

and how they can apply these concepts in their daily lives to contribute to the conservation of rivers, lakes, and seas in a changing world. This activity will engage students in critical thinking and help them better understand concepts related to climate change and aquatic ecosystems. It also promotes collaboration and creativity in finding solutions to current environmental problems.	

Checks	Typology
Part 1: Single-Answer Questions (1 point each) 1. What is one of the effects of climate change on rivers? A. Rising water temperature B. Flood Reduction C. Falling sea level 2. What is ocean acidification and how is it related to climate change? 3. What is one of the impacts of climate change on lakes? A. Increasing biodiversity B. Shoreline erosion in lakes C. Reduction of water temperature 4. How can the impacts of climate change threaten coastal communities? 5. What does "resilience" mean in relation to aquatic ecosystems? Part 2: Short Answer Questions (2 points each) 6. Explain how sea level rise can affect rivers in coastal areas. 7. What are some obvious signs of ocean acidification? 8. Describe the importance of sustainable management of water resources in lakes. 9. What is the effect of greenhouse gas emissions on ocean acidification? 10. How can aquatic ecosystems affect the availability of drinking water for human communities?	Structured assessment with questions, activities and reflections.

Part 3: Analysis and Reflection Questions (3 points each) 11. Choose an aquatic ecosystem type (river, lake, or ocean) and explain how it might be affected by climate change. Provide specific examples. 12. Imagine you're an environmentalist. What actions would you take to mitigate the impacts of climate change on a lake in your region? 13. Discuss the interconnections between climate change, aquatic ecosystems and human communities. What are the challenges and opportunities? Part 4: Practical activity (4 points) 14. Imagine that you are part of a group of students participating in the activity "Designing a Resilient Aquatic Ecosystem". Choose an ecosystem type (river, lake, or ocean) and describe your project proposal to make that ecosystem more resilient to climate change. Explain your ideas and strategies in detail. Part 5: Final Reflection (2 points) 15. What are the key lessons you learned from the lesson on rivers, lakes, and seas in relation to climate change? What can you do to contribute to the conservation of these ecosystems in a changing world? Total rating: 20 points	
Structured test with questions Structured assessment of the lesson on rivers, lakes and seas with reference to climate change. In this assessment, there are some open-ended questions, but instructions or suggestions are provided to guide students in their answers. Verification: Rivers, lakes and seas - Impacts of climate change Part 1: Effects of climate change (4 points) 1. Explain how climate change can affect the flow pattern of a river. Provide specific examples. 2. Discuss the importance of ocean acidification and how it is related to atmospheric carbon dioxide absorption. How can this phenomenon affect marine organisms?	E.g. Tests already prepared by textbooks

Part 2: Impacts on rivers, lakes and seas (4 points) 3. Choose one of the impacts of climate change on lakes and explain how it can affect biodiversity in that lake system. 4. What are some of the challenges that coastal communities may face due to sea level rise? Describe how these challenges can have social and economic impacts. Part 3: Mitigation and adaptation (4 points) 5. Describe at least two mitigation strategies that can be implemented to reduce the impacts of climate change on rivers, lakes, and seas. What do these strategies involve? 6. Imagine that you are involved in the design of a sustainable water management system for a lake. What key elements would you include in this system and why? Part 4: Practical activity (4 points) 7. Imagine that you are part of a group participating in the activity "Designing a resilient aquatic ecosystem". Choose an ecosystem type (river, lake, or ocean) and provide a summary of the main ideas for making that ecosystem more resilient to climate change. Provide at least three practical solutions and explain how they could be implemented. Part 5: Final Reflection (4 points) 8. What are the most pressing challenges facing aquatic ecosystems due to climate change? How can individuals and communities help mitigate these impacts and preserve these ecosystems? Total rating: 20 points	
Simple Multiple Choice Multiple-Choice Question Test: Rivers, Lakes and Seas - Impacts of Climate Change 1. What is one of the effects of climate change on rivers? - [a] Increased biodiversity - [b] Decrease in flooding - [c] Sea level rise 2. What are the causes of ocean acidification? - [a] Absorption of atmospheric carbon dioxide - [b] Nitrous oxide emissions	E.g. tests prepared by the teacher with multiple answers

- [c] Deforestation

3. What is one of the impacts of climate change on lakes?

- [a] Increased water temperature
- [b] Increased flooding
- [c] Sea level decrease

4. How can the impacts of climate change threaten coastal communities?

- [a] Increasing biodiversity
- [b] Causing prolonged droughts
- [c] Through sea level rise and coastal flooding

5. What is meant by 'resilience' in relation to aquatic ecosystems?

- [a] The ability to completely remove the impacts of climate change
- [b] The ability of an ecosystem to withstand the impacts of climate change and to recover quickly
- [c] The ability to accurately predict future climate change

6. Which of the following is a possible effect of sea level rise on coastal rivers?

- [a] Decrease in flooding
- [b] Inland saltwater intrusion
- [c] Decrease in summer temperatures

7. What is affected by ocean acidification?

- [a] Marine biodiversity
- [b] Greenhouse gas emissions
- [c] Sea level

8. Why is sustainable water management important for lakes?

- [a] To increase the water temperature
- [b] Preventing coastal erosion
- [c] Ensuring a secure water supply

9. What is the effect of greenhouse gas emissions on ocean acidification?

- [a] Decreases ocean acidity
- [b] Increases ocean acidity
- [c] No effect

10. How can aquatic ecosystems affect the availability of drinking water for human communities?

- [a] Treating wastewater
- [b] Evaporating water more quickly
- [c] Capturing rainwater

Here are the correct answers to the multiple-choice test:

1. What is one of the effects of climate change on rivers?

- Correct answer: [b] Decrease in flooding

2. What are the causes of ocean acidification?

- Correct answer: [a] Absorption of atmospheric carbon dioxide

3. What is one of the impacts of climate change on lakes?

- Correct answer: [a] Increased water temperature

4. How can the impacts of climate change threaten coastal communities?

- Correct answer: [c] Through sea level rise and coastal flooding

5. What is meant by 'resilience' in relation to aquatic ecosystems?

- Correct answer: [b] The ability of an ecosystem to withstand the impacts of climate change and recover quickly

6. Which of the following is a possible effect of sea level rise on coastal rivers?

- Correct answer: [b] Inland saltwater intrusion

7. What is affected by ocean acidification?

- Correct answer: [a] Marine biodiversity

8. Why is sustainable water management important for lakes?

- Correct answer: [c] To ensure a safe water supply

9. What is the effect of greenhouse gas emissions on ocean acidification?

- Correct answer: [b] Increases ocean acidity

10. How can aquatic ecosystems affect the availability of drinking water for human communities?

- Correct answer: [a] Treating wastewater

Open-ended questions (11, 12, and 13) require answers based on individual understanding and do not have predefined "correct" answers. They are intended to stimulate reflection and discussion.

Skills acquired

1. Understanding Aquatic Ecosystems: Students learn to understand the complexity of aquatic ecosystems, including rivers, lakes, and seas, and how they are interconnected with their surroundings.

2. Knowledge of climate change: Students gain a deeper understanding of climate change, including how it affects aquatic ecosystems.

3. **Understanding Impacts:** Students learn to recognize and understand the specific impacts of climate change on rivers, lakes, and seas, such as warming waters, ocean acidification, and sea level rise.
4. **Resilient design skills:** Through hands-on activity, students develop skills in designing solutions to make aquatic ecosystems more resilient to climate change. This activity helps them think creatively and identify practical strategies for addressing environmental challenges.
5. **Analytical and reflection skills:** students are able to analyze the impacts of climate change and reflect on their consequences for the environment and human communities. These skills help them develop a critical view of the problem.
6. **Communication skills:** During presentations and class discussions, students improve their communication skills, learning to present ideas clearly and convincingly, and participate in constructive discussions.
7. **Critical Thinking:** Students are encouraged to develop critical thinking to evaluate proposed solutions to mitigate the impacts of climate change on rivers, lakes, and seas.
8. **Environmental Awareness:** The class promotes environmental awareness, helping students understand the importance of conserving aquatic ecosystems and their role in mitigating climate change.
9. **Teamwork skills:** Through the hands-on activity of designing resilient ecosystems, students improve their teamwork skills, learning to collaborate effectively to achieve common goals.
10. **Individual and Collective Responsibility:** The class promotes individual and collective responsibility to preserve aquatic ecosystems and address climate change, encouraging students to consider how they can help mitigate environmental impacts.

Lesson No. 3 - Glaciers

Lesson plan

Keywords: glacier retreat, glacier melt, ice loss, glacier shrinkage, glacial erosion.

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities

School: first two years of secondary school.

Objectives
Objectives of the lecture on glaciers and climate change: 1. Understand what glaciers are and how they form. 2. Recognize the importance of glaciers in the terrestrial environment and in the water cycle. 3. Analyze the main impacts of climate change on glaciers. 4. Explore the global consequences of glacier changes. 5. Discuss actions that can be taken to mitigate the effects of climate change on glaciers.

Lesson structure:

Duration: 60 minutes

Materials needed:

- Projector or whiteboard
- Computer with internet access
- Slides or visual materials
- Glacier images and climate change data

Step 1: Introduction (10 minutes)

- Teacher's introduction.
- Explanation of the title and objectives of the lesson.
- Brief introduction to glaciers as natural resources and climate change as a global problem.

Step 2: What are glaciers (10 minutes)

- Definition of what glaciers are.
- Explanation of how glaciers are formed.
- Examples of world-famous glaciers (e.g., the Perito Moreno Glacier in Argentina).

Step 3: Importance of glaciers (10 minutes)

- Discussion on the importance of glaciers in the terrestrial environment and in the water cycle.
- How glaciers affect sea levels.
- The role of glaciers in freshwater supply.

Step 4: Impacts of climate change on glaciers (15 minutes)

- Presentation of data and graphs showing the rapid melting of glaciers in recent decades.
- Discussion of the impacts of climate change, such as global temperature rise and local consequences.
- Examples of glaciers that have disappeared due to climate change.

Step 5: Global Consequences (10 minutes)

- Exploration of the global consequences of accelerated glacier melting, including sea level rise and alterations in climate patterns.
- Discussion of how this affects human communities, wildlife, and flora.

Step 6: Mitigation Actions (5 minutes)

- Presentation of possible actions to mitigate the effects of climate change on glaciers, such as reducing greenhouse gas emissions. - Emphasis on the importance of individual and collective involvement in the fight against climate change. Step 7: Discussion and questions (5 minutes) - Open to students' questions and discussion. - Clarifications on topics covered during the lesson. Step 8: Conclusion (5 minutes) - Summary of the key points of the lesson. - Strengthening the importance of glacier conservation and action against climate change. Step 9: Homework (5 minutes) - Assign homework or a project that encourages students to further explore the topic of glaciers and climate change. This lesson should provide students with a solid understanding of glaciers, their role in the Earth's ecosystem, and the impacts of climate change on them. Additionally, it should encourage students to reflect on actions they can take to help mitigate these effects.		
Slide text for the lecture on glaciers and climate change: Slide 1: Introduction Title: Glaciers and climate change Contents: -Welcome! - Lesson objectives. - Importance of glaciers and climate change. Slide 2: What are glaciers? Titolo: Definition of Glaciers Contents: - What are glaciers? - Glacier formation process. - Examples of world-famous glaciers. Slide 3: Importance of glaciers Title: The importance of glaciers		Slides for lecture, add images.

Contents:

- Environmental role
- Water cycle and glaciers.
- Fresh water supply and climate regulation.

Slide 4: Impacts of Climate Change

Title: How Climate Change Affects Glaciers

Contents:

- Climate change
- Global temperature rise.
- Local effects: accelerated merging.

Slide 5: Data and Charts

Titolo: Impact Data and Graphs

Contents:

- Trend chart
- Recent data on glacier melt.
- Comparison between past and present.

Slide 6: Global Consequences

Titolo: Global Impact of Glacier Melting

Contents:

- Global consequences
- Sea level rise.
- Alteration of climate patterns.

Slide 7: Mitigation Actions

Title: Combating climate change

Contents:

- Mitigation actions
- Reduction of greenhouse gas emissions.
- Individual and collective involvement.

Slide 8: Discussion and Questions

Titolo: Time for Discussion

Contents:

- Questions and discussion
- Open to students' questions and comments.
- Clarifications on topics covered during the lesson.

Slide 9: Conclusion Titolo: Summary and Call to Action Contents: -Summary - Key points of the lesson. - Importance of glacier conservation and action against climate change. Slide 10: Homework Titolo: Homework Assignment Contents: - Project or assignment - Assignment of homework or a project to deepen your understanding of the topic. - Develop awareness about glacier conservation. Interactive activity to be conducted after class to engage students and make them apply what they have learned:		

Activity	Methodology
Attività: "Save the Glacier" - Environmental Council Simulation Objective: Students will work in groups to simulate an environmental council in which they will develop and present imaginary solutions to save a glacier threatened by climate change. Procedure: 1. Group formation: divide the class into groups of 4-5 students. Make sure each group has at least a few resources (paper, pens, internet access). 2. Glacier Assignment: Assign each group an imaginary glacier in a specific region of the world. Provide them with imaginary data on the current state of the glacier, such as size, melt rate, and local impacts. 3. Research and planning: Each group will have to "research" how climate change is affecting their glacier and identify possible solutions to slow its melting. They can use the Internet to find information, but encourage them to use what they learned during the lesson.	Role-playing and group play.

4. Developing solutions: Groups will need to create a detailed plan that includes specific measures to protect the glacier. They can include actions such as reducing greenhouse gas emissions, raising public awareness, or improving conservation technologies. 5. Presentation to the Environment Council: Each group will present its plan to the "Environmental Council" (the class). They need to explain their imaginary situation, the details of the plan, and why they believe their solutions will work. 6. Discussion and decision-making: After each presentation, the class will discuss the plan and ask questions of the groups. In the end, students will vote for the solution they think is most effective. 7. Final Reflection: At the end of the activity, ask students to reflect on what they learned during the simulation. What did they discover about glaciers, climate change, and possible solutions? What do they think now about glacier conservation? Not only will this activity engage students actively and collaboratively, but it will also allow them to apply what they have learned in class to real-world problems. In addition, it will promote critical thinking and environmental awareness.	

Checks	Typology
Semi-structured assessment consisting of 20 questions on the lecture on glaciers and climate change: Section 1: Short Answer Questions (1-10) 1. What are glaciers and how do they form? 2. What is the role of glaciers in the earth's environment and water cycle? 3. Can you name some world-famous glaciers? 4. Explain how climate change affects glaciers. 5. What does "melting glaciers" mean? 6. What are some global consequences of rapidly melting glaciers? 7. How can climate change impact human communities near glaciers? 8. Why is sea level rise a concern related to melting glaciers? 9. What can we do to mitigate the effects of climate change on glaciers?	Semi-structured verification.

10. What is the role of the individual in the fight against climate change?

Section 2: Open Questions (11-20)

11. Explain how the water cycle is connected to glaciers and how this can be affected by climate change.

12. Provide a specific example of a glacier threatened by climate change and discuss its local impacts.

13. What are some challenges coastal communities may face due to rising sea levels?

14. Imagine you're involved in a glacier conservation project. What actions would you take to preserve a threatened glacier?

15. What are some ways people can reduce their impact on climate change in their daily lives?

16. How can climate change affect flora and fauna in areas near glaciers?

17. What is the concept of "positive feedback" in the context of climate change and glaciers? Give an example.

18. Describe how climate change can unpredictably alter regional climate patterns.

19. What is the difference between an ice sheet glacier and a valley glacier? How might they respond differently to climate change?

20. Imagine you're an ambassador for glacier conservation. How would you raise awareness of the importance of protecting glaciers?

Structured test consisting of 20 questions on the lecture on glaciers and climate change. Each question has only one correct answer.

Section 1: Multiple-Choice Questions (1-10)

1. What are glaciers?

- a. Large icebergs in the ocean
- b. Displacement of rivers of ice
- c. Surface ice formations
- d. Winter snow accumulations

2. What is one of the main factors contributing to the rapid melting of glaciers?

E.g. tests already prepared from textbooks or structured tests.

- a. Increased solar reflection
- b. Decrease in summer temperatures
- c. Rising average temperatures
- d. Increased winter precipitation

3. What is the water cycle?

- a. The Life Cycle of Water in a Bottle
- b. The movement of water between oceans and land
- c. The process of water evaporation, condensation and precipitation
- d. The path of water from a mountain to a lake

4. What is the main result of rapid glacier melt on sea level rise?

- a. Falling sea level
- b. Sea level rise
- c. No effect on sea level
- d. Changes in seawater temperature

5. Why is it important to preserve glaciers?

- a. To create a tourist destination
- b. To keep summer temperatures cool
- c. For their role in the water cycle and climate regulation
- d. Because they are renewable energy sources

6. What are positive feedbacks in the context of climate change?

- a. Processes that amplify climate change
- b. Processes that slow down climate change
- c. Neutral effects on climate change
- d. Short-term effects on climate change

7. What is one of the local impacts of climate change on glaciers?

- a. Increased winter precipitation
- b. Accelerated glacier growth
- c. Greater extent of the glacier
- d. Increasing flood intensity

8. What can an individual do to help mitigate the effects of climate change on glaciers?

- a. Cooling your home during the winter
- b. Use less potable water
- c. Reducing greenhouse gas emissions
- d. Eat more red meat

9. What is the effect of climate change on the habitat of animal species near glaciers?

- a. Improved conditions
- b. No effect on habitats
- c. Reduction of food resources
- d. Northward migration of species

10. What does "melting glaciers" mean?

- a. Freezing of water inside glaciers
- b. The process of turning glaciers into dry ice
- c. The conversion of glaciers to liquid water due to rising temperatures
- d. Ice formation in glaciers during the winter

Section 2: Correspondence (11-20)

11. Match the term to its correct definition:

- Ice Sheet Glacier
- Valley Glacier
- Climate change
- Positive feedback

Definitions:

- A large glacier that covers a large land area.
- A type of glacier located in the mountains.
- Long-term changes in temperatures and weather patterns.
- A process that further amplifies climate change.

12. Match the name of the glacier to its geographical location:

- Perito Moreno Glacier
- Columbia Glacier
- Ghiacciaio Vatnajökull
- Athabasca Glacier

Places:

- Patagonia, Argentina
- Canada
- Iceland
- Island Park, United States

Here is a simple multiple-choice test with 20 questions about the lecture on glaciers and climate change. Just place an "X" next to the correct answer for each question.

E.g. tests prepared by the teacher, simple multiple-choice test.

Section 1: Questions Checkbox (1-20)

1. What are glaciers?

- ☐ a. Large icebergs in the ocean
- ☒ b. Displacement of rivers of ice
- ☐ c. Surface ice formations
- ☐ d. Winter snow accumulations

2. What is the main factor contributing to the rapid melting of glaciers?

- ☐ a. Increased solar reflection
- ☐ b. Decrease in summer temperatures
- ☒ c. Increase in average temperatures
- ☐ d. Increased winter precipitation

3. What does the water cycle represent?
- ☐ a. The Life Cycle of Water in a Bottle
 - ☐ b. The movement of water between oceans and land
 - ☒ c. The process of water evaporation, condensation and precipitation
 - ☐ d. The path of water from a mountain to a lake
4. What is the main result of rapid glacier melt on sea level rise?
- ☐ a. Falling sea level
 - ☒ b. Sea level rise
 - ☐ c. No effect on sea level
 - ☐ d. Changes in seawater temperature
5. Why is it important to preserve glaciers?
- ☐ a. To create a tourist destination
 - ☐ b. To keep summer temperatures cool
 - ☒ c. For their role in the water cycle and climate regulation
 - ☐ d. Because they are renewable energy sources
6. What do positive feedbacks represent in the context of climate change?
- ☒ a. Processes that amplify climate change
 - ☐ b. Processes that slow down climate change
 - ☐ c. Neutral effects on climate change
 - ☐ d. Short-term effects on climate change
7. What is one of the local impacts of climate change on glaciers?
- ☒ a. Increased winter precipitation
 - ☐ b. Accelerated glacier growth
 - ☐ c. Larger glacier extension
 - ☐ d. Increased flood intensity
8. What can an individual do to help mitigate the effects of climate change on glaciers?
- ☐ a. Cooling your home during the winter
 - ☐ b. Use less potable water
 - ☒ c. Reduce greenhouse gas emissions
 - ☐ d. Eat more red meat
9. What is the effect of climate change on the habitat of animal species near glaciers?
- ☐ a. Improved conditions
 - ☐ b. No effect on habitats
 - ☒ c. Reduction of food resources
 - ☐ d. Migration of species to the north
10. What does "melting glaciers" mean?
- ☐ a. Freezing of water inside glaciers
 - ☐ b. The process of turning glaciers into dry ice

- [X] c. The conversion of glaciers to liquid water due to rising temperatures
- [] d. Ice formation in glaciers during winter

Skills acquired

After successfully completing the lecture and test on glaciers and climate change, students should have gained a number of important skills and knowledge, including:

1. Understanding Glaciers: Students should now have a clear understanding of what glaciers are, how they form, and their role in the Earth's environment.
2. Knowledge of the water cycle: They learned how glaciers are connected to the water cycle and how they affect the availability of fresh water.
3. Climate Change Awareness: Students should have gained a thorough understanding of climate change, including the factors that cause it and its impacts on glaciers.
4. Understanding global consequences: They explored the global consequences of rapidly melting glaciers, including sea level rise and alterations in climate patterns.
5. Environmental awareness: Students should be more aware of the importance of preserving glaciers and their role in climate regulation.
6. Mitigation skills: They discussed actions that can be taken to mitigate the effects of climate change on glaciers and recognize the role of the individual in this fight.
7. Research and presentation skills: Through the environmental council's simulation activity, students have developed research, information processing, and presentation skills.
8. Critical Thinking: The test questions required students to apply critical thinking to provide accurate and consistent answers.
9. Communication skills: Students improved their communication skills through class discussions and solution presentations.
10. Knowledge of glacial regions: They have gained specific knowledge about glacial regions and glaciers that are famous in different parts of the world.

These skills and knowledge are crucial to understanding the importance of glaciers in the Earth's ecosystem and to addressing issues related to climate change, thus contributing to the conservation of our planet.

Lesson No. 4 - The Water Cycle

Lesson plan

Keywords: evaporation, condensation, precipitation, transpiration, groundwater.

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities
 School: first two years of secondary school.

Objectives
Main objectives: Understanding the water cycle: Students should gain a comprehensive understanding of the water cycle, including the processes of evaporation, condensation, precipitation, and runoff. Recognize the importance of water: Students should understand how essential water is to life on Earth and to natural processes. Understanding Climate Change: Students should develop a basic understanding of climate change, its causes, and its effects. Linking the water cycle to climate change: Students should be able to identify how the water cycle is affected by climate change and, in turn, how it affects climate change. Promote environmental awareness: Students should develop a greater awareness of the importance of water conservation and actions that can help mitigate climate change. Specific objectives: Describe the water cycle: Students should be able to explain each step of the water cycle, including evaporation, condensation, precipitation, and the flow of water on Earth. Recognize influential factors: Students should identify both natural and anthropogenic factors that can affect the water cycle, such as air pollution and excessive use of water resources. Explain climate change: Students should be able to clearly explain what climate change is, its root causes (e.g., the greenhouse effect), and its effects (such as global temperature rise and extreme weather events). Illustrate the link between the water cycle and climate change: Students should be able to link the water cycle to climate change, explaining how higher global temperatures can affect the frequency and intensity of rainfall and extreme weather events. Explore solutions: Students should be able to discuss possible solutions to mitigate climate change and preserve the water cycle, such as reducing greenhouse gas emissions and conserving water. An effective lesson might include a combination of theoretical explanations, hands-on activities, explainer videos, and group discussions to help students achieve these goals. Additionally, using concrete examples and recent data on climate change can make the lesson more topical and engaging for students.

Lesson content	References	Methodology
Step 1: Introduction (10 minutes) Welcome and introduction to the topic. Brief discussion of the basic concepts of the water cycle. Presentation of the objectives of the lesson. Step 2: Water Cycle Explained (15 minutes)	Materials needed: Whiteboard or projection screen Water Cycle Charts or Diagrams	Lectures

Detailed explanation of the phases of the water cycle, using graphs or diagrams. Discussion of natural factors that affect the water cycle. Phase 3: Climate Change (10 minutes) Explanation of climate change, its causes and effects. Using images or videos to illustrate the effects of climate change on Earth. Step 4: Connecting the water cycle and climate change (10 minutes) Discussion of how climate change affects the water cycle and vice versa. Concrete examples of how higher global temperatures affect precipitation and extreme weather events. Step 5: Practice activity (optional) (5 minutes) If possible, a short hands-on activity that involves students demonstrating how the water cycle works. For example, a simulation of water evaporation and condensation. Step 6: Solutions and storage (5 minutes) Discussion of solutions to mitigate climate change and preserve the water cycle. Possible presentation of cards or posters with water conservation tips. Step 7: Group discussion (5 minutes) A short group discussion session where students share their ideas on actions that can be taken to help mitigate climate change and conserve water. Step 8: Summary and Conclusions (5 minutes) Brief summary of the key concepts of the lesson. Reinforcement of the main and specific objectives. Invite students to ask questions and share any final thoughts. Step 9: Homework (5 minutes) Assigning homework, such as researching specific aspects of the water cycle or climate change, or compiling a list of actions for water conservation. Note: The duration of the different stages may vary depending on the time available and the age of the students. It's important to keep the lesson	Climate change-related videos or images Hands-on activity (optional) Postcards or posters with water conservation tips (optional)	

engaging by using visual materials, interactive discussions, and hands-on activities if possible.		
Slides for the lecture on the water cycle and climate change: Slide 1: Introduction Title: The Water Cycle and Climate Change Reception and objectives of the lesson Objective: To understand the water cycle, climate change and its connection Slide 2: The water cycle Title: The Water Cycle Explanation of the phases of the water cycle Evaporation, condensation, precipitation and runoff Importance of Water for the Earth and Life Slide 3: Natural Factors in the Water Cycle Title: Natural Factors in the Water Cycle Discussion of factors such as the sun, atmosphere, and water bodies How they affect the water cycle Slide 4: Climate Change Titolo: Climate Change Definition of climate change Main causes (greenhouse effect, pollution, deforestation) Effects (rising temperatures, extreme weather events) Slide 5: Link between the water cycle and climate change Title: Link between the water cycle and climate change How climate change affects the water cycle Concrete examples of how global warming affects precipitation Slide 6: Hands-on activity (optional) Title: Practical activity - simulation of the water cycle		Slides for the lecture

Demonstration of water condensation and evaporation

Student engagement (if possible)

Slide 7: Solutions and Storage

Title: Solutions and Conservation

Actions to mitigate climate change

Water Conservation and Pollution Reduction

Slide 8: Group Discussions

Title: Group Discussions

Group instances to share ideas and reflections

How every person can contribute to water conservation and the fight against climate change

Slide 9: Summary and conclusions

Title: Summary and Conclusions

Summary of key concepts

Reinforcement of the main and specific objectives

Final Questions and Thoughts

Slide 10: Homework

Title: Homework

Homework assignment

Examples: research on specific aspects of the water cycle or climate change, creation of a list of water conservation actions

Slide 11: Thank You and Questions

Title: Thank You and Questions

Thank you to the students for participating

Invitation for students to ask questions or express concerns

Slide 12: Additional Resources

Title: Additional Resources

List of recommended books, websites, or documentaries for further insight into the topic

Slide 13: End

Title: End

Conclusion of the lesson

Thank you for your participation and attention

Activity	Methodology
Activity: Environmental Awareness Project Objective: Students will create an environmental awareness project that illustrates the link between the water cycle and climate change and proposes practical solutions for water conservation and reducing environmental impact. Arrangement: Research and Information: Students will begin by conducting in-depth research on: The water cycle, including its processes and regional variations. Causes and effects of climate change. Solutions and practical actions to mitigate climate change and conserve water. Project Creation: Each student or group of students will create an environmental awareness project. This can take the form of a poster, PowerPoint presentation, video, brochure, or any other creative format chosen by students. Project Content: The project should include: A clear explanation of the water cycle and climate change. Concrete examples of how climate change affects the water cycle. Tips and practical actions to conserve water and reduce environmental impact. Charts, images, or diagrams to illustrate concepts. Presentation: Students will present their projects to the class or at a special environmental awareness event. Teachers, parents, or other students may be invited to attend. Discussion: After each presentation, there will be a short discussion session where students can ask questions and share reflections. Assessment: Students will be assessed based on the completeness of their project, the clarity of the presentation, and their ability to answer questions and participate in discussion. Benefits of the activity: This activity encourages students to become active advocates for environmental awareness. It promotes independent research and the ability to communicate information effectively. It promotes a deeper understanding of the concepts of the water cycle and climate change.	Research, teamwork.

Show students how individual and collective actions can help mitigate climate change and conserve water. This activity not only allows students to deepen their knowledge but also engages them in concrete actions for the conservation of the environment and the fight against climate change.	

Checks	Typology
Semi-structured quiz with 20 questions on the topic of the water cycle and climate change: Section 1: Water Cycle (Questions 1-10) Explain the main stages of the water cycle and their significance for the environment. What are the natural factors that influence the water cycle? Describe the evaporation process and how it occurs. What does the term "condensation" mean in the water cycle? Explain the concept of precipitation and provide examples of different types of precipitation. How does the process of water runoff occur on Earth and why is it important? What is the importance of water for life on Earth? How might the water cycle be affected by an increase in global temperatures? What are the main pollutants that can have a negative impact on the water cycle? How can you personally contribute to water conservation in your daily life? Section 2: Climate Change (Questions 11-16) What is climate change and what are its main causes? What are the effects of climate change on the Earth and on the life of living organisms? Describe the greenhouse effect and explain its role in climate change. How can climate change affect the frequency and intensity of rainfall?	Semi-structured verification.

What are some of the main sources of air pollution that contribute to climate change? What are some of the strategies and actions that can be taken to mitigate climate change? Section 3: Link between the water cycle and climate change (questions 17-19) Explain how climate change affects the water cycle. Provide examples. How can the water cycle affect climate change? What are the possible long-term consequences on the water cycle if climate change continues to progress? Section 4: Reflective Questions (Question 20) Based on what you've learned about the connection between the water cycle and climate change, what specific actions do you think should be taken globally to address these issues?	
Structured test with 20 questions on the topic of the water cycle and climate change: Section 1: Water Cycle (Questions 1-5) What are the main stages of the water cycle? a) Evaporation, condensation, precipitation, runoff. b) Evaporation, sublimation, evaporation, precipitation. c) Evaporation, combustion, precipitation, absorption. What does the "condensation" phase in the water cycle represent? What is the process by which water changes from a liquid to a gaseous state in the water cycle? a) Sublimation. b) Evaporation. c) Merger. What is the correct term for acid rain? a) Acid rain.	E.g. tests already prepared from textbooks or structured tests.

b) Acid precipitation.

c) Atmospheric acidity.

What does the "runoff" phase of water represent in the water cycle?

Section 2: Climate Change (Questions 6-10)

What is climate change?

a) Daily variations in weather conditions.

b) Seasonal variations in temperatures.

c) Long-term changes in Earth's climate patterns.

What are the main causes of climate change?

(a) The greenhouse effect and water pollution.

b) The greenhouse effect and volcanic eruptions.

(c) The greenhouse effect and air pollution.

What are the effects of climate change on Earth?

a) Rising global temperatures and rising sea levels.

b) Reduction of pollution and reduction of storms.

c) Increasing biodiversity and growing freshwater reserves.

What is the greenhouse effect and how does it contribute to climate change?

What actions can be taken to mitigate climate change?

Section 3: Link between the water cycle and climate change (questions 11-14)

How does climate change affect the water cycle?

What are some of the long-term consequences on water if climate change continues to progress?

How can the water cycle affect climate change?

How might the water cycle be affected by an increase in global temperatures?

Section 4: Reflective Questions (Questions 15-20) What can you do individually to contribute to water conservation and the fight against climate change? What are some of the main sources of air pollution that contribute to climate change? Explain the process of precipitation and provide an example of a type of precipitation other than rain. Describe the evaporation process and explain how it occurs. What is the importance of water for life on Earth? In your opinion, what are the urgent actions that society should take globally to address issues related to the water cycle and climate change? You can use this structured test to assess students' understanding of the water cycle and the topic of climate change.	
Simple multiple-choice test with 20 questions on the topic of the water cycle and climate change: Section 1: Water Cycle (Questions 1-5) What are the main stages of the water cycle? a) Evaporation, condensation, precipitation, runoff. b) Evaporation, sublimation, evaporation, precipitation. c) Evaporation, combustion, precipitation, absorption. What does the "condensation" phase in the water cycle represent? a) The transformation of water from the solid state to the liquid state. b) The passage of water from the atmosphere to the Earth's surface. c) The transition of water from the gaseous to the liquid state. What is the process by which water changes from a liquid to a gaseous state in the water cycle? a) Merger. b) Evaporation.	E.g. tests prepared by the teacher, multiple choice tests.

c) Precipitation.

What is the correct term for acid rain?

a) Acid rain.

b) Acid precipitation.

c) Atmospheric acidity.

What does the "runoff" phase of water represent in the water cycle?

a) The passage of water from the atmosphere to the Earth's surface.

b) The flow of water on the earth's surface, such as in rivers and streams.

c) Water uptake by plants.

Section 2: Climate Change (Questions 6-10)

What is climate change?

a) Daily variations in weather conditions.

b) Seasonal variations in temperatures.

c) Long-term changes in Earth's climate patterns.

What are the main causes of climate change?

(a) The greenhouse effect and water pollution.

b) The greenhouse effect and volcanic eruptions.

(c) The greenhouse effect and air pollution.

What are the effects of climate change on Earth?

a) Rising global temperatures and rising sea levels.

b) Reduction of pollution and reduction of storms.

c) Increasing biodiversity and growing freshwater reserves.

What is the greenhouse effect and how does it contribute to climate change?

a) A natural phenomenon that keeps the Earth warm and hospitable.

b) The accumulation of greenhouse gases in the atmosphere that trap heat and increase the Earth's average temperature.

c) The effect of deforestation on the earth's temperature.

What actions can be taken to mitigate climate change?

a) Consume more fossil energy.

b) Reduce recycling.

c) Reduce greenhouse gas emissions and promote renewable energy.

Answer the questions by choosing the letter that corresponds to the correct answer.

Skills acquired

After participating in the class on the water cycle and climate change, students will gain a range of skills, including:

1. Understanding the Water Cycle: Students will be able to explain the key stages of the water cycle, including the processes of evaporation, condensation, precipitation, and runoff.

2. Knowledge of Climate Change: Students will understand the fundamental concepts of climate change, including the factors that cause it and the effects it has on the Earth and society.

3. Connection Between the Water Cycle and Climate Change: Students will recognize the link between the water cycle and climate change, including how climate change affects the water cycle and vice versa.

4. Environmental Awareness: Students will develop a greater awareness of the importance of water conservation and actions that can help mitigate climate change.

5. Critical Thinking Skills: Students will be able to analyze the causes and effects of climate change and evaluate strategies for addressing these issues.

6. Effective communication: Students will be able to communicate concepts related to the water cycle and climate change clearly and consistently, both verbally and in writing.

7. Teamwork: If group activities have been conducted, students will have improved their teamwork skills in working with others to achieve common goals.

8. Research and self-directed learning: Students will gain independent research skills to deepen their understanding of the topic and continue to learn about environmental and climate issues.

9. Solution Awareness: Students will identify some practical solutions to help mitigate climate change and conserve water, demonstrating their understanding of the personal and collective actions needed.

These skills are not only important for understanding the topic covered in the lesson, but are also transferable to other areas of knowledge and daily life, thus contributing to the development of more informed and environmentally conscious citizens who are attuned to global environmental challenges.

Lesson No. 5 - Coastal erosion and climate change

Lesson plan

Keywords: coastal erosion, coastal retreat, beach loss, sediment displacement, coastal degradation.

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities

School: first two years of secondary school.

Objectives
Main Objective: The main goal of this lesson is to help students understand the link between coastal erosion and climate change, as well as the consequences of this phenomenon on human life and the environment. Students should develop a critical awareness of the issues related to coastal erosion and the actions needed to address them. Specific objectives: 1. Understanding Coastal Erosion: Students should be able to define coastal erosion and explain its root causes, including the action of waves, winds, and human activities. 2. Identify climate change: Students should be able to explain what climate change is and how it affects coastal conditions, including changes in sea levels and changes in global temperatures. 3. Risk Factor Analysis: Students should be able to identify coastal areas most at risk of erosion due to climate change and understand the implications for human life, ecosystems, and local economies. 4. Explore the consequences of coastal erosion: Students should be able to discuss the consequences of coastal erosion, including habitat loss, infrastructure damage, forced community migration, and potential economic impacts. 5. Solution Assessment: Students should be able to examine mitigation and adaptation strategies for coastal erosion, including coastal reinforcement projects, protection of coastal ecosystems, and changes in land use planning policies.

6. Promote action: Students should be able to discuss the role of education and activism in raising awareness about coastal erosion and climate change issues, and in encouraging individual and community-based action to address these issues.

7. Develop research and communication skills: Students should be able to use reliable sources to gather information about the topic and effectively communicate what they have learned through presentations, reports, or other means.

These objectives should provide a solid framework for the "Coastal Erosion and Climate Change" lesson and help students develop an in-depth understanding of this important environmental issue.

Lesson content	References	Methodology
Lesson structure: 1. Introduction (10 minutes) - Greeting and introduction to the topic. - Rationale for the importance of coastal erosion and climate change. - Presentation of the objectives of the lessons. 2. What is coastal erosion? (15 minutes) - Definition of coastal erosion. - Main causes of coastal erosion, including natural and anthropogenic factors. - Discussion of examples of coastal areas affected by erosion. 3. What is climate change? (15 minutes) - Explanation of the concept of climate change. - Factors that contribute to climate change. - Effects of climate change on coastal conditions, including sea level changes. 4. Coastal erosion and climate change (15 minutes) - Discussion on the link between coastal erosion and climate change. - How climate change intensifies coastal erosion. - Concrete examples of how coastal communities are affected by this connection.		Lectures or dialogues.

5. Implications of Coastal Erosion (10 minutes)

- Exploration of the consequences of coastal erosion, including environmental, social and economic impacts.
- Examples of coastal communities facing erosion-related challenges.

6. Mitigation and adaptation strategies (10 minutes)

- Introduction to solutions to address coastal erosion and climate change.
- Discussion of coastal reinforcement projects, protection of coastal ecosystems and changes in spatial planning policy.

7. Promote Activism and Action (10 minutes)

- Reflection on the importance of education and activism in addressing these issues.
- Tips on how students can raise awareness and take individual and community-wide actions.

8. Hands-on activity (10-15 minutes)

- A hands-on activity, such as watching a video or reading a case study, that illustrates the issue of coastal erosion and climate change in a specific context.

9. Discussion and questions (10 minutes)

- A discussion session for students to express their opinions, ask questions, and share what they have learned.

10. Conclusions and assignments (5 minutes)

- Summary of the key points of the lesson.
- Assigning additional tasks or activities, such as researching a specific case of coastal erosion or creating an informational poster.

11. Closing (5 minutes)

- Thank the students for their participation.
- Invite questions or requests for additional information.

This structure of the lessons should allow an in-depth study of the topic of coastal erosion and climate change, involving students in interactive activities and critical reflections on possible solutions.		
Slides for the lecture "Coastal erosion and climate change": Slide 1: Introduction Title: Welcome to the Lecture on Coastal Erosion and Climate Change Contents: - Greeting and introduction to the topic. - Justification for the importance of addressing coastal erosion and climate change. Slide 2: Lesson Objectives Title: Lesson Objectives Contents: - Illustration of the main and specific objectives of the lesson. Slide 3: What is Coastal Erosion? Title: What is coastal erosion? Contents: - Definition of coastal erosion. - Natural and anthropogenic factors that contribute to coastal erosion. Slide 4: Causes of Coastal Erosion Title: Causes of coastal erosion Contents: - In-depth exploration of root causes, such as waves, winds, and human activities. - Examples of coastal areas affected by erosion. Slide 5: What is climate change? Titolo: What Is Climate Change? Contents: - Explanation of the concept of climate change and its factors. - Global effects of climate change. Slide 6: Impacts of climate change on coasts		Lesson slides, add images.

Title: Impacts of climate change on coasts

Contents:

- How climate change intensifies coastal erosion.
- Concrete examples of coastal communities affected by these impacts.

Slide 7: Implications of Coastal Erosion

Title: Implications of coastal erosion

Contents:

- Discussion of environmental, social and economic impacts.
- How coastal erosion affects community life.

Slide 8: Mitigation and Adaptation Strategies

Title: Mitigation and Adaptation Strategies

Contents:

- Presentation of solutions such as coastal reinforcement projects and spatial planning policies.
- The role of protecting coastal ecosystems.

Slide 9: Promoting Activism and Action

Title: Promoting Activism and Action

Contents:

- Importance of education and activism in raising awareness of the problem.
- Suggestions on how students can contribute individually and communityly.

Slide 10: Practice Activity

Title: Practical Activity

Contents:

- Description of a hands-on activity, such as watching a video or reading a case study.
- Highlight the importance of hands-on experience.

Slide 11: Discussion and Questions

Title: Discussion and Questions

Contents:

- Discussion session to encourage students to share their opinions and ask questions.

Slide 12: Conclusions and Tasks

Title: Conclusions and assignments Contents: - Summary of the key points of the lesson. - Assignment of additional tasks or activities, such as researching a specific case of coastal erosion. Slide 13: Closing Titolo: Closing Contents: - Thank the students for their participation. - Invite questions or requests for additional information. These slides should help you effectively structure and present the lesson on coastal erosion and climate change. You can add relevant images, charts, or diagrams to further illustrate the concepts if desired.		

Activity	Methodology
Activity: Visit to a coastal area at risk of erosion Objective: To allow students to directly observe the effects of coastal erosion and climate change in a vulnerable area and gain a better understanding of the concepts discussed in class. Materials needed: Transportation to reach the selected coastal area. Cameras or mobile phones to document the activity. Maps or coastal zone maps. Notebooks and pens for taking notes. Procedure: Pre-visit planning (in advance): Identify a local or easily accessible coastal area that is at risk of erosion due to climate change. Make sure you have all the necessary permissions for the visit. Classroom Introduction (Advance): Prior to the visit, discuss with students the objective and details of the activity, including aspects of the coastal zone that you intend to examine. On-site field visit:	Field excursion and research activities.

Guide students to their chosen coastal area. During your visit, pay attention to the following: Observe clear signs of coastal erosion, such as narrow beaches, landslides, or coastal protection structures. Examine the local ecosystem and how it is affected by the loss of coastal habitats. Discuss with students the importance of sustainable use of natural resources in these areas. Observation and data collection activities: Encourage students to take notes, take photographs, and make observations during the visit. They can document obvious changes in the coastal landscape compared to previous images or maps. Discussion and data analysis (after the visit): Go back to the classroom and share students' experiences and observations. Discuss how the effects of coastal erosion and climate change manifest themselves in the area visited. Analyze the data collected and compare it with the information learned in class. Creative Elaboration: Ask students to create presentations, posters, or reports based on their visit and the data collected. Emphasize the importance of sharing this information with the local community to raise awareness and promote action. Conclusions: Summarize the importance of fieldwork in improving understanding of the theoretical concepts of the lesson. Highlight how individual and collective actions can contribute to mitigating coastal erosion and addressing climate change. This fieldwork will provide students with practical and tangible experience, allowing them to apply the knowledge gained in the classroom and develop a deeper understanding of coastal erosion and climate change.	

Checks	Typology
Unstructured assessment consisting of 20 questions Multiple-choice questions: What is the main cause of coastal erosion? (a) Human activity (b) Climate change c) Earthquakes d) Growth of coastal plants	Multiple-choice tests.

What is climate change?

- (a) Daily variations in weather conditions
- b) Changes in ocean conditions
- c) Long-term changes in global climate patterns
- d) Seasonal temperature fluctuations

What are some of the natural factors that contribute to coastal erosion?

- a) Human activity and deforestation
- b) Waves, winds and precipitation
- c) Changes in government policies
- (d) Industrial activities

How does climate change affect coastal erosion?

- (a) Reducing the number of tourists in coastal areas
- b) Increasing the availability of coastal land for construction
- c) Rising sea levels and causing extreme weather events
- d) Lowering ocean water temperatures

Open-ended questions:

Explain how human activity can contribute to coastal erosion.

What are some possible consequences of coastal erosion for coastal communities?

What does "mitigation" and "adaptation" mean when dealing with coastal erosion?

What are some strategies that can be adopted to protect coastlines from erosion?

Analysis Questions:

Give an example of a famous coastal area that has been heavily affected by coastal erosion and explain why.

Imagine you are a resident of a coastal community at risk of erosion. What actions could you take to protect your home and community?

Discussion Questions:

What is the role of education in raising awareness about coastal erosion and climate change?

How can spatial planning policies help mitigate coastal erosion?

Questions about the application:

Propose a mitigation strategy that could be implemented in your local community to address coastal erosion. How could you actively engage your community in addressing coastal erosion and climate change? Research Questions: Choose a species of flora or fauna that is particularly affected by coastal erosion. What can you find out about how this species is coping with this problem? Search for information about a coastal reinforcement project in a specific region of the world and explain how it works and what the results have been so far. I hope these questions are helpful for your assessment of coastal erosion and climate change. You can adapt them according to your students' level of knowledge and the specific needs of the lesson.	
Structured test consisting of 20 questions Definition and causes of coastal erosion: It explains what coastal erosion is and what its main natural causes are. What is the role of human activity in accelerating coastal erosion? Give at least two examples. Climate change and coastal impacts: Define climate change and explain how it affects coastal conditions. What are the effects of sea level rise on coastal communities and coastal ecosystems? Consequences of coastal erosion: Gain insight into the environmental consequences of coastal erosion and how they affect coastal biodiversity. Describe the socio-economic impacts of coastal erosion on coastal communities and infrastructure. Mitigation and Adaptation Strategies: Explain the difference between mitigation and adaptation strategies in dealing with coastal erosion. Provide examples of each.	E.g. tests already prepared by textbooks, structured test of 20 questions.

What is the role of coastal ecosystem protection in mitigating coastal erosion? Case studies and research projects: Choose a popular coastal area that has been affected by coastal erosion and describe its current situation and the measures taken to address the problem. Research and description of a scientific research project that studies the effects of coastal erosion on a specific marine species. Activism and Future Actions: What is the role of education in raising awareness about coastal erosion and climate change? How can students help promote awareness and action to address coastal erosion and climate change in their community? Analysis and Application: Analyze the importance of sustainable use of natural resources in coastal areas at risk of erosion. Propose a specific mitigation strategy that could be implemented in your local community to address coastal erosion. Conclusions and reflections: Briefly summarize three main impacts of coastal erosion on coastal communities.	
Multiple-choice test with 10 questions on coastal erosion and climate change. Each question has four answer options, one of which is correct. Just mark the correct answer with an "X". Questions: What is coastal erosion? a) Global warming b) Beach Growth (c) Loss of land along the coast d) Rising temperatures What is one of the main causes of coastal erosion? a) Volcanic eruptions b) Ocean currents	E.g. multiple-choice tests prepared by the teacher.

- c) Reforestation
- (d) Fisheries

What is the main human contribution to coastal erosion?

- a) Building houses on the coast
- b) Destruction of coral reefs
- c) Use of solar energy
- d) Collection of shells

What is climate change?

- (a) Daily variations in weather conditions
- b) Long-term changes in global climate patterns
- c) Seasonal temperature fluctuations
- (d) Fluctuations in atmospheric pressure

How does climate change affect coastal erosion?

- a) Reducing energy consumption
- b) Rising sea levels and causing extreme weather events
- c) Reducing CO2 emissions
- d) Influencing seabird migrations

What are some consequences of coastal erosion?

- (a) Increasing marine biodiversity
- b) Reduction of flood risks
- c) Habitat loss, damage to infrastructure and forced migration of communities
- (d) Increasing water resources

What does "mitigation" mean in the context of coastal erosion?

- (a) Sustainable use of coastal resources
- b) Ocean conservation education
- c) Strategies to reduce coastal erosion
- (d) Adaptation to coastal conditions

What is the role of coastal ecosystems in mitigating coastal erosion?

- a) They have no impact
- b) They can slow erosion by providing natural protection
- c) Increase coastal erosion
- d) They are insensitive to climate change

What can students do to contribute to activism and action against coastal erosion?

- a) Ignoring the problem
- b) Organise awareness-raising campaigns
- c) Polluting beaches
- d) Avoid community events

What is the role of spatial planning policies in addressing coastal erosion?

- a) They have no role

- (b) They can help control coastal development and protect vulnerable areas
- c) Encourage coastal urbanization
- (d) Promote commercial fishing

Skills acquired

Understanding Coastal Erosion: Students should now have a solid understanding of what coastal erosion is and its primary causes, including natural and anthropogenic influences.

Knowledge of climate change: They learned what climate change is, what its causes are, and how it affects coastal conditions, including sea levels and extreme weather events.

Awareness of impacts: Students should be able to identify the impacts of coastal erosion on coastal communities, marine ecosystems, and infrastructure.

Understanding of mitigation and adaptation strategies: They are familiar with the strategies used to address coastal erosion and climate change, including coastal reinforcement projects, coastal ecosystem protection, and land use planning.

Mindfulness and activism: Students have gained an understanding of the importance of education and activism in raising awareness about coastal erosion and climate change issues, and are able to suggest individual and community actions.

Analytical and reflection skills: they can analyze and reflect on the data and information collected during the lesson, as well as connect theoretical concepts to experiences in the field.

Research and presentation skills: They have developed research skills to gain insight into specific cases of coastal erosion and climate change, as well as presentation skills to effectively communicate their findings.

Critical thinking: Students should be able to critically evaluate proposed policies and solutions to address coastal erosion and climate change, recognizing their benefits and potential challenges.

These skills are essential to effectively address issues related to coastal erosion and climate change, as well as to promote greater awareness and activism in this important environmental sector.

Lesson No. 6 - Forests and Climate

Lesson plan

Keywords: deforestation, carbon sequestration, carbon emissions, climate impact of forests, changes in the forest water cycle

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities

School: first two years of secondary school.

Objectives
Understand the crucial role of forests in the carbon cycle and in the absorption of CO₂ from the atmosphere. Analyze the effects of deforestation on the global climate, including changes in rainfall, temperatures, and climate patterns. Examine the various types of forests (temperate, tropical, boreal, etc.) and their different influences on climate. Explore forest conservation strategies and the importance of reforestation in mitigating the effects of climate change. Assess the impact of forests on biodiversity and local communities, as well as their role in food and water security. Discuss international and national policies aimed at protecting forests and sustainable management of forest resources. Analyze the effects of tree species extinctions on ecological networks and biogeochemical cycles. Explore synergies between forests, climate change and environmental sustainability, including the importance of initiatives to involve local communities in forest management. Understand the concept of "ecosystem services" provided by forests and how these affect the health of the environment and human societies. Promote awareness of the interconnectedness between forest health and human well-being, encouraging individual and collective action to preserve and protect forests

Lesson content	References	Methodology
Introduction (15 minutes) Reception and presentation of the objectives of the lesson. Explanation of the importance of forests for the planet and climate balance. Brief discussion on climate change and its impact on our world. Session 1: The role of forests in the carbon cycle (20 minutes) Explanation of the carbon cycle and its connection to climate. Discussion of how forests absorb and store carbon. Examples of forests that are important for the global carbon balance.	Hats://vv.tesf.unipid.it Hats://vv.Reteklima.it	Lectures and video projection or other resources.

Session 2: Deforestation and climate change (15 minutes)

Illustration of how deforestation contributes to the accumulation of carbon dioxide in the atmosphere.

Data and statistics on the extent of deforestation globally.

Effects of deforestation on biodiversity and ecosystem services.

Session 3: Forests as carbon sinks (15 minutes)

Discussion of the potential of forests as carbon sinks.

Strategies for sustainable forest management for climate change mitigation.

Examples of reforestation and forest conservation projects.

Break (10 minutes)

Session 4: Impact of climate change on forests (15 minutes)

Examining the effects of climate change on forest conditions, including fires, disease, and higher temperatures.

Discussion on how forests are responding to climate change.

Examples of forests affected by climate change.

Session 5: Actions for Forest Conservation (15 minutes)

Exploring the actions needed to preserve and protect forests in the context of climate change.

Discussion on international policies, laws and initiatives for forest conservation.

Encouragement of active participation in forest conservation at the local and global levels.

Conclusion and discussion (10 minutes)

Summary of the key points covered during the lesson.

Opportunity for students to ask questions and start a discussion. Conclusion by emphasizing the importance of forests in the fight against climate change and the importance of individual and collective action. Assignment of tasks: Students may be tasked with researching recent news or studies about forests and climate change and presenting them to the class in the next lesson. This lesson structure provides a comprehensive overview of the link between forests and climate change, giving students a solid foundation for understanding the importance of forest conservation in the context of global warming.		
Slides corresponding to the structure of the lesson on "Forests and climate": Slide 1: Introduction Title: Welcome to "Forests and Climate Change" Contents: Presentation of the objectives of the lesson. Importance of forests for the planet and climate. Brief explanation of climate change. Slide 2: The Role of Forests in the Carbon Cycle Title: Forests and Atmospheric Carbon Contents: The carbon cycle and its impact on the climate. How forests absorb and store carbon. Examples of key forests in the global carbon budget. Slide 3: Deforestation and Climate Change Title: Deforestation and climate impact	https://www.iconacliima.it	Slides on the lecture

Contents:
How deforestation contributes to the increase in CO₂.
Global statistics on deforestation.
Effects on biodiversity and the environment.

Slide 4: Forests as carbon sinks

Title: Forests as climate mitigators
Contents:
The role of forests as carbon sinks.
Sustainable forest management strategies for climate change mitigation.
Examples of reforestation and conservation projects.

Slide 5: Impact of climate change on forests

Title: Climate Change and Forests
Contents:
Effects of climate change on forest conditions, including fires, diseases, and higher temperatures.
Discussion on how forests are responding to climate change.
Examples of forests affected by climate change.

Slide 6: Actions for Forest Conservation

Title: Conserving forests for the future
Contents:
Actions needed to protect and preserve forests in the context of climate change.
Discussion on international policies, laws and initiatives for forest conservation.
Encouragement of active involvement in forest conservation locally and globally.

Slide 7: Conclusion and discussion

Title: Summary and Final Discussions
Contents:
Summary of the key points covered during the lesson.
Opportunity for students to ask questions and start a discussion.
Emphasis on the importance of forests in the fight against climate change and in individual and collective action.

Slide 8: Homework

Titolo: Homework Assignment

Contents:

Homework suggestions, such as searching for recent news or studies on forests and climate change.

Invitation to present the results in the next lesson.

Activity	Methodology
Practical activity for students to deepen "Forests and Climate Change": Activity: Local forest hike and observation log Objective: To allow students to directly explore the connection between forests and climate change through a hike in a local forest, identifying signs of climate change and recording observations. Arrangement: Preparation: Organize a hike in a local forest. Be sure to choose an area that is accessible and safe for students. It can be a national park, a nature reserve, or even a city park with a forest. Plan the excursion to allow students to observe various aspects of the forests. Tools and materials: Provide students with tools and materials such as notebooks, pens, cameras, or smartphones to record their observations. Field Activities: During the hike, encourage students to: - Observe the local flora and fauna and record the names of the species if possible. - Identify signs of climate change, such as trees damaged by fire or disease, out-of-season blooms or fruiting, changes in precipitation patterns, etc. - Measure the temperature and humidity of the air at different points during the hike. Discussion: After the hike, organize a discussion session in class. Students can share their observations and images collected during the hike. Discuss the signs of climate change they have identified and how these affect the local forest. Group project: Divide students into groups and assign them specific topics related to climate change and forests, based on their	Activities with excursion and field research.

observations. For example, one group may examine how biodiversity in the forest is changing due to climate change, while another group may focus on plant conditions. Project presentation: Ask groups to present their projects in class, including their observations, conclusions, and recommendations for forest conservation. This activity will provide students with hands-on, hands-on experience, allowing them to apply what they have learned in class and develop a deeper understanding of the link between forests and climate change. In addition, it will promote group collaboration and students' active participation in forest conservation.	

Checks	Typology
Structured test consisting of 20 questions Multiple choice questions (1 point each): 1. What is the main greenhouse gas responsible for the greenhouse effect? a) Oxygen b) Carbon dioxide (CO₂) c) Nitrogen d) Hydrogen 2. What is the role of forests in the carbon cycle? a) They absorb carbon from the atmosphere. b) They release carbon into the atmosphere. c) They do not affect the carbon cycle. d) They produce carbon. 3. What does "deforestation" mean? a) Plant new trees in a wooded area. b) Removal of trees and conversion of woodland for other uses. c) Increase the density of trees in a forest. d) Sustainable forest management practice. 4. Why is deforestation linked to climate change? a) Increases biodiversity. b) Reduces the greenhouse effect. c) Improves carbon absorption. d) Increases carbon dioxide emissions. 5. What are carbon sinks? a) Underground oil tanks. b) Places where carbon is stored in the long term. c) Carbon dioxide storage tanks. d) Drinking water tanks.	Structured test of 20 questions

Open-ended questions (2 points each): 6. Explain the carbon cycle and how forests are involved. 7. What is the role of biodiversity in forests and how could it be affected by climate change? 8. What does "sustainable forest management" mean and what are its main objectives? 9. Provide examples of the effects of climate change on forest conditions. 10. What are some global policies or initiatives for forest conservation? In-depth questions (3 points each): 11. Analyze the impact of climate change on patterns of distribution of plant and animal species in forests. 12. Explain how forests can be used as solutions to mitigate climate change. 13. Discuss the effects of forest fires on forest health and carbon budget. 14. What are the main challenges in forest management in a world facing climate change? 15. Describe a reforestation or forest conservation project that has been successfully implemented and analyze its results. This assessment covers a range of topics related to the theme "Forests and Climate Change" and can be used to assess students' comprehension after studying the material.	
Multiple-choice test (1 point each): 1. What is the main greenhouse gas responsible for the greenhouse effect? a) Oxygen b) Nitrogen c) Carbon dioxide (CO₂) d) Hydrogen 2. What is the role of forests in the carbon cycle? a) They release carbon into the atmosphere. b) They absorb carbon from the atmosphere.	E.g. tests prepared by the teacher with multiple choice.

- c) They do not affect the carbon cycle.
- d) They convert carbon into oxygen.

3. What does "deforestation" mean?

- a) Plant new trees in a wooded area.
- (b) Removal of trees and conversion of woodland for other uses.
- c) Increase the density of trees in a forest.
- d) Creation of new nature reserves.

4. Why is deforestation linked to climate change?

- a) Increases biodiversity.
- b) Reduces the greenhouse effect.
- c) Improves carbon absorption.
- d) Increases carbon dioxide emissions.

5. What are carbon sinks?

- a) Places where oil is stored.
- (b) Underground natural gas reservoirs.
- c) Places where carbon is stored in the long term.
- (d) Fossil coal reserves.

6. What is the effect of forest fires on forests and climate?

- (a) They contribute to the conservation of forests.
- b) They cool the climate.
- c) They damage forests and release carbon dioxide into the atmosphere.
- d) They promote the growth of forests.

7. What is the primary objective of sustainable forest management?

- a) Maximize tree harvesting.
- b) Minimise people's access to forests.
- c) Conserve forests for future generations.
- d) Promote deforestation.

8. What are some global policies for forest conservation?

- a) There are no comprehensive policies for forest conservation.
- b) The Kyoto Protocol.
- c) The Paris Agreement.
- (d) The Treaty of Rome.

9. What does the abbreviation IPCC stand for in the context of climate change?

- (a) International Climate Control Programme
- (b) Intergovernmental Panel on Climate Change
- (c) International pollution prevention and control
- (d) International Group on Climate Conservation

10. What is the significance of water in forests?

- a) It is of no importance to forests.
- b) Contributes to the spread of forest fires.

- c) Supports the growth and survival of trees and wildlife.
- d) It poses a threat to forests.

Skills acquired

After participating in the lecture on "Forests and Climate Change", students should have acquired a number of important skills and knowledge. Here are some key skills students may have developed:

Understanding the Carbon Cycle: Students should have gained a solid understanding of the carbon cycle and how forests are essential for the absorption and release of carbon into the atmosphere. This knowledge will help them understand the connection between forests and climate change.

Climate Change Awareness: Students should be aware of the importance of climate change as a global issue and the various ways in which climate change affects forests.

Knowledge of mitigation measures: Students should be able to identify climate change mitigation strategies involving forests, such as conservation, reforestation, and sustainable management of forest resources.

Understand the impact of deforestation: Students should have a clear understanding of the effects of deforestation on the environment, including its impact on biodiversity, the water cycle, and climate.

Ability to analyze data and observations: Through the hands-on forest hike and observation recording activity, students should have developed skills in analyzing environmental data and field observations.

Communication Competence: Students should be able to effectively communicate the information gained during the lecture and excursion, both in written and oral form, during class discussions and group project presentations.

Environmental Policy Awareness: Students should be aware of international policies and initiatives for forest conservation and climate change mitigation.

Critical thinking: They should be able to think critically about how human actions affect forests and climate and consider the implications of forest management choices.

Group collaboration: Through group projects, students should have developed collaboration skills, including teamwork in data collection and analysis.

These skills gained from the class on "Forests and Climate Change" prepare students to better understand the importance of forests in the context of climate change and to participate more informed and actively in forest conservation and climate change mitigation.

Lesson No. 7 - Solar System and Climate

Lesson plan

Keywords: solar system, planetary climate, atmospheres, greenhouse effect, space weather

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities

School: first two years of secondary schools.

Objectives
Main objectives of the lesson: Understanding the Solar System: Students should gain a fundamental understanding of the solar system, including its major components such as the Sun, planets, and other celestial bodies. Analyze the Sun's Influence: Students should examine how the Sun affects Earth's climate, including concepts of solar radiation, the solar cycle, and variations in solar activity. Examine Earth's climate: Students should understand the key variables that affect Earth's climate, such as temperature, precipitation, and atmospheric circulation. Relate the solar system to the Earth's climate: Students should link the information learned about the components of the solar system and the influence of the Sun to the Earth's climate, recognizing the importance of this connection. Specific objectives of the lesson: Identifying Solar System Components: Students will be able to list the major components of the solar system, including the Sun, planets, moons, asteroids, and comets. Understanding solar radiation: Students will be able to explain what solar radiation is, how it is generated, and how it reaches Earth. Knowledge of the solar cycle: Students will be able to describe the solar cycle, with a focus on variations in solar activity, such as sunspots and solar activity cycles. Greenhouse Effect Analysis: Students will be able to explain the greenhouse effect and how greenhouse gas concentrations in the atmosphere affect the Earth's climate. Examine climate variations: Students will be able to link variations in solar activity to climate variations on Earth, such as ice ages and global warming. Understanding the importance of research: Students will appreciate the importance of scientific research in understanding the connections between the solar system and Earth's climate.

Lesson content

References

Methodology

Introduction (10 minutes): Introduction to the solar system and its main components. Section 1: The Influence of the Sun (20 minutes): Explanation of solar radiation. Discussion of the solar cycle and variations in solar activity. Examples of how solar influence can affect the Earth's climate. Section 2: Earth's Climate (20 minutes): Definition of climatic variables, such as temperature, precipitation and atmospheric circulation. Explanation of the greenhouse effect and the role of greenhouse gases in influencing climate. Section 3: Connections between the Solar System and Earth's Climate (20 minutes): Discussion of how variations in solar activity can affect Earth's climate. Historical evidence of climate change linked to solar activity. Conclusion and activities (10 minutes): Summary of key concepts. Discussion of how scientific research contributes to our understanding of the link between the solar system and Earth's climate. Possible activities or experiments to further explore the topic. Homework (10 minutes): Assigning homework, such as researching a related topic or creating a presentation on the topic. Q&A (10 minutes): Answer students' questions and discuss their views on the topic.	https://airandspace.si.edu/stories/editorial/climate-change-solar-system https://www.esa.int/Science_Exploration/Space_Science/Space_for_you/Climate_change_on_other_planets	Lectures and dialogues.
Slide 1: Introduction Title: The Solar System and Its Influence on Climate Content: Welcome to our lecture on the connection between the solar system and Earth's climate. Slide 2: Lesson Objectives	HTTPS://Press.Princeton.Seven/Books/Hardcover/9780691153834/The-Sons-Influence-on-Climate	Slides for lectures and dialogues.

Title: Lesson Objectives

Contents:

Main objectives:

Understand the solar system.

Analyze the influence of the Sun.

Examine the Earth's climate.

Relate the solar system to the Earth's climate.

Specific objectives:

Identification of the components of the solar system.

Understanding solar radiation.

Knowledge of the solar cycle.

Analyzing the greenhouse effect.

Examine climatic variations.

Understand the importance of scientific research.

Slide 3: The Solar System

Titolo: The Solar System

Contents:

The solar system consists of:

The sun

Planets

Moons

Asteroids

Comets

Slide 4: The influence of the sun

Title: The Influence of the Sun

Contents:

Solar radiation:

Explanation of solar radiation.

Origin and path to Earth.

Slide 5: The Solar Cycle

Title: The Solar Cycle

Contents:

Solar cycle:

Description of the phases of the solar cycle.

Variations in solar activity, such as sunspots.

Slide 6: Earth's Climate

Titolo: Earth's Climate

Contents:

Climatic variables:

Temperature

Precipitation

Atmospheric circulation
Greenhouse effect:
Explanation of the greenhouse effect.
Role of greenhouse gases in influencing climate.

Slide 7: Connections between the Solar System and Earth's Climate

Title: Connections between the solar system and Earth's climate

Contents:

Changes in solar activity:

How variations in solar activity can affect Earth's climate.

Historical:

Examples of climate change related to solar activity.

Slide 8: Conclusion and Activities

Title: Conclusion and Activities

Contents:

Summary of the key concepts of the lesson.

Discussion on the importance of scientific research.

Possible activities or experiments to further explore the topic.

Slide 9: Homework

Title: Homework

Contents:

Assigning homework, such as researching a related topic or creating a presentation on the topic.

Slide 10: Questions and discussion

Title: Questions and Discussion

Contents:

Time spent answering students' questions and discussing their opinions on the topic.

These slides should comprehensively cover the main and specific objectives of the lecture on the solar system and its influence on climate. You can further customize your slides by adding additional images, charts, or data if desired.

Activity	Methodology
Procedure: Preparation: Organize students into pairs and distribute the necessary materials to each pair. Explanation: Explain to students who will be conducting a simulation of solar variations and their impact on the Earth's climate. Creating "Planet Earth": Have students draw a simplified representation of planet Earth on a sheet of clear paper or plastic. It marks the equator, continents, and ocean. Creating the "Sun": Place the table lamp at a certain distance from the earthly representations of the pairs. This lamp will represent the Sun. Simulation of solar variations: Have students move the lamp (Sun) back and forth in relation to their representation of the Earth. Explain to them that this movement represents the variations in solar activity and the different amount of solar radiation that reaches the Earth based on the relative position of the Sun. Recording of observations: As you move the lamp, ask students to track variations in the amount of "sunlight" that hits different parts of the Earth. Point out that some areas receive more sunlight than others during these variations. Discussion and analysis: Gather the class and ask students to share their observations. Conduct a discussion on the relationship between simulated solar variations and the effect on Earth's climate, such as an increase or decrease in temperature in certain regions. Conclusion: Summarize the importance of variations in solar activity in modulating the Earth's climate. Encourage students to reflect on how these variations can contribute to understanding past and future climate change. This interactive activity will allow students to visually understand how solar variations affect the Earth's climate and promote a deeper understanding of the topic covered in the lesson.	Hands-on activity. Materials needed: Transparent paper or transparent plastic. Colored pencils or markers. Table lamp (representing the Sun). Flat surface (table or desk).

Checks	Typology
Semi-Structured Assessment: The Solar System and Its Influence on Climate Open-ended questions: It briefly explains what the solar system is and what its main components are. Describe how the Sun influences the Earth's climate through solar radiation. What are sunspots and how are they related to the solar cycle? What is the greenhouse effect and what role do greenhouse gases play in influencing the Earth's climate? How can variations in solar activity affect Earth's climate? What are the main climate variables and how do they help define the climate of a region? What are ocean currents and how do they affect the global climate? Explain the importance of atmospheric circulation in the distribution of heat on Earth. What is the historical evidence of climate change linked to solar activity? Multiple-choice questions: Which of the following is not a major component of the solar system? a) Comets b) Meteorites c) Asteroids d) Planets What is the primary source of energy that drives the Earth's climate? a) Wind b) Geothermal energy c) Solar radiation d) Cosmic radiation What does the solar cycle represent? a) Changes in solar activity b) Water cycle c) Carbon cycle d) Climate cycle	Semi-structured verification.

Which of the following is not a greenhouse gas?

- a) Carbon dioxide (CO₂)
- b) Oxygen (O₂)
- c) Methane (CH₄)
- d) Water vapour (H₂O)

What is the albedo effect?

- a) Reflection of solar energy by the Earth
- b) Global warming
- c) Absorption of solar radiation by the atmosphere
- d) Distribution of temperatures on Earth

Reflection Questions:

How might variations in solar activity affect Earth's climate in the coming decades?

What are some of the main challenges that scientific research faces in studying the link between the solar system and the Earth's climate?

Questions about the application:

Imagine you're a scientist studying climate change. What types of data and tools would you use to monitor solar activity and its impact on the climate?

It analyzes the climate map of a region and explains how its geographical location and local atmospheric circulation affect its climate.

In-depth questions:

Discuss the long-term implications of variations in solar activity on human society and the environment.

How can global policies and actions help mitigate the effects of climate change caused by solar activity?

Multiple-choice question test:

1) What is the main component of the solar system responsible for generating energy through nuclear fusion?

- a) Moon
- b) Sun
- c) Venus
- d) Saturn

2) What is the primary source of light and heat for the Earth?

- a) Venus

E.g. tests already prepared by textbooks, multiple-choice tests.

- b) Mars
- c) Sun
- d) Jupiter

3) What does the solar cycle represent?

- a) The Earth's Seasons
- b) Changes in solar activity
- c) The water cycle
- d) The life cycle of stars

4) What is the main consequence of variations in solar activity for the Earth's climate?

- a) Rising global temperatures
- b) Decrease in rainfall
- c) Increased hurricane intensity
- d) Global cooling

5) What is the role of the greenhouse effect in influencing the Earth's climate?

- a) Absorption of solar radiation
- b) Reflection of solar radiation
- c) Trapping heat in the atmosphere
- d) Causing ocean acidification

6) What is the most abundant greenhouse gas in the Earth's atmosphere?

- (a) Azoto (No2)
- b) Oxygen (O2)
- c) Carbon dioxide (CO2)
- d) Water vapour (H2O)

7) How can variations in solar activity affect the Earth's average temperature?

- a) Increasing solar radiation
- b) Increasing greenhouse gas concentrations
- c) Reducing CO2 emissions
- d) Causing atmospheric cooling

8) What is the importance of ocean currents in regulating global climate?

- a) Ocean currents do not affect the Earth's climate.
- b) They transport heat from one ocean region to another, influencing the climate.
- c) They cause sea level rise.
- d) They contribute to coastal erosion.

9) What does the albedo effect represent with respect to the Earth's climate?

- a) The reflection of solar energy from the Earth's surface
- b) Heat generated by volcanoes

c) The amount of cosmic radiation that reaches the Earth d) Daily temperature change 10) What is the main historical evidence of climate change linked to solar activity? a) Increase in CO₂ concentrations in the atmosphere b) Fluctuations in the global average temperature c) Changes in the distribution of precipitation (d) Sea level rise	
Multiple-choice questions: What is the main component of the solar system responsible for generating energy through nuclear fusion? a) Moon b) Sun c) Venus d) Saturn What is the primary source of light and heat for the Earth? a) Venus b) Mars c) Sun d) Jupiter What does the solar cycle represent? a) The Earth's Seasons b) Changes in solar activity c) The water cycle d) The life cycle of stars What is the main consequence of changes in solar activity for the Earth's climate? a) Rising global temperatures b) Decrease in rainfall c) Increased hurricane intensity d) Global cooling What is the role of the greenhouse effect in influencing the Earth's climate? a) Absorption of solar radiation b) Reflection of solar radiation c) Trapping heat in the atmosphere d) Causing ocean acidification What is the most abundant greenhouse gas in the Earth's atmosphere? (a) Azoto (No₂) b) Oxygen (O₂)	Multiple-choice tests.

- c) Carbon dioxide (CO₂)
- d) Water vapour (H₂O)

How can variations in solar activity affect the Earth's average temperature?

- a) Increasing solar radiation
- b) Increasing greenhouse gas concentrations
- c) Reducing CO₂ emissions
- d) Causing atmospheric cooling

What is the importance of ocean currents in regulating global climate?

- a) Ocean currents do not affect the Earth's climate.
- b) They transport heat from one ocean region to another, influencing the climate.
- c) They cause sea level rise.
- d) They contribute to coastal erosion.

What does the albedo effect represent with regard to the Earth's climate?

- a) The reflection of solar energy from the Earth's surface
- b) Heat generated by volcanoes
- c) The amount of cosmic radiation that reaches the Earth
- d) Daily temperature change

What is the main historical evidence of climate change linked to solar activity?

- a) Increase in CO₂ concentrations in the atmosphere
- b) Fluctuations in the global average temperature
- c) Changes in the distribution of precipitation
- d) Sea level rise

What are the main components of the solar system?

- a) The Sun, the Earth, the Moon and Mars
- b) The Sun, planets, moons, asteroids and comets
- c) The Sun, the solar wind and artificial satellites
- d) The Sun, stars and galaxies

What is the closest planet to the Sun in our solar system?

- a) Land
- b) Venus
- c) Mars
- d) Jupiter

What are sunspots?

- a) Regions of heavy precipitation on Earth
- b) Regions of intense seismic activity on the Moon
- c) Colder and darker regions on the Sun's surface
- d) Regions of high pressure in the Earth's atmosphere

What is the process that converts solar energy into thermal energy in the Earth's atmosphere?

- a) Photosynthesis
- (b) Greenhouse effect
- (c) Atmospheric circulation
- d) Conduction

What is the main cause of the rainy season in many tropical regions?

- (a) Greenhouse effect
- b) Precession of the equinoxes
- c) Change in solar activity
- d) Earth's rotation

What is the most influential greenhouse gas in triggering global warming?

- a) Carbon dioxide (CO₂)
- b) Oxygen (O₂)
- c) Azoto (N₂)
- d) Methane (CH₄)

What is the name of the atmospheric phenomenon that occurs when water vapor condenses and forms water droplets or ice crystals?

- (a) Evaporation
- (b) Precipitation
- c) Infiltration
- d) Perspiration

What is the term for the movement of water rising to the Earth's surface due to solar heating?

- (a) Convection
- (b) Conduction
- (c) Radiation
- d) Evaporation

What is the term for the temperature difference between day and night?

- a) Albedo effect
- b) Climate change
- c) Solar cycle
- d) Amplitude of temperature

What is the main cause of the natural greenhouse effect on Earth?

- a) Cosmic radiation
- (b) Greenhouse gas emissions
- c) Volcanic activity
- d) Solar radiation

Answers:

- b) Sun

- c) Sun
- b) Changes in solar activity
- a) Rising global temperatures
- c) Trapping heat in the atmosphere
- d) Water vapour (H₂O)
- a) Increasing solar radiation

Skills acquired

After participating in the lecture on the solar system and its influence on climate, students should have acquired various skills, including:

Understanding the Solar System: Students have developed a solid understanding of the major components of the solar system, including the Sun, planets, moons, asteroids, and comets.

Analyzing the Sun's influence: They learned how the Sun acts as the primary source of energy for the Earth through solar radiation and understood the importance of variations in solar activity, such as sunspots, in shaping Earth's climate.

Examining the Earth's Climate: Students are now able to identify and explain the key variables that affect the Earth's climate, including temperature, precipitation, atmospheric circulation, and the greenhouse effect.

They linked the information they learned about the components of the solar system and the Sun's influence to Earth's climate dynamics, recognizing the crucial role of the solar system in determining Earth's climate.

Science Skills: Students have developed skills in critically evaluating scientific evidence, interpreting climate data, and understanding the causes of past and future climate change.

Critical thinking: They exercised critical thinking in linking variations in solar activity to climate fluctuations and in discussions about the long-term implications of those changes.

Communication skills: Students have improved their ability to communicate complex scientific concepts clearly and understandably through discussion and group activities.

Environmental Awareness: The class contributed to students' awareness of the importance of understanding the link between the solar system and Earth's climate to address environmental challenges related to climate change.

Research skills: Students were encouraged to explore the topic further through individual or group research, thereby developing research and presentation skills.

Overall, the lecture provided students with a solid foundation for understanding how the solar system influences the Earth's climate and promoted awareness of the environmental challenges

related to climate change, encouraging them to consider how scientific research can help address these challenges.

Lesson No. 8 - Sustainability and Climate Change

Lesson plan

Keywords: sustainability, climate change mitigation, renewable energy, carbon footprint, environmental conservation.

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities

School: first two years of secondary school.

Objectives
Main Objective: Understand the fundamental concepts related to climate change and environmental sustainability. Specific objectives: 1. Identify the main causes of climate change and the role of human activities in these changes. 2. Examine the effects of climate change on the Earth and global communities. 3. Understand the importance of sustainability as a solution to climate-related problems. 4. Explore individual and collective actions to promote sustainability and address climate change. 5. Analyze global policies and initiatives aimed at mitigating climate change. 6. Assess how climate change affects different regions of the world and their economies. 7. Stimulate reflection on the social and economic impacts of climate change. 8. Promote awareness of the need for global collaboration to address climate change.

Lesson content	References	Methodology
Lesson structure: Introduction (10 minutes): - Welcome students and explain the objectives of the lesson. - Briefly discuss the meaning of climate change and environmental sustainability. Section 1: Causes of Climate Change (15 minutes):	https://www.cambiamenti-climatici.it/sostenibilita/agenda2030 https://lab24.ilsole24ore.com/sostenibilita-ambientale-2020/?refresh_ce=1	Lectures and/or dialogues.

- Explain the main causes of climate change, including greenhouse gas emissions and the greenhouse effect.
- Use charts and data to illustrate global emissions trends.
- Lead a guided discussion on how human activities contribute to climate change.

Section 2: Effects of Climate Change (10 minutes):

- Examine the effects of climate change on Earth, including rising temperatures, changes in weather patterns, melting glaciers, and rising sea levels.
- Highlight impacts on ecosystems and human communities in different parts of the world.

Pause/Interactive Activity (10 minutes):

- Quizzes or small group discussion on the causes and effects of climate change.

Section 3: Sustainability as a solution (15 minutes):

- Explain the concept of sustainability and how it can help mitigate climate change.
- Present examples of sustainable practices, such as renewable energy, waste reduction, and sustainable mobility.
- Discuss how people can adopt a more sustainable lifestyle.

Section 4: Actions and Policies (10 minutes):

- Review global and national policies to address climate change, such as the Paris Agreement.
- Discuss the collective actions needed to reduce global emissions and promote sustainability.

Conclusions and reflections (5 minutes):

- Summarize the key points of the lesson.
- Stimulate reflection on the social and economic impacts of climate change.
- Invite students to share their ideas on how to contribute to sustainability and address climate change.

Final activity (5 minutes):

- Ask students to write a brief reflection on how they plan to adopt more sustainable behaviors in their daily lives.

Questions and answers (5 minutes):

- Answer students' questions and clarify any doubts.

Assignment (if applicable):

- If you want to assign a task or project related to climate change, provide instructions and deadlines.

Closing (2 minutes):

- Thank students for their participation and interest.
- Summarize the importance of addressing climate change and promoting sustainability.

This lesson structure can be adapted according to the level of the students, the time available, and the teaching resources. Additionally, it is important to keep the lesson engaging and interactive to maximize student learning.		
Slides for the lecture "Sustainability and Climate Change": Slide 1: Title - Title: "Sustainability and Climate Change" - Subtitle: Understanding the Link Between Human Actions and Climate Change Slide 2: Introduction Welcome! Today we are going to talk about sustainability and climate change. Objective: To understand humanity's role in climate change. Slide 3: Key Definitions Climate change: what is it and why is it important? Sustainability: the key to tackling climate change. Slide 4: Causes of Climate Change Main causes: greenhouse gas emissions, greenhouse effect. Global Emissions Chart: how have they changed over time?	https://unesdoc.unesco.org/ark:/48223/pf0000373060_ita#:~:text=URL%3A%20https%3A%2F%2Funesdoc.unesco.org%2Fark%3A%2F48223%2Fpf0000373060_ita%0Avisible%3A%200%25%20 https://unric.org/it/che-cosa-sono-i-cambiamenti-climatici/	Slides for the lecture. These slides provide a foundation for your lecture on sustainability and climate change. You can enhance them with additional images, charts, and data to make the presentation more engaging and informative.

Slide 5: The Role of Humans

How human activities contribute to climate change.
Examples: industry, transport, agriculture.

Slide 6: Effects of climate change

Rising temperatures: impacts on climate and ecosystems.
Melting glaciers and sea level rise: coastal impacts.

Slide 7: Effects on ecosystems and communities

Changes in terrestrial and marine ecosystems.
Impacts on human communities: extreme weather events, food security.

Slide 8: Interactive Activity

Quiz: Test your knowledge of climate change and sustainability.

Slide 9: Sustainability as a solution

What is sustainability and why is it important?
Examples of sustainable practices: renewable energy, recycling, waste reduction.

Slide 10: Individual Actions

How each of us can adopt a more sustainable lifestyle.
Reduction of personal emissions: transport, energy consumption.

Slide 11: Global Policies and Initiatives

The Paris Agreement: global goals and commitments.
National policies to tackle climate change.

Slide 12: Social and economic impacts

How climate change affects economies and societies.
The need for adaptation and resilience.

Slide 13: Global Collaboration

The importance of international collaboration in the fight against climate change.
The role of international organizations.

Slide 14: Final thoughts

Summary of the key points of the lesson.
Encouragement to reflect on how each individual can contribute to sustainability.

Slide 15: Final activity

Write a brief reflection on how you plan to adopt more sustainable behaviors in your daily life.

Slide 16: Questions and answers

Answer students' questions and clarify doubts.

Slide 17: Assignment (if applicable)

If there is a related task or project, provide instructions and deadlines.

Slide 18: Closing

Thank the students for their participation and interest. It stresses the importance of tackling climate change.

Activity	Methodology
Post-class activity: Environmental Awareness Project Objective: Students will create an environmental awareness project that educates the school or local community about climate change and sustainability. Arrangement: 1. Select a theme: Students should choose a specific theme related to climate change or sustainability to focus on in their project. Examples of topics include reducing the carbon footprint, recycling, conserving water, or promoting sustainable transportation. 2. Research and information: Students must conduct thorough research on their chosen topic to gather relevant data, statistics, and information. 3. Project Development: Based on their research, students should develop an environmental awareness project. The project may include elements such as: - Creation of informative posters or flyers. - Organization of events or workshops on sustainability. - Running a social media campaign to raise awareness. - Fundraising to support local environmental initiatives. 4. Implementation: Students should implement their project within the school or local community. They can work in groups or individually, depending on the scope of the project. 5. Evaluation: At the end of implementation, students should evaluate the effectiveness of their project and gather feedback from the community on how it has affected environmental awareness. 6. Presentation: Students must prepare a presentation or report documenting their project, including the results, challenges, and lessons learned. 7. Class Discussion: Organize a classroom discussion session where students can share their projects, experiences, and discoveries with	Research project with the aim of creating a <i>peer to peer</i> approach.

classmates. This can further stimulate discussions on sustainability and climate change. 8. Project Exhibition: Host a project exhibition event where students can showcase their projects to the school or local community to maximize the impact of their initiative.	

Checks	Typology
Structured assessment consisting of 20 questions on sustainability and climate change: Section 1: Conceptual Questions (8 questions) 1. What is climate change and what is its impact on the Earth? 2. What are the main causes of climate change? 3. Explain the concept of the greenhouse effect and its role in climate change. 4. How do human activities contribute to climate change? 5. What is the importance of sustainability in tackling climate change? 6. Provide three examples of sustainable practices that can help combat climate change. 7. What does the Paris Agreement represent and what are its objectives? 8. How can the impacts of climate change affect global food security? Section 2: Questions about Effects and Impacts (6 questions) 9. What are some effects of climate change on coastal communities? 10. How can climate change affect terrestrial and marine ecosystems? 11. What are the social and economic challenges associated with climate change? 12. How can climate change affect the availability of water resources? 13. How are changes in weather patterns related to climate change? 14. What is the importance of biodiversity in the fight against climate change?	Structured assessment with different types of questions.

Section 3: Actions and Solutions (6 questions) 15. What are some individual actions people can take to reduce their carbon emissions? 16. What does it mean to "reduce the ecological footprint" and how can it be achieved? 17. How can national and international policies contribute to mitigating climate change? 18. Why is sustainable mobility important in the context of sustainability? 19. How can international organizations facilitate global collaboration to address climate change? 20. What is the importance of environmental awareness and education in promoting sustainability?	
Structured test with questions Structured test of 20 questions on sustainability and climate change: Section 1: Conceptual Questions (4 points each) 1. What is climate change and what is its root cause? 2. Describe the concept of the greenhouse effect and explain how it affects the Earth's climate. 3. What is the main objective of the Paris Climate Agreement? 4. What does "sustainability" mean and why is it important for tackling climate change? Section 2: Questions about effects and impacts (4 points each) 5. What are some of the effects of climate change on coastal communities? 6. Explain how climate change can affect terrestrial and marine ecosystems. 7. How can climate change affect global food security? 8. What are the social and economic challenges associated with climate change? Section 3: Actions and solutions (4 points each)	Structured Verification

9. Provide three examples of sustainable practices that can help mitigate climate change.

10. What can people do to reduce their carbon emissions in their daily lives?

11. Explain the importance of sustainable mobility in the context of sustainability.

12. How can national and international policies contribute to climate change mitigation?

Section 4: Insights (4 points each)

13. Discuss the challenges related to water management in the context of climate change.

14. Explain how variations in weather patterns may be linked to climate change.

15. What does "reducing the ecological footprint" mean and what are the steps to achieve it?

16. What is the role of biodiversity in the fight against climate change?

Section 5: Practical application (4 points each)

17. Imagine you're a consultant for a company. What suggestions would you provide to improve the sustainability of their operations?

18. Propose a concrete strategy to engage your school community in promoting sustainability.

19. How could you use the information learned in the sustainability and climate change class to make more sustainable decisions in your daily life?

20. Imagine you are a representative of a country at the United Nations. What measures would you propose to tackle climate change on a global scale?

Calculate the total score by awarding 1 point for each correct answer

Multiple-choice test with 10 questions:

What is the root cause of climate change?

- A) Volcanic activity
- B) Human activities
- C) Natural cycles

Test with multiple-choice answers.

D) Solar variations

What does the Paris Agreement stand for?

- A) A global trade agreement
- B) A treaty to colonize Mars
- C) An agreement to reduce greenhouse gas emissions
- D) An agreement to increase trade tariffs

What is the greenhouse effect?

- A) A type of agricultural greenhouse
- B) The effect of greenhouse gases in the Earth's atmosphere
- C) A type of garden greenhouse
- D) The effect of volcanoes on the earth's temperature

What are greenhouse gases?

- A) Gases used in the kitchen
- B) Gases that cause climate cooling
- C) Gases that trap heat in the atmosphere
- D) Gases present only in outer space

Which of the following is NOT an effect of climate change?

- A) Sea level rise
- B) Melting glaciers
- C) Increase in oil reserves
- D) Global temperature rise

What is one of the main impacts of climate change on marine ecosystems?

- A) Increasing biodiversity
- B) Reduction of polluted water
- C) Ocean acidification
- D) Disappearance of sea storms

What does "sustainability" mean in environmental terms?

- A) Excessive use of resources
- B) Use resources to your advantage
- C) Use resources without consideration for future generations
- D) Use resources responsibly for present and future well-being

What is one way people can reduce their carbon emissions?

- A) Increased consumption of fossil fuels
- B) Reduce recycling
- C) Use of public transport

D) Waste of water

What is one of the main objectives of sustainable mobility?

- A) Increased air pollution
- B) Promotion of fossil fuel vehicles
- C) Reduction of greenhouse gas emissions from transport
- D) Increased traffic congestion

What is one of the social impacts of climate change?

- A) Increasing global economic well-being
- B) Forced migration due to extreme weather events
- C) Reduction of tensions between nations
- D) Growth in global food production

You can now use this checkmark test to assess students' knowledge about sustainability and climate change.

Skills acquired

1. Understanding of Climate Change: Students should have a solid understanding of key concepts related to climate change, including its causes, effects, and impacts on natural and human systems.
2. Knowledge of the causes: They should be able to identify the main causes of climate change, in particular the role of human activities, including greenhouse gas emissions.
3. Environmental Awareness: Students should develop a greater awareness and sensitivity to the importance of environmental conservation and the need for sustainable action.
4. Knowledge of solutions: They should be able to identify and describe sustainable solutions and practices that can help mitigate climate change, such as the use of renewable energy, recycling, and the promotion of sustainable mobility.
5. Knowledge of environmental policies: Students should be aware of global policies and agreements aimed at combating climate change, such as the Paris Agreement, and understand the role of national policies in this fight.
6. Assessment skills: They should be able to assess the social and economic impacts of climate change and understand the need for adaptation and resilience strategies.
7. Ability to act: Students should gain the ability to take practical actions to reduce their carbon emissions and promote sustainability in their daily lives.
8. Communication skills: They should be able to communicate concepts related to climate change and sustainability clearly and persuasively, both in written and oral form.

9. Collaborative skills: Students should develop the ability to work in a team and collaborate with others to address challenges related to climate change and sustainability.

10. Critical reflection: They should be able to critically reflect on their individual and collective responsibility in promoting sustainability and addressing climate change.

These skills are essential for tackling climate change issues and helping to build a more sustainable future for our planet

Lesson No. 9 - Smart City, City and Climate

Lesson plan

Keywords: smart cities, urban planning, climate-resilient cities, sustainable urban development, green infrastructure

Timetable: 90-minute lesson, 90-minute activity, 60-minute test. Any other activities

School: first two years of secondary school.

Objectives
Main objectives:
1. Understand the concept of "Smart City": Students should be able to define and explain what a Smart City is and how it differs from traditional cities.
2. Understand the impact of cities on climate: Students should gain a solid understanding of how cities affect climate change through their activities, infrastructure, and behaviors.
3. Explore solutions for sustainable urban management: Students should be able to identify and evaluate different solutions and technologies that cities can adopt to address climate challenges.

Lesson content	References	Methodology
Step 1: Introduction (10 minutes) - Greet students and introduce the objectives of the lesson. - Briefly discuss what students already know about smart cities and climate change.	Materials needed: - Whiteboard or projection screen - Visual aids (images, graphics, videos)	Lectures and group work.

Step 2: Defining a Smart City (15 minutes) - Explain the concept of Smart City and its key features. - Provide examples of smart cities from around the world. - Guided discussion: What advantages could Smart Cities offer in terms of environmental sustainability?	- Worksheets or notebooks for students - Computer and internet access (for research and presentations).	
Step 3: Impact of cities on climate (20 minutes) - Describe how cities contribute to greenhouse gas emissions and air pollution. - Illustrate the effect of cities on local microclimates and urban temperatures. - Provide examples of extreme weather events related to urbanization. - Guided discussion: What are the main environmental challenges related to cities?	https://www.culturedigitali.org/smart-city-platform-il-futuro-sostenibile-delle-citta/ HTTPS://Commission.Europa.U/U-Regional-and-Urban-Development/Topics/Cities-and-Urban-Development/City-Initiatives/Smart-Cities_N	
Phase 4: Technologies and initiatives for sustainable cities (25 minutes) - Present innovative technologies and initiatives for urban sustainability. - Analyze case studies of cities that have implemented successful sustainability projects. - Guided discussion: How can technologies help make cities more sustainable?	https://www.lumi4innovati.on.it/smart-city-cose-come-funziona-caratteristiche-ed-esempi-in-italia/	
Step 5: Hands-on activity or group project (15 minutes) - Assign a group project: students must imagine designing a sustainable solution for an imaginary or real city. - Explain the project guidelines. - Group work and preparation of presentations.		
Step 6: Presentation of group projects (10 minutes) - Each group presents its own sustainable solution for the city. - Class discussion and questions for each group.		

Step 7: Summary and homework (5 minutes) - Summarize the key concepts covered in the lesson. - Assign homework assignments or suggest further reading to deepen your understanding of the topic. Step 8: Conclusion (5 minutes) - Thank the students for their participation and recap the objectives of the lesson. This lesson structure should keep students engaged and allow them to learn key concepts about the relationship between smart cities, cities, and climate. You can adjust the duration of the different stages based on the specific needs of your class and how deeply you want to explore the concepts.		
Slides of the lesson "Smart City, City and Climate": Slide 1: Introduction - Titolo: Smart City, Cities, and Climate - Subtitle: Understanding the relationship between urbanization and the environment. - Objective: Introduce the topic and objectives of the lesson. Slide 2: Lesson Objectives - Main objectives: - Understand the concept of Smart City. - Explore the impact of cities on the climate. - Analyze solutions for sustainable smart urban management. - Specific objectives: - Definition of Smart City. - Impact of cities on climate. - Technologies and initiatives for sustainable cities. Slide 3: Definition of Smart City - Title: What are Smart Cities?	https://vv2.deloitte.com/us/n/insights/industry/public-sector/inclusive-smart-cities.html https://www.c40.org	Lesson slides

- Definition: Smart cities use advanced technologies to improve citizens' quality of life and resource efficiency.
- Key features: Connectivity, mobility, sustainability, citizen participation.

Slide 4: Smart City Examples

- Title: Examples of Smart Cities Worldwide
- Examples: Singapore, Barcelona, Amsterdam, Songdo (South Korea).
- Display iconic images of these cities.

Slide 5: Impact of cities on climate

- Title: How Cities Affect Climate
- Greenhouse gas emissions: industry, transport, energy consumption.
- Urban heat island effect: increase in urban temperatures.

Slide 6: Urban Air Pollution

- Titolo: Urban Air Pollution
- Effects: public health, smog, respiratory diseases.
- Factors: vehicle emissions, industries, domestic heating.

Slide 7: Extreme Weather Events

- Title: Climate-related events in cities
- Examples: urban floods, heat waves, droughts.
- Relationship with urbanization: changes in climate patterns.

Slide 8: Smart City Technologies

- Title: Innovative solutions for cities
- Eco-friendly public transport: trams, subways, electric buses.
- Renewable energy: solar panels, urban wind turbines.
- Smart waste management: collection and recycling.

Slide 9: Successful Sustainable Cities

- Titolo: Successful City Cases

- Case studies: Curitiba (Brazil), Copenhagen (Denmark), San Francisco (USA).
- Positive results and impact on the climate.

Slide 10: Discussions and Reflections

- Title: Challenges and Opportunities
- Class discussion: How can smart cities address climate challenges?
- Invite students to share ideas and opinions.

Slide 11: Practical Activity or Group Project

- Title: Designing a Sustainable City
- Activity description: Students will work in groups to design an imaginary or real sustainable city.
- Objective: to integrate the concepts learned in class and propose innovative solutions.

Slide 12: Presentation of group projects

- Title: Sustainable Solutions
- Each group presents its proposal for a sustainable city.
- Class discussion and questions.

Slide 13: Summary and Homework

- Title: Lesson Summary
- Summarize the key concepts covered in the lesson.
- Assign homework or suggest further reading.

Slide 14: Conclusion

- Title: Thank you for participating
- Thank students for their participation and review the lesson objectives.
- Preview the next lesson, if any.

Activity	Methodology
Activity: Simulation of a meeting of the City Council of Sustainability	Role-playing

Objective of the activity: Students will have the opportunity to apply what they have learned during the lesson on Smart Cities and climate, exercising their creativity and problem-solving skills. Arrangement: 1. Divide students into groups and assign them to simulate a city council meeting for a fictional or real city. 2. Each group will represent their city's city council and discuss and make decisions on how to improve the city's sustainability. 3. Assign to each group a specific set of environmental and sustainability challenges and opportunities, such as reducing greenhouse gas emissions, energy efficiency, sustainable mobility or waste management. 4. Students should develop concrete proposals to address challenges and take advantage of opportunities, considering aspects such as budget, citizen involvement, and technical feasibility. 5. Each group must present its proposal during the city council simulation. Each presentation should include a description of the challenge faced, an explanation of the proposed solution, and a discussion of the advantages and disadvantages of the proposal. 6. After each presentation, other groups will have the opportunity to ask questions and provide feedback. 7. At the end of the simulation, students will vote on the proposals submitted and select the one they consider most effective and sustainable for their "city". 8. Conclude the activity with a general discussion on the decisions made and the learning outcomes. Ask students to reflect on how urban sustainability can be implemented in reality and how they can contribute to making cities more sustainable. This activity will not only help students consolidate their understanding of the concepts covered in the lesson, but it will also engage them in a critical and creative thinking exercise as they seek solutions to real environmental and urban challenges.	

Checks	Typology
Structured assessment with 20 questions to assess students' understanding of the "Smart City, City and Climate" lesson.	Structured verification.
Section 1: Basic Definitions and Concepts (4 questions)	These questions cover a variety of topics and

1. What is a Smart City and what are some of its key features?

2. What are the primary objectives of a Smart City?

3. Explain the concept of the "urban heat island effect" and how it can impact cities.

4. What are some innovative technologies used to make cities smarter and more sustainable?

Section 2: Impact of cities on climate (4 questions)

5. How do cities contribute to greenhouse gas emissions?

6. What is urban air pollution and what are its effects?

7. What is the relationship between urbanization and extreme weather events?

8. How can cities affect the local microclimate?

Section 3: Sustainable Solutions for Cities (4 questions)

9. Provide examples of renewable energy sources that cities can adopt.

10. What are some strategies for promoting eco-friendly public transport in a city?

11. What does "smart waste management" mean and why is it important for urban sustainability?

12. Can you cite some examples of cities that have launched successful sustainability projects?

Section 4: Discussions and Reflections (4 questions)

13. What are the main environmental challenges related to modern cities?

14. How can citizen participation contribute to the sustainability of cities?

15. Do you have any ideas on how your city could improve its sustainability? Share.

16. What are some key considerations when designing a sustainable solution for a city?

Section 5: Group Project (4 questions)

levels of complexity, allowing students to demonstrate their understanding comprehensively. You can further customize these questions based on the level of the students and the specific goals of your class.

17. During the activity of the group project, what environmental challenge did your group face and what solution did you propose? 18. What were the main strengths of your group's proposal? 19. What was the outcome of the vote at the end of the city council simulation? Has your proposal been accepted? 20. What did you learn from this lesson on Smart Cities and urban sustainability that you think will influence your future views and actions?	
Test with 20 multiple-choice questions to assess students' understanding of the "Smart City, City and Climate" lesson. Each question has four answer options, with only one correct. Section 1: Basic Definitions and Concepts (4 questions) 1. Cos'è una Smart City? a) A city with many cultural activities. b) A city with a high population. c) A city that uses advanced technologies to improve quality of life and resource efficiency. d) A city that is not technologically developed. 2. What are some key features of a Smart City? a) Congested transport and air pollution. b) Advanced technologies, sustainability, citizen participation. c) Traditional architecture, heavy industry, low population density. d) Scarcity of natural resources, economic inequality, high levels of crime. 3. What is the urban heat island effect in a city? a) An increase in temperatures in an oceanic area. b) An area where temperatures are lower than the surrounding areas. c) An increase in temperatures in a city due to urbanization and heat absorption. d) A geographical region with very cold winters. 4. What is one of the main objectives of Smart Cities? a) Increase greenhouse gas emissions. b) Reduce energy efficiency. c) Improving the quality of life of citizens. d) Promote the intensive use of non-renewable resources. Section 2: Impact of cities on climate (4 questions) 5. How do cities contribute to greenhouse gas emissions? (a) Absorption of greenhouse gases from the atmosphere. b) Reduce emissions through urbanization.	Multiple-choice tests.

- c) Greenhouse gas emissions through transport and industry.
- d) Using only renewable energy.

6. What is urban air pollution?

- a) Clean air in cities.
- b) The emission of perfumes into the air.
- c) The emission of polluting gases and particles into urban air.
- d) The smell of cities.

7. What is the urban heat island effect?

- a) A meteorological phenomenon that occurs only in coastal cities.
- b) An increase in rainfall in cities.
- c) An increase in urban temperatures compared to the surrounding areas.
- d) A decrease in urban temperatures compared to the surrounding areas.

8. What is the connection between urbanization and extreme weather events?

- a) Cities do not influence extreme weather events.
- b) Cities tend to have fewer extreme weather events.
- c) Cities can contribute to extreme weather events such as floods and heat waves.
- d) Extreme weather events never occur in cities.

Section 3: Sustainable Solutions for Cities (4 questions)

9. What are some renewable energy sources that cities can adopt?

- (a) Coal and oil.
- (b) Natural gas and nuclear power.
- c) Solar, wind and hydroelectric energy.
- d) Fossil fuels.

10. What is the main goal of smart waste management in a city?

- a) Increase the production of waste.
- (b) Improving recycling and waste collection.
- c) Increase the dispersion of waste in the environment.
- d) Reduce citizens' involvement in waste management.

11. What do eco-friendly public transport options represent in sustainable cities?

- (a) Heavy goods vehicles.
- b) Coal-fired public transport.
- c) Low-emission public transport options such as trams, metros and electric buses.
- d) A public transport service for tourists only.

12. What is one of the benefits of solar energy in Smart Cities?

- a) Increased greenhouse gas emissions.
- b) Lower energy costs for citizens.

- c) Emission of air pollutants.
- d) Lack of sunlight in cities.

Section 4: Discussions and Reflections (4 questions)

13. What are some of the major environmental challenges associated with modern cities?

- a) Pollution of the oceans.
- b) Efficient public transport.
- c) Climate change and air pollution.
- (d) Reliable energy supply.

14. How can citizen participation contribute to the sustainability of cities?

- a) Citizen participation has no impact on the sustainability of the city.
- b) Participation can help set priorities and support sustainable projects.
- c) Participation increases the consumption of natural resources.
- d) Participation can cause conflict in cities.

15. Do you have any ideas on how your city could improve its sustainability? Share.

- a) Yes, I have specific ideas.
- b) No, I don't have any ideas at the moment.
- c) I don't think it's necessary to improve the sustainability of my city.
- d) I have never thought about this problem.

16. What are some key considerations when designing a sustainable solution for a city?

- (a) Budgetary considerations are not necessary.
- b) The focus should be solely on technology.

Simple Multiple Choice

True/False: A simple multiple-choice test with 20 questions on the "Smart City, City and Climate" lesson:

True/False: A Smart City uses advanced technologies to improve the quality of life of citizens.

True/False: The urban heat island effect in a city refers to a decrease in urban temperatures compared to surrounding areas.

True/False: Cities contribute to greenhouse gas emissions through transportation and industry.

True/False: Urban air pollution refers to the emission of polluting gases and particles into urban air.

True/False: Cities can affect local microclimates and increase urban temperatures.

Simple test with multiple choice (V or F) answer.

True/False: Solar energy is considered a renewable energy source that cities can adopt.

True/False: Smart waste management aims to improve recycling and waste collection.

True/False: Eco-friendly public transportation in sustainable cities includes options such as trams, subways, and electric buses.

True/False: Citizen participation can help prioritize and support sustainable projects in cities.

True/False: Urbanization has no impact on extreme weather events.

True/False: Extreme weather events never occur in cities.

True/False: Smart cities seek to increase greenhouse gas emissions.

True/False: Technology is a key element in making a city smart and sustainable.

True/False: Cities can only contribute to greenhouse gas emissions through industry.

True/False: The urban heat island effect can increase urban temperatures relative to surrounding areas.

True/False: Citizen participation has no impact on the sustainability of cities.

True/False: Urban air pollution is the smell of cities.

True/False: Smart waste management increases the dispersion of waste in the environment.

True/False: Urbanization can affect extreme weather events such as floods and heat waves.

True/False: The sustainability of the city is an important goal to improve the quality of life of citizens.

Skills acquired

Skills acquired by the lesson:

Understanding Smart Cities: Students will learn to define and understand key concepts related to Smart Cities, including their main goals and characteristics.

Environmental Awareness: Students will develop a greater awareness of the impact of cities on the environment, including the effects on climate change and air pollution.

Knowledge of green technologies: Students will become familiar with sustainable technologies and initiatives used in cities, such as renewable energy, eco-friendly public transportation, and smart waste management.

Analytical and reflective skills: students will be able to analyze the environmental challenges related to cities and reflect on possible solutions to address them.

Design skills: Through group project activity, students will develop design skills and creative thinking in the search for sustainable solutions for cities.

Citizen participation: Students will understand the importance of citizen participation in setting priorities and promoting sustainable projects in cities.

Presentation skills: During group project presentations, students will improve their communication and presentation skills.

Understand the links between climate and cities: Students will be able to link urbanization to climate change and extreme weather events.

Critical Thinking: Students will develop critical thinking skills in the analysis of environmental challenges and in the evaluation of proposed solutions.

Understanding the importance of urban sustainability: Students will gain a deeper understanding of the importance of making cities more sustainable to improve the quality of life of citizens and protect the environment.

These skills will be invaluable for students to not only better understand the relationship between Smart Cities, cities, and climate, but also to be informed and active citizens who can help promote sustainability in their communities.

Lesson No. 10 - Extreme Weather Events

Lesson plan

Keywords: hurricanes, heat waves, floods, droughts, tornadoes

Timetable: 90 minutes lesson, 90 minutes activity, 60 minutes test. Any other activities

School: first two years of secondary school.

Objectives
Main Objective:
Provide students with a comprehensive understanding of extreme weather events, their causes, impacts, and adaptation and mitigation strategies.
Specific objectives:

Understanding Extreme Weather Events:

- Define what extreme weather events are.
- Identify different types of extreme weather events, such as storms, floods, droughts, heat waves, etc.

Analysis of the causes of extreme weather events:

- Explore the natural and anthropogenic causes of extreme weather events.
- Discuss the effect of increased greenhouse gas emissions on climate change.

Assessment of the impacts of extreme weather events:

- Identify impacts on ecosystems, human societies, economies and infrastructure.
- Examine historical examples of extreme weather events and the resulting damage.

Studying adaptation strategies:

- Discuss adaptation strategies to deal with extreme weather events, such as dam construction, climate-resilient urban planning, and water management.
- Review case studies of communities or countries that have effectively adopted adaptation strategies.

Exploring Mitigation Strategies:

- Present mitigation strategies to reduce greenhouse gas emissions and slow climate change.
- Analyze the importance of renewable energy, energy efficiency and emission reduction policies.

Promote Individual Awareness and Action:

- Encourage students to reflect on their daily actions and how they can help mitigate climate change and adapt to extreme weather events.
- Suggest ways to raise awareness of the issue among friends and family.

Develop critical research skills:

- Encourage students to explore reliable sources of information to deepen their understanding of extreme weather events.
- Teach critical analysis skills to evaluate news and information related to climate change.

Provide a global perspective:

- Explore how extreme weather events affect different regions of the world in various ways.
- Discuss the importance of international cooperation in the fight against climate change.

Promote active participation:

- Encourage students to participate in local projects or actions related to environmental sustainability and climate resilience.

- Stimulate discussion on public policies and government initiatives to address climate change.

Lesson content	References	Methodology
I. Introduction (10 minutes) - Welcome students and present the objectives of the lesson. - Explain the importance of extreme weather events in modern society.	Materials needed: - Projector or whiteboard - Diagrams, graphs and images - Articles or online resources - Quizzes or discussion questions for class discussion	Lectures with practical experience and dialogues.
II. Understanding Extreme Weather Events (15 minutes) - Define extreme weather events. - Discuss different types of extreme weather events (storms, floods, droughts, etc.).	https://unric.org/it/effetti-del-cambiamento-climatico/ https://www.esg360.it/environmental/eventi-meteo-estremi-cosa-sono-e-perche-sono-legati-al-climate-change/	
III. Causes of extreme weather events (15 minutes) - Explore natural causes (e.g., meteorological phenomena) and anthropogenic causes (e.g., climate change). - Use charts and graphs to illustrate the increase in greenhouse gas emissions.		
IV. Impacts of extreme weather events (15 minutes) - Identify impacts on ecosystems, societies, economies and infrastructure. - Present historical examples of extreme weather events and the resulting damage.		
V. Adaptation strategies (15 minutes) - Discuss adaptation strategies such as climate-resilient urban planning and water management.		

- Review case studies of communities or countries that have effectively adopted adaptation strategies.

VI. Mitigation Strategies (10 minutes)

- Present mitigation strategies to reduce greenhouse gas emissions.
- Discuss the importance of renewable energy, energy efficiency, and emission reduction policies.

VII. Promoting Awareness and Individual Action (10 minutes)

- Encourage students to reflect on their daily actions that can help mitigate climate change.
- Suggest ways to raise awareness among friends and family.

VIII. Global Perspective (10 minutes)

- Discuss how extreme weather events affect different regions of the world in various ways.
- Examine the importance of international cooperation in the fight against climate change.

IX. Active participation (10 minutes)

- Encourage students to think about local projects or actions related to environmental sustainability and climate resilience.
- Discuss public policies and government initiatives to address climate change.

X. Evaluation (5 minutes)

- Use quizzes, class discussions, or written assignments to assess students' comprehension. XI. Conclusion and summary (5 minutes) - Summarize the key points of the lesson. - Invite students to ask questions or share final thoughts. XII. Compiti a casa (5 minutes) - Assign additional assignments or readings to deepen students' understanding of extreme weather events. This lesson structure provides a comprehensive overview of the topic, encourages student participation, and provides opportunities for further exploration. You can adjust the duration and details according to your classroom needs and students' knowledge levels.		
Slides for the lecture on "Extreme weather events": Slide 1: Introduction - Title: Extreme weather events: causes, impacts and solutions - Lesson objective: Understand extreme weather events and their implications. - Image: Graph showing the rise in global temperatures. Slide 2: Defining Extreme Weather Events - Titolo: Understanding Extreme Weather Events - Definition: Extreme weather events are weather or climate events that deviate significantly	https://www.eurac.edu/it/magazine/che-cos-e-un-evento-estremo	Slides for the lecture

from the norm and can cause devastating impacts.

- Examples: storms, floods, droughts, heat waves.

Slide 3: Natural Causes of Extreme Weather Events

- Title: Natural Causes
- Explanation: Events such as hurricanes and earthquakes are caused by natural phenomena and can become extreme under certain circumstances.
- Example: Hurricane cycle in the Atlantic Ocean.

Slide 4: Anthropogenic Causes

- Title: Anthropogenic causes
- Explanation: Human activity, especially greenhouse gas emissions, contributes to climate change and intensifies extreme weather events.
- Graphic: Increase in CO2 emissions into the atmosphere.

Slide 5: Impacts of Extreme Weather Events

- Title: Impacts
- Explanation: Extreme weather events can have devastating effects on ecosystems, human communities, economies, and infrastructure.
- Image: Comparison of an area affected by the flood and the same area before the event.

Slide 6: Examples of Historical Impacts

- Title: Historical Impacts
- Examples: 2004 Indian Ocean tsunami, 2005 Hurricane Katrina, 2011 drought in Somalia.
- Images: photographs of the impacts of these events.

Slide 7: Adaptation Strategies

- Title: Adaptation
- Explanation: Adaptation strategies help communities prepare for extreme weather events and reduce their impact.
- Examples: climate-resilient urban planning, coastal defences.

Slide 8: Adaptation Case Studies

- Title: Adaptation Successes
- Examples: City of Copenhagen, Netherlands.
- Graphic: Flood reduction in the Netherlands through adaptation strategies.

Slide 9: Mitigation Strategies

- Snap: Mitigation
- Explanation: Mitigation strategies aim to reduce greenhouse gas emissions and slow climate change.
- Examples: renewable energy, energy efficiency.

Slide 10: Promoting Individual Awareness

- Title: Individual Actions
- Explanation: Every individual can contribute to the fight against climate change through daily actions.
- Examples: reduction of car use, energy saving.

Slide 11: International cooperation

- Titolo: Global Perspective
- Explanation: Extreme weather events are a global challenge that requires cooperation between countries.
- Examples: Paris Climate Agreement.

Slide 12: Active participation

- Title: Engaging the Community
- Explanation: Students are encouraged to actively participate in local projects and actions to address climate change.
- Examples: reforestation projects, volunteering with environmental associations.

Slide 13: Evaluation

- Title: Tests and Discussions
- Explanation: Students will be assessed on their understanding of the topics through quizzes, class discussions, and written assignments.

Slide 14: Conclusion and summary

- Title: Final Summary
- Summary: Summary of the key points of the lesson and the actions students can take.

Slide 15: Homework

- Title: Homework
- Assignment: Students should read an article or watch a documentary about climate change and prepare a short presentation for the next lesson.

Slide 16: Questions and discussions

- Title: Questions and Discussions
- Invite students to ask questions or share their final thoughts before closing the lesson.

Activity	Methodology
Activity: Environmental Awareness Project	Group work or world café.

Objective: Students will develop environmental awareness projects to share information on extreme weather events and adaptation and mitigation strategies with the local community. Arrangement: Group selection: Students will be divided into groups of 3-4. Choose a topic: Each group selects a specific topic related to extreme weather events or climate change. Examples of topics might include "Preparing for a Hurricane," "Reducing Greenhouse Gas Emissions in Daily Life," or "Sustainable Water Management." Research: Each group conducts in-depth research on their chosen topic, collecting data, statistics, case examples, and success or failure stories. Project Creation: Students develop an environmental awareness project based on their research. This can include creating a presentation, flyer, video, website, or informational brochure. Event planning: Each group plans an event or initiative to share information with the local community. For example, they could organize a public presentation, an eco-cleanup day, a social media awareness campaign, or an informational exhibition at a local library. Project execution: students put their project into action, actively involving the community and raising awareness about extreme weather events. Assessment: At the end of the activity, each group shares their project with the class and reflects on the effectiveness of their environmental awareness effort. Final discussion: In a concluding class discussion, students share their experiences, learnings, and challenges encountered during the project. The importance of environmental awareness and individual action in the fight against climate change is also discussed. This activity encourages students to put into practice what they have learned in the lesson, promotes tangible actions to deal with extreme weather events, and gives them the opportunity to contribute positively to the local community by becoming ambassadors for environmental sustainability.	

Checks	Typology
Structured test with 20 questions. Each question has only one correct answer. Multiple-choice questions:	Structured Verification

1. What are extreme weather events?

- a) Normal weather events
- b) Unusual and distant climatic events
- c) Geological events

Answer: b) Unusual and deviating climatic events from the norm

2. What are some natural causes of extreme weather events?

- (a) Human activity
- b) Changes in the water cycle
- (c) Increase in greenhouse gas emissions

Answer: b) Changes in the water cycle

3. What is one of the main anthropogenic causes of extreme weather events?

- a) Hurricane cycle
- b) Changes in Earth's orbit
- (c) Increase in greenhouse gas emissions

Answer: c) Increased greenhouse gas emissions

4. What is the impact of extreme weather events on human communities?

- (a) Increasing biodiversity
- (b) Damage to the infrastructure
- (c) Improvement of water resources

Answer: b) Damage to infrastructure

5. What is an adaptation strategy for extreme weather events?

- (a) Increase in greenhouse gas emissions
- b) Climate-resilient urban planning
- (c) Deforestation of all forests

Answer: b) Climate-resilient urban planning

6. Which of these options is a renewable energy source?

- (a) Carbon
- b) Oil
- c) Solar energy

Answer: c) Solar energy

7. What is the main objective of climate change mitigation strategies?

- a) Increasing greenhouse gas emissions
- b) Reducing greenhouse gas emissions
- c) Increasing the consumption of fossil fuels

Answer: b) Reduce greenhouse gas emissions

8. What can an individual do in his or her daily life to contribute to the fight against climate change?

- a) Increase car use
- b) Reduce the use of single-use plastics
- c) Increase home heating

Answer: b) Reduce the use of single-use plastics

9. What is the international agreement focused on reducing greenhouse gas emissions?

- (a) London Agreement
- (b) The Paris Agreement
- (c) New York Agreement

Answer: b) Paris Agreement

10. What is the goal of the Paris Climate Agreement?

- a) Increasing greenhouse gas emissions
- b) Limit the global temperature increase to less than 2 degrees Celsius above pre-industrial levels
- c) Promoting the use of fossil fuels

Answer: b) Limit the global temperature rise to less than 2 degrees Celsius above pre-industrial levels

True or False Questions:

11. True or False: Extreme weather events are normal weather events.

Answer: False

12. True or false: Human activity does not contribute to climate change.

Answer: False

13. True or false: Extreme weather events can cause damage to infrastructure.

Answer: True

14. True or False: Mitigation strategies aim to reduce greenhouse gas emissions.

Answer: True

15. True or False: Climate-resilient urban planning is an adaptation strategy for extreme weather events.

Answer: True

Follow-up questions:

16. Adaptation strategies aim to prepare communities for extreme weather events to _____ their impacts.

Answer: Reduce

17. An example of renewable energy is _____.

Answer: Solar energy

18. The _____ is the international agreement focused on the reduction of greenhouse gas emissions.

Answer: Paris Agreement

19. One of the main effects of climate change is the _____ increase in global temperatures.

Answer: Temperatures

20. In the fight against climate change, it is important to commit to reducing the use of single-use plastics and _____ natural resources.

Answer: Store

Simple multiple-choice test with 20 cross-questions on the lesson on "Extreme Weather Events". Select the correct answer by writing the corresponding letter (a, b, or c).

1. What are extreme weather events?

- a) Normal weather events
- b) Unusual and distant climatic events
- c) Geological events

Answer: b) Unusual and deviating climatic events from the norm

2. What are some natural causes of extreme weather events?

- (a) Human activity
- b) Changes in the water cycle
- (c) Increase in greenhouse gas emissions

Answer: b) Changes in the water cycle

3. What is one of the main anthropogenic causes of extreme weather events?

- a) Hurricane cycle
- b) Changes in Earth's orbit

E.g. multiple-choice tests prepared by the teacher

(c) Increase in greenhouse gas emissions

Answer: c) Increased greenhouse gas emissions

4. What is the impact of extreme weather events on human communities?

- (a) Increasing biodiversity
- (b) Damage to the infrastructure
- (c) Improvement of water resources

Answer: b) Damage to infrastructure

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- (a) Increase in greenhouse gas emissions
- b) Climate-resilient urban planning
- (c) Deforestation of all forests

Answer: b) Climate-resilient urban planning

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- c) Solar energy

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- a) Increasing greenhouse gas emissions
- b) Reducing greenhouse gas emissions
- (c) Increasing the consumption of fossil fuels

Answer: b) Reduce greenhouse gas emissions

8. What can an individual do in his or her daily life to contribute to the fight against climate change?

- a) Increase car use
- b) Reduce the use of single-use plastics
- (c) Increase home heating

Answer: b) Reduce the use of single-use plastics

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- (a) London Agreement
- (b) The Paris Agreement
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Answer: b) Paris Agreement

10. What is the goal of the Paris Climate Agreement?

- a) Increasing greenhouse gas emissions
- b) Limit the global temperature increase to less than 2 degrees Celsius above pre-industrial levels
- c) Promoting the use of fossil fuels

Answer: b) Limit the global temperature rise to less than 2 degrees Celsius above pre-industrial levels

11. Extreme weather events are mainly caused by:

- a) Regular natural cycles
- b) Human activity and climate change
- c) Randomness

Answer: b) Human activity and climate change

12. Which of the following is NOT an example of an extreme weather event?

- (a) Drought
- b) Flooding
- c) Calm weather

Answer: c) Calm weather

13. What does "mitigation strategy" mean?

- a) A way to increase greenhouse gas emissions
- b) A plan to reduce greenhouse gas emissions and combat climate change
- c) A tactic to ignore the impacts of extreme weather events

Answer: b) A plan to reduce greenhouse gas emissions and combat climate change

14. What is one of the impacts of extreme weather events on the natural environment?

- (a) Improvement of biodiversity
- b) Destruction of habitats and species
- c) Increased water reserves

Answer: b) Destruction of habitats and species

15. What is an example of an adaptation strategy?

- a) Increased consumption of fossil fuels
- b) Building dams to prevent flooding
- (c) Increase in greenhouse gas emissions

Answer: b) Build dams to prevent flooding

16. What does "climate-resilient urban planning" mean?

- a) Designing cities to withstand extreme weather events
- b) Planning cities to increase greenhouse gas emissions

c) Ignoring urban planning

Answer: a) Designing cities to withstand extreme weather events

17. What is one of the main objectives of climate change mitigation strategies?

- (a) Reduction of greenhouse gas emissions
- (b) Increase in greenhouse gas emissions
- (c) Keeping greenhouse gas emissions unchanged

Answer: a) Reduce greenhouse gas emissions

18. What can an individual do to contribute to the fight against climate change in his or her daily life?

- a) Increase the use of single-use plastics
- b) Use oil heating
- c) Reduce electricity consumption

Answer: c) Reduce electricity consumption

19. What does the Paris Climate Agreement stand for?

- (a) An agreement to increase greenhouse gas emissions
- b) An international agreement to reduce greenhouse gas emissions and limit global temperature rise
- c) An agreement to promote the use of fossil fuels

Answer: b) An international agreement to reduce greenhouse gas emissions and limit global temperature rise

20. What is one of the impacts of climate change?

- (a) Falling sea level
- (b) Improvement of atmospheric conditions
- (c) Increase in greenhouse gas emissions

Answer: a) Falling sea level

Skills acquired

Understanding of extreme weather phenomena: Students should be able to define and identify extreme weather events, as well as recognize their prime examples, such as storms, floods, droughts, and heat waves.

Knowledge of causes: Students should have an understanding of the natural causes of extreme weather events, such as weather cycles and anthropogenic causes, including greenhouse gas emissions and climate change.

Awareness of impacts: They should be able to identify the impacts that extreme weather events can have on ecosystems, societies, economies, and infrastructure.

Knowledge of adaptation strategies: Students should be able to explain adaptation strategies used to prepare communities for extreme climate events, such as climate-resilient urban planning and water management.

Understanding of mitigation strategies: They should be familiar with mitigation strategies to reduce greenhouse gas emissions, such as the use of renewable energy and energy efficiency.

Promoting Individual Awareness: Students should have gained awareness of the impacts of their daily actions on the environment and combating climate change.

Understanding of international cooperation: They should have an understanding of the importance of international cooperation in managing extreme weather events, as demonstrated by the Paris Climate Agreement.

Environmental Awareness Skills: After the environmental awareness project activity, students should be able to develop and promote environmental awareness projects in their community.

Analytical and evaluation skills: They should be able to critically evaluate information related to climate change and extreme weather events, as well as reflect on the implications of their actions.

These skills are essential for tackling climate change and promoting environmental sustainability, both individually and collectively. Students should be able to apply this knowledge and skills to make a significant contribution to managing extreme weather events and improving climate resilience.

English

curated by Diana Grape

Lesson No. 1 – Articles and Environment

Lesson plan

Keywords: environment, protect, magazine, article

Time: 80 minutes

Scuola: Intermedio

Objectives
Research of article structure and information about the environment. Discussing the need for the item. Create your own article based on an article's criteria.

Contents	Reference	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Students are asked about the latest news they have heard or read related to the environment. Brainstorm the validity of news and information. Possible criteria for the credibility of the information. Present the objectives of the lesson.		Brainstorming
Summary of prior knowledge (10 minutes): Types of articles/opinions vs facts. Quizzes to test students' knowledge.	https://sure.nlb.gov.sg/tng/survivors-activity5/	Pensiero critico

Presentation of new content (45 minutes): Students are provided with a link and asked to consult three articles that they find interesting and mark: Vocabulary unknown; Common features in the article; Facts that prove the validity of the information; The main focus of the article. Together, students form criteria/vocabulary/structure for an article. Inform classmates about the latest information related to the environment and discuss the need for this information. Students think or find a topic about the environment in their country or the world, a specific problem or issue, and write an article about it according to the criteria of a good article.	https://www.theguardian.com/uk/environment https://pin.it/1kkjalip	Individual work Individual work
Summary and conclusion (15 minutes) Evaluation of the written article	https://pin.it/2BVRIC	Peer Evaluation

Activity	Methodology
Evaluation of the written article: 1.To familiarize yourself with the criteria. 2.To read classmates' articles and rate them according to the criteria indicated. 3.To note the advantages of the item. 4.To make suggestions on how to improve the article to make it more appealing to readers. Multiple people can read the same article and then compare their impressions and suggestions.	Peer work, evaluation

Verify	Typology
Cross-check	Tests already prepared by textbooks
	Verified

Skills acquired

Understand the main points, the criteria of a good article
Develop creativity and self-expression skills in written form.
Develop critical thinking skills through analysis, evaluation, critical synthesis of information
Learn to evaluate and give constructive feedback, listening to others' thoughts and accepting them.

Lesson No. 2 - Sustainable Development Goals

Lesson plan

Keywords: sustainable, goals, environment

Time: 80 minutes

Scuola: pre-intermediate

Objectives

Introduce students to the 17 SDGs.

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Present development goals without their titles. Ask students to guess the titles of each goal. Present the objectives of the lesson.	https://www.un.org/sustainabledevelopment/blog/2015/12/sustainable-development-goals-kick-off-with-start-of-new-year/	Pensiero critico
Summary of prior knowledge (10 minutes): Discussing SDGs.		Teamwork
Presentation of new content (35 minutes): In pairs (or individually) find information about one of the goals and connect it with the topic "environment". Whether the goal can affect it or not. Create a mind map on it and present it in front of the class.		
Summary and conclusion (15 minutes)		

Presentation of mind maps/books. Presentations. Ideas compared. Discuss commonalities and differences. Evaluation of the process and the result.		Presentation Comparison Evaluation

Activity	Methodology
Ask students to guess the titles of each objective: write on the board/use any syllabus with the option to give answers separately.	Guessing, Predicting, Critical Thinking
Discussing the SDGs: -brainstorming - group work (each group, in pairs, analyzes, describes, provides examples for 1 objective), -speed dating (talk about an SDG and gather information from classmates)	Discussion
Map of MIInd: Together students create a book (on paper) or a presentation (in digital form) on all objectives. It is accessible to everyone.	Using IT / Creating a Book

Checks	Typology
Open-ended questions	Discussion, expression of thoughts

Skills acquired

Students are able to orient themselves in the Sustainable Development Goals, talk about them and express their opinion
Students expanded their vocabulary on environmental issues
Students have developed their communication, collaboration, critical thinking, creativity, self-paced skills
Students practice giving constructive feedback

Lesson No. 3 – Can You Create "a Perfect Farm"?

Lesson plan

Keywords: environment, protect

Time: 80 minutes

School: pre-intermediate, intermediate

Objectives
1. Developing integrated skills: listening, speaking and writing on the topic of climate change
2. Develop skills in forecasting and synthesis of audiovisual content

Contents	References	Methodology
Introduction (10 minutes): Welcoming students and creating a learning atmosphere. Brainstorm at odds. "When tillage begins, other arts follow. Farmers, therefore, are the founders of human civilization. —Daniel Webster. Brainstorm on "What is a Perfect Farm?" Discussions. Present the objectives of the lesson.		Brainstorming Brainstorming
Summary of prior knowledge (10 minutes): Pair/group work-sharing experiences: "What do they know about farms and agriculture?"		Teamwork

Presentation of new content (40 minutes): Introducing the title of the video and anticipating the following issues: • What could the video be about? • How much of our world's land is farmland? • How can we feed every member of the growing population a healthy diet? • The Significance of the Agricultural Revolution – • We are feeding people the expense of; • Agriculture depends on.....; • What could help farmers in data collection? • What will the farms of the future look like...? Watch a video and check the answers. 2. Look at and write down what might be the possible obstacles and the vocabulary unknown. (Play the video with subtitles.)	https://www.youtube.com/watch?v=xFqecEtdGZ0&ab_channel=TED-Ed	Individual work Individual work
Summary and conclusion (20 minutes) Comments on predictions vs reality of the video. Let's talk about the main thoughts of the video. Gather and discuss unfamiliar vocabulary and look up definitions.		Discussion

Activity	Methodology
Watch a video	Pre-vision, vision and post-vision activities

Skills acquired

She has developed listening, speaking and writing skills on the topic of climate change.

Develop critical thinking skills, predicting and synthesizing audiovisual content.

Developed skills in problem solving, generating creative ideas, evaluating alternatives, making decisions.

Developed communication and collaboration skills through group and pair work.

Lesson No. 4 – Fast Fashion**Lesson plan**

Keywords: fast fashion, recycling, use

Time: 80 minutes

School: Pre-Intermediate, Intermediate

Objectives

1. To understand the term "Fast fashion", the need to recycle clothes and the possibilities of doing it locally.
2. Promote critical thinking and in-depth study of the subject.

Contents**References****Methodology**

Introduction (10 minutes): Present images of fast fashion brands and guess what the lesson topic, related vocabulary, and themes might be. Answers are provided using Mentimeter. Showing the definition of "fast fashion", guessing it. Formulate the goal with activities to increase attention.	https://www.mentimeter.com	Brainstorming
Summary of prior knowledge (10 minutes): Vocabulary review "Clothing/shopping"	https://learnenglishvocabulary.co.uk/b1-intermediate/going-shopping-clothes/	Watch a video
Presentation of new content (40 minutes):	https://en.wikipedia.org/wiki/Fast_fashion	Using IT

Presentation of fast fashion statistics in 2000. Search for statistics for the previous year. Discussion of how we can look for such information and its credibility. By discussing the possible reasons for the change and the damage to the environment from its use, what can we do to prevent it? Pupils must recycle or donate clothes. Group work: Research on where they can use clothes locally and what does the country do to make them affordable? Preparation of a poster.		Discussion Teamwork
Summary and conclusion: (20 minutes) Presentation of the group work. Draw conclusions (common, different, the most important things).		Presentation Discussion

Activity	Methodology
Group work: Research on where they can use clothes locally and what does the country do to make them affordable?	Using IT

Verify	Typology
Discuss, compare, analyze	

Skills acquired
Conceptual knowledge.
Critical thinking.
Use of ICT.
Collaboration and communication.

Lesson No. 5 – Recycling

Lesson plan

Keywords: environment, protect

Time: 60 minutes

School: Pre-Intermediate

Objectives
Be able to speak and discuss the topic "Recycling" based on the video material viewed.

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Write the word "Environment" and renewable energy on the board. Ask students what this word means to them. Present the goal of the lesson and what students will learn.		Brainstorming
Summary of prior knowledge (10 minutes): Together, try to brush up on vocabulary that might relate to this topic. Write on board the vocabulary that the students can name (or let the students write it down).		Frontal learning
Presentation of new content (30 minutes): Introduce your students with a video about how people can take care of our planet. Ask your students to watch the video carefully the first time. Ask questions: What they learned, are there any questions, new vocabulary etc. Hand out the handout sheet, let the students read it before	https://www.youtube.com/watch?v=bn8R_Xqj1l0&t=73s	Individual studies

playing the video the second time. Students are assigned the task of reviewing the video, but this time to look for the missing information to fill out the assignments on the worksheet (below).	https://ieej.lvHPvAx	
Summary and conclusion (15 minutes): Review the answers with your students. Check your spelling. Let the pupils discuss the last assignment in groups/pairs Talk about what the students have learned and what their thoughts are on this topic. Discuss the new vocabulary, in which situations we can use it.		Evaluation

Verification	Typology
Cross check	Assessment prepared by the teacher

Skills acquired
Knowledge of vocabulary.
Improved conversational skills.
Able to evaluate topics.

Lesson No. 6 – Follow the Instructions: How to Make a Water Filter?

Lesson plan

Keywords: water filter

Hours: 80-minute lecture, 60-minute activity, 20-minute presentation.

School: Elementary, Pre-Intermediate

Objectives
1. Design and build a water filter using materials that can be found in the house, follow the written instructions. 2. Pour the dirty water into the filter and discuss the observations, talk about the importance of clean water.

Contents	References	Methodology
Introduction (10 minutes): Greetings to the students. Setting the mood by asking questions about the importance of clean water. Arouse the goal of the lesson from students.	https://youtu.be/ORHj-4zWxAk	Watch video, discuss
Summary of prior knowledge (20 minutes): Mindmap "What are the benefits of having a water filtration system"? Vocabulary Review	https://www.aquascience.net/glossary/	Teamwork Frontal work
Introducing new content (40 minutes): Read the instructions and follow them, do an experiment.	https://drive.google.com/file/d/1XAg_17WBpERe0pUyYONqoKkoroPZFo7g/view?usp=sharing	Practical work
Summary and Conclusion (10 minutes): Presentation of the results Discuss the process, the results		Presentation Discussion

Activity	Methodology
Mindmap "What are the benefits of having a water filtration system"? Options: - using the MindMaster computer tool - Making a poster - Using a Card - Using MentiMeter - Using Word Cloud - Using the Wall Padlet	Teamwork
Discussing the process, the results: - Do you think the filter helped clean the crappy water?	Discussion

- Is the water that came out cleaner than the water you started with? Is it the same color? - How can you improve your filter next time? - Compare water samples from different locations. What are your conclusions?	

Verify	Typology
Open-discussion	Discussions

Skills acquired

Students have acquired specific vocabulary on the topic.
Students have developed their communication and collaboration skills.
Students have developed their reading comprehension skills.
Students see the interaction between theoretical knowledge and practical activities.
Students develop their critical thinking skills, evaluation skills.

Lesson No. 7 - Water Treatment Plants

Lesson plan

Keywords: water treatment, plant, coagulation, flocculation, sedimentation, filtration, disinfection

Time: 40 minutes

School: Pre-Intermediate

Objectives
1. Understand the water treatment process. 2. To expand vocabulary. 3. Create a theoretical basis for visiting a wastewater treatment plant.

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Discussion with students: What did you do today? What are your daily routines? What can't you imagine your day without? What can't you live without? What's the most essential thing that people can't live without?		Brainstorming

Present the objectives of the lesson.		
Summary of previous knowledge (5 minutes): "Water" mentimeter: where you use it, where you meet it, how we get it, etc.	www.metimeter.com	Using IT for a Survey
Presentation of new content (35 minutes): Acquire the new vocabulary: Water Treatment, Plant, Light Watch a video about water treatment plants and answer questions about the video. Compare answers, discuss (if necessary). Divide into pairs and match the titles to the stages of the water treatment descriptions. Compare answers, discuss (if necessary)	Video "How do water treatment plants work?" https://youtu.be/0_ZcCqqpS2o https://ej.uz/bbee	Watch a video Sibling work
Summary and conclusion (5 minutes) Take the test and browse through the answers.	https://ej.uz/bbee	Individual work

Verify

Typology

Cross-check	Tests prepared by the teacher

Skills acquired

Understanding of water treatment plants, creating theoretical foundations
Acquisition of a specific vocabulary.
Develop listening, speaking, and reading skills.

Lesson No. 8 – City Vs Countryside

Lesson plan

Keywords: urban, rural, pros or advantages and cons or disadvantages

Timetable: 60 minutes lesson, 50 minutes activity, 10 minute test.

School: Pre-Intermediate

Objectives
1. Develop creative skills (speaking and writing) to express opinions. 2. Promote critical thinking. 3. Promote collaborative skills.

Contents	References	Methodology
Introduction (5 minutes): Greetings to the students. Speaking of photos as a couple. Arouse the goal of the lesson from students.	https://ej.uz/bdgs	Collaborative learning
Summary of prior knowledge (5 minutes): Brainstorm the main points about the countryside and the city in small groups.		Collaborative learning
Introducing new content (40 minutes): Watch a video and write down the pros and cons. Compare the answers with a classmate, a teacher. Work in pairs and complete the worksheet. Compare your answers with your teacher. Watch a video on how to express opinions and	https://youtu.be/EdUs8jA7AHk CITY LIFE vs COUNTRYSIDE: English PDF & Doc ESL Worksheets (islcollective.com) https://youtu.be/I5l7e6oW-GM	Self-study Collaborative learning Collaborative learning

take notes on key phrases. Work in a team and write down advantages and disadvantages for city/country life. Work in pairs and discuss the topic.		Collaborative learning
Summary and Conclusion (10 minutes): Vote to live in the country or in the city. Express your opinion in writing.		Gamification Self-study

Activity	Methodology
Work in a team and write down advantages and disadvantages for city/country life. Work in pairs and discuss the topic: 1. Students are divided into small groups (they can be chosen from different colors of paper, creating a puzzle picture (city, countryside), etc.). 2. They choose or are given only one option: city or country. 3. After finishing the assignment, students can join groups and discuss their ideas with people from another group who have written on the same topic to add to or improve their answers. 4. Finally, students return to their seats or find someone they would like to talk to about the "opposite group" (a person who prepared the + and - on another issue) and share their opinions.	Collaborative learning
Vote to live in the country or in the city. Voting options: -hands that are raised, -the use of ICT, e.g. Methyter, -use 2 sides of the classroom (on the left- to live in the countryside, on the right- to live in the city, in the center- for those who can't decide), -Paste a name under the appropriate title on the board/wall.	Gamification

Elements of a game can make lessons more alive, act as movement, and promote engagement.	
Express your opinion in writing. It can also be used as a homework assignment or as an essay for the next lesson.	Self-study

Verify	Typology
Express your opinion in writing.	

Skills acquired

You can mention some advantages and disadvantages of living in the countryside and living in the city.
They can express their opinion and react to the opinion of others.
He expresses his opinion and is able to argue.
Learn to listen to and help others.

Lesson No. 9 – The Importance of Water

Lesson plan

Keywords: water cycle, savings, facts, taste

Timetable: lesson 40 minutes, activity 35 minutes, test 5 minutes.

School: Elementary

Objectives
1. Introduce key vocabulary related to water and flavor description. 2. Improve students' communication skills through topic-related discussions. 3. Promote creative thinking by writing a poem. 4. Arouse students' interest in the topic by watching videos and answering their questions. 5. Engage students in hands-on activities.

Contents	References	Methodology
Introduction (5 minutes): Greetings to the students. Create the atmosphere by asking questions about their daily activities and the things they can or can't imagine their day without. Arouse the goal of the lesson from students.		Lectures
Summary of prior knowledge (15 minutes): Writing a poem		Collaborative learning

Introducing new content (40 minutes):		
Read about water, discuss	Infographic on H2O Facts on Behance	Discussion
Watch a video about the water cycle and discuss	https://youtu.be/ncORPosDrjI	TIC
Watch the videos to answer specific questions that came up during the discussion (e.g., Dead Sea, Niagara Falls, how do you get water, how much does a gallon cost, etc.)	https://youtu.be/_z6Tjwb9l0w https://youtu.be/IyBq4AdBKJI https://youtu.be/U1MM4V3_faY	TIC Inquiry-based learning
Water tasting	tasting wheel Archives - The Man with the Cup	
Summary and Conclusion (10 minutes):		
Verify students' knowledge and vocabulary skills	https://quizizz.com/admin/quiz/6187efb40ac0e7001ed062c9?source=quiz_share	TIC
Summing up the topic		Self-study

Activity	Methodology
Writing a poem: - Students are divided into pairs. - On the paper or cardstock is written the word "WATER" in an upright position. The students' task is to write a poem about water or where we use water, in which each line begins with a letter of the given word. - After finishing the assignment, students share their ideas and vote for the best poem and give some reasons why they choose this poem exactly. The activity promotes collaboration, creativity, assessment skills, students review vocabulary and engage in the topic.	Collaborative work
Tasting water: Students taste different types of water without seeing what water it is (carbonated	Inquiry-based learning

mineral water, tap water, still water, birch juice etc.) 2. They vote for their favorite flavor and try to characterize it with appropriate adjectives (soft, sweet, delicious, salty, bitter etc.) using the water tasting wheel and explain their choice.	
Summing up the topic	Self-study

Verify	Typology
Cross-check	Tests already prepared by quizziz
Semi-structured testing	Tests already prepared by the teacher

Skills acquired

Students have acquired specific vocabulary on the topic.
Students have developed their communication and collaboration skills.
The students fostered their creativity.
Students see the interaction between theoretical knowledge and practical activities.

Lesson No. 10 – Tips for Protecting the Environment

Lesson plan

Keywords: environment, protect, infographic, advice

Timetable: 80 minutes lesson, 70 minutes of activity, 10-minute test.

School: Elementary, Pre-Intermediate

Objectives
1. Comprehension of written text. 2. Use of key vocabulary. 3. Make an infographic based on the text and your own experience.

Contents	References	Methodology
Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Talking about the "Reduce-Reuse-Recycle" sign Present the goal of the lesson and what students will learn.		Frontal work
Summary of prior knowledge (10 minutes):		Sibling work

Repeated vocabulary.	https://drive.google.com/file/d/1lxw4317cEnH2wYmJmm1Gb9dGFklrS4nQ/view?usp=sharing	
Presentation of new content (50 minutes): Reading comprehension exercises. Talking about how to create infographics. Creation of infographics.	https://drive.google.com/file/d/11B3E1OMguQRHxrijzC4GGHNHWZorrUVkj/view?usp=sharing https://www.canva.com/create/infographics/	Individual work Frontal work Using IT
Summary and conclusion (15 minutes): Presentation of infographics. Voting for the best, the most efficient.		Presentation Evaluation

Verification (one or more)	Typology
Semi-structured text that answers teachers' questions.	

Skills acquired
Students understand the fundamental principles and are able to make an infographic, use computer skills.
Students have developed their communication and cooperation skills.
Students understand the written text

Literature

curated by Evangelia Dialyna

Lesson No. 1 – Ecocriticism in literature

Lesson plan

Keywords: Ecocriticism, Literary texts, Ecological consciousness.

Timetable: lesson: 65 minutes and test: 15 minutes.

School: Two-year middle school

Objectives

At the end of the lesson, students will be able to:

- Define and explain the concept of ecocriticism as a literary theory that explores the relationship between literature and the environment.
- Identify and analyze literary works that reflect ecological concerns and highlight the relationship between humans and nature.
- Apply ecocritical perspectives to literary texts, examining the way authors describe nature, environmental issues, and the relationship between man and nature.
- Engage in critical thinking and interpretation by discussing and supporting their analysis with evidence drawn from texts.
- Reflect on the importance of literature in raising awareness about ecological concerns and promoting a deeper understanding of the human-nature connection.
- Explore creative ways to respond to literature through art, writing, or other mediums, expressing one's understanding of ecological issues and the relationship between humans and nature.
- Promote appreciation for the environment and inspire students to become active, environmentally conscious citizens.
- It connects themes and ideas explored in the literature to real-life environmental issues, and considers personal actions and choices that can contribute to sustainability and ecological stewardship.

Contents

Introduction:

It explores the intersection of literature and the environment by examining works that reflect ecological concerns. It analyzes texts that highlight the relationship between man and nature.

- Begin the lesson by engaging students in a discussion about the importance of the environment and our connection to nature.
- Introduce the concept of ecocriticism as a literary theory that explores the

References

Every country should find literary texts on ecocriticism. It is better for each country to analyze the texts in its own language instead of the texts in English.

Methodology

Class Discussion
Student
Presentations

relationship between literature and the natural world. - Introduce key concepts and themes related to ecocriticism, such as nature, ecology, environmental justice and sustainability. - Discuss how literature can be a powerful medium to explore and raise awareness of ecological concerns.		
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> Reading & Analysis Choose a literary work that prominently reflects ecological concerns and highlights the relationship between humans and nature. Examples are "The Lorax" by Dr. Seuss or "The Old Man and the Sea" by Ernest Hemingway. -Provide students with copies of the selected text or display it on a projector. -Read the text aloud as a class or ask students to read it silently. -In small groups or individually, analyze the text using ecocritical perspectives. Consider the following questions: How does the author describe nature or the environment in the text? -Which aspects of the relationship between man and nature are highlighted or deepened? -Are there issues of environmental degradation, conservation, or impact of human actions on nature? -How do the characters in the text interact with the natural world? Group Discussion -Facilitate a discussion with the whole class to share and compare students' interpretations of the text from an ecocritical point of view. -Encourage students to provide evidence from the text to support their analysis and engage in respectful dialogue.	<u>Sources:</u> Stanford Encyclopedia of Philosophy - Ecocriticism: This comprehensive entry provides an overview of ecocriticism as a literary theory and its various approaches. Explore key concepts, themes, and influential works in the field. West Virginia University Ecocriticism Study Guide: This study guide offers an introduction to ecocriticism and provides an overview of its key concepts and theoretical frameworks. Includes a list of suggested readings and links to additional resources. The Association for the Study of Literature and the Environment (ASLE): ASLE is an international organization dedicated to the study of literature and the environment. Their website provides access to a wide range of resources, including articles, journals, conference information, and educational materials. University of California, Santa Barbara (UCSB) Ecocriticism Resources: The literature and environment program at UCSB offers a collection of ecocriticism resources, including reading lists,	Class Discussion Student Presentations

-Explore different perspectives and interpretations, fostering critical thinking and deeper understanding. Creative Response -Have students create individually or in small groups a creative response to the text, such as a poem, short story, or artwork that reflects their understanding of the human-nature relationship explored in the literary work. -Provide art supplies, writing materials, or digital tools as needed. -Give students time to create and express their interpretations creatively. Presentation and reflection -Invite students to present their creative responses to the class, explaining the connections with the text and their ecocritical analysis. -After each presentation, encourage the class to provide feedback and reflections on the connections between the creative response and the original text. The duration of each activity can be adjusted according to class dynamics and time constraints. It is recommended to select literary works that are accessible and recognizable by students, effectively addressing ecological concerns and the relationship between man and nature.	syllabi, and links to journals and organizations in the field.	
<u>Summary and Conclusion:</u> Summarize the main points discussed during the lecture and emphasize the role of literature in highlighting ecological concerns and shaping our understanding of the human-nature relationship. Engage students in a discussion about how they can apply ecocritical concepts in their own lives and actions to promote environmental awareness and sustainability.		Class Discussion

Encourage students to explore and read other works of literature with ecological themes outside of the classroom.

Activity	Methodology
<u>Activity:</u> The main lesson includes activities.	

Checks	Typology
To test students' comprehension of the "Ecocriticism in Literature" lesson and their ability to explore the intersection between literature and the environment, as well as to analyze texts that reflect ecological concerns and the relationship between man and nature, the following assessment methods can be incorporated: -Class Discussion: Engage students in a structured classroom discussion where they have the opportunity to share their interpretations, insights, and connections made between literary texts and ecological themes. Ask open-ended questions that encourage critical thinking and require students to back up their ideas with evidence from the texts. -Written Reflections: Assign short written reflections in which students can individually express their understanding of the lesson content. Ask them to summarize the key concepts of ecocriticism, to provide examples of analyzed literary works, and to explain the significance of the relationship between humans and nature in those texts.	Class Discussion

Skills acquired

Critical Thinking: Students develop the ability to think critically about literature and environmental issues, analyzing texts and identifying underlying ecological themes and messages conveyed by authors.

Literary Analysis: Students improve their literary analysis skills by examining how authors describe nature, environmental concerns, and the human-nature relationship. They learn to identify literary techniques, symbols, and metaphors that contribute to the depiction of ecological themes.

Textual Interpretation and Evidence: Students learn to interpret literary texts through an ecocritical lens, providing evidence and examples from texts to support their analysis. They strengthen their ability to make connections between specific steps and broader environmental issues.

Research skills: Students may engage in further research to deepen their understanding of ecocriticism and identify supplemental sources that support their analysis of literary works. They develop skills in gathering and evaluating information from various sources.

Communication and Presentation: Students improve their oral and written communication skills by articulating their interpretations, participating in class discussions, and presenting their analyses of literary texts. They learn to convey their ideas effectively and engage in respectful dialogue with their peers.

Creative expression: Students have the opportunity to express their understanding and interpretations creatively through artistic projects, such as creating visual art, writing poetry, or developing short stories. They learn to communicate complex ideas through different mediums.

Environmental Awareness and Management: Students develop a greater sense of environmental awareness and the importance of ecological issues. They gain a deeper understanding of the relationship between humans and nature and are encouraged to become environmentally conscious individuals who take responsibility for the environment.

Lesson No. 2 – Environmental Justice in Fiction

Lesson plan

Keywords: Fiction, Literary Texts, Environmental Justice.

Timetable: lesson: 65 minutes and test: 15 minutes.

School: Two-year middle school

Objectives
- Define and explain the concept of environmental justice, emphasizing the equitable treatment of all individuals, regardless of race, ethnicity, or socioeconomic status, in relation to environmental issues. - Identify and analyze environmental justice issues and the experiences of marginalized communities portrayed in fiction literature. - Evaluate the ways in which fiction literature can raise awareness about environmental justice issues and promote empathy and understanding. - Engage in critical thinking and interpretation by examining the social, economic, and political factors that contribute to environmental injustice in fictional narratives. - Develop empathy and perspective-taking skills by considering the lived experiences of marginalized communities facing environmental justice challenges. - Promote awareness and sensitivity to the interconnectedness between environmental degradation, social inequality, and environmental justice concerns.

Contents	References	Methodology
<u>Introduction:</u> Students will examine the concept of environmental justice through the analysis of fictional literature, gaining an	Every country should find literary fiction texts about environmental justice. It is better for each country to	Class Discussion Student Presentations

understanding of how marginalized communities are impacted by environmental issues, and exploring the role of literature in raising awareness of environmental injustice. -Begin the lesson by discussing the concept of environmental justice and its significance in addressing the unequal distribution of environmental benefits and burdens across different communities. -Explain the purpose of the lesson: explore how fiction literature can shed light on environmental justice issues and encourage empathy and understanding.	analyze the texts in its own language instead of the texts in English.	
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> Definition and context -Define environmental justice, emphasizing the importance of fair treatment and the involvement of all individuals, regardless of race, ethnicity, or socioeconomic status, in environmental decision-making. -Provide examples of environmental justice issues, such as pollution in low-income neighborhoods or the impact of industrial activities on indigenous lands. Reading Selection -Select a novel or short story that addresses environmental justice issues and presents the experiences of marginalized communities. Examples include Jeff Goodell's "The Water Will Come" or Barbara Kingsolver's "The Poisonwood Bible." -Provide copies of the reading or display the text on a projector. -Assign students to read the selected text independently or in small groups, encouraging them to jot down and annotate passages that illustrate environmental justice concerns. Discussion and analysis	<u>Sources:</u> Teaching Tolerance – Environmental Justice: This resource provides a collection of articles, lesson plans, and activities specifically focused on teaching environmental justice in the classroom. It includes resources that can be adapted for high school students. Teaching for Change – Environment and Environmental Justice: Teaching for Change offers resources and lesson plans on various social justice issues, including environmental justice. They provide educational materials, book suggestions, and articles that can be used to develop a lesson on environmental justice in fiction. EdChange - Social Justice Books: EdChange's website features a collection of recommended books related to social justice issues,	Class Discussion Student Presentations

-Engage students in a guided discussion of the text, focusing on environmental justice issues and the experiences of marginalized communities.

-Ask questions like:

1. In how does the author describe the environmental challenges faced by marginalized communities?
2. What social, economic or political factors contribute to these challenges?
3. In how does the text explore the interconnection between environmental degradation, social inequality, and environmental justice?
4. Can you find examples of activism or resilience within the narrative that address environmental justice issues?
5. Encourage students to support their answers with evidence from the text and to respond respectfully to the insights of their peers.

Real-life connections

- Facilitate a discussion on real-world examples of environmental justice issues in the local community or globally.
- Have students identify similarities and differences between fictional storytelling and real-world environmental justice challenges that they are aware of.
- Encourage students to share personal experiences, stories, or news articles related to environmental justice.

Reflective Writing

- Assign a short reflective writing activity where students respond to prompts such as:
 - How has reading this fictional narrative deepened your understanding of environmental justice?
 - What actions can individuals or communities take to address environmental justice issues?
 - How can literature be a tool to raise awareness and promote change in environmental justice?

including environmental justice. Explore their curated list of fiction books that touch on environmental justice themes and can be incorporated into high school lessons.

The Conscious Kid –
Recommended Books: The Conscious Kid offers a comprehensive list of books for children and young adults that address environmental justice and related topics. Their book recommendations can be tailored for high school students and provide a valuable resource for selecting fiction literature that explores environmental justice themes.

Extension activities (optional) Give students the opportunity to learn more about the topic through research, creative projects, or further reading. Here are some examples: 1. Research and present case studies on environmental justice issues and movements. 2. Organize a classroom debate or panel discussion on the ethical considerations and policy implications of environmental justice.		
<u>Summary and Conclusion:</u> -Summarize the key concepts discussed during the lecture and emphasize the importance of recognizing and addressing environmental justice issues. -Encourage students to further explore environmental justice issues in literature and in their own communities, promoting empathy, awareness, and action. The duration of each activity can be adjusted according to class dynamics and time constraints.		Class Discussion

Activity	Methodology
<u>Activity:</u> The main lesson includes activities.	

Verify	Typology
1. Written Response: Assign a written response activity in which students individually analyze a specific passage, scene, or character in fiction literature that reflects concerns about environmental justice. Invite them to explain the significance of the chosen element in relation to environmental justice, and provide evidence from the text to support their analysis. 2. Class Discussion: Engage students in a classroom discussion where they share their interpretations and insights on environmental justice issues in fictional texts. Ask open-ended questions that encourage critical thinking and require students to back up their ideas with evidence from the texts. Encourage respectful dialogue	Class Discussion

and allow students to respond and develop the contributions of others.

3. **Literary Circle or Group Discussion:** Organize literary circles or small group discussions where students can analyze different fictional texts related to environmental justice. Assign each group a specific text and ask them to discuss issues of environmental justice, the representation of marginalized communities, and the interconnectedness of environmental issues and social inequalities. Monitor their discussions and provide guidance if necessary.

Skills acquired

Critical Reading Skills: Students develop the ability to critically analyze and interpret fictional texts that explore environmental justice issues. They learn to identify the key elements, literary techniques, and social contexts that contribute to the representation of environmental injustices in literature.

Cultural and Social Awareness: Through the exploration of fiction literature, students gain a deeper understanding of the diverse experiences and perspectives of marginalized communities facing environmental injustices. They develop empathy, sensitivity, and a heightened awareness of the social and cultural factors that contribute to environmental disparities.

Critical Thinking and Analysis: Students improve their critical thinking skills by analyzing the complex relationship between environmental issues and social inequalities depicted in fiction literature. They learn to evaluate and evaluate the causes, consequences, and ethical implications of environmental justice concerns.

Communication and Expression: Through class discussions, presentations, and written reflections, students improve their communication skills. They learn to articulate their ideas, express their interpretations, and engage in respectful dialogue on environmental justice issues in fiction literature.

Ethical Awareness and Responsibility: Students reflect on the ethical dimensions of environmental justice and recognize the responsibility of individuals and society in addressing environmental disparities. They consider their role and potential actions to promote environmental justice and fair environmental decision-making.

Research skills: Students can engage in further research to deepen their understanding of environmental justice issues, linking real-world examples to the fictional narratives studied. They develop skills in gathering and evaluating information from various sources to support their analyses and reflections.

Lesson No. 3 – Poetry of Nature

Lesson plan

Keywords: Poetry, Ecology, Environmental Awareness.

Timetable: lesson: 65 minutes and test: 15 minutes.

School: Two-year middle school

Objectives
- Understand the characteristics and elements of nature's poetry, including the use of vivid imagery, sensory language, and poetic devices to capture the beauty and essence of the natural world. - Analyze and interpret poems about nature, identifying and discussing the poet's experiences, emotions, and connections with nature through the use of literary techniques and imagery. - It develops an appreciation for the natural world and its meaning in human life by exploring the poetry of nature and its ability to evoke a sense of wonder, awe, and connection. - Engage in critical thinking and reflection, examining one's personal connections and experiences with nature and comparing them to the themes and emotions expressed in the poems. - Promote creativity and self-expression through the creation of nature-inspired poems or artworks, incorporating elements of nature and poetic devices discussed in the lesson. - Communicate and share their interpretations, reflections and creative expressions with their peers, promoting a supportive and collaborative learning environment.

Contents	References	Methodology
<u>Introduction:</u> Students will explore and appreciate the beauty of nature's poetry, analyze the use of poetic devices, and develop a personal connection to the natural world through creative expression. -Begin the class by discussing the meaning of nature's poetry and its ability to capture the beauty and power of the natural world. -Engage students in a brief discussion about their experiences with nature and how it makes them feel.	Every country should find poems about nature. It is better for each country to analyze the texts in its own language instead of the texts in English.	Class Discussion Student Presentations
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> Key Elements of Nature's Poetry	<u>Sources:</u> Poetry Foundation - Nature Poems: The Poetry	Class Discussion Student Presentations

-Introduce the key elements and features of nature poetry, such as vivid imagery, sensory language, metaphors, and themes of connection with nature.

-Show examples of famous nature poems by poets such as William Wordsworth, Emily Dickinson or Mary Oliver and discuss their unique styles and approaches to nature.

Reading & Analysis

-Select some poems about nature that show different aspects of the natural world and different poetic techniques.

Provide copies of the selected poems or display them on a projector.

-Read the poems aloud as a class or ask students to read them silently.

-Analyze the poems together, discussing the use of imagery, symbolism, and figurative language to convey the poet's experiences and emotions related to nature.

Reflexive Response

-Ask students to reflect individually on the poems and their personal connections to nature.

Provide writing tips such as:

-Choose a specific verse or image from one of the poems that resonates with you and explain why.

Reflect on a personal experience in nature that evokes emotions or sensations similar to those described in the poems.

-Write a short poem or descriptive paragraph about a natural scene that inspires you.

Sharing & Discussion

-Encourage students to share their reflective responses in small groups or with the whole class.

-Create a supportive environment where students can discuss their personal connections to nature and the impact of

Foundation's website offers a wide range of poems about the nature of various poets throughout history. You can search their database for nature-themed poems that align with the themes and goals of your lesson.

Academy of American Poets - Nature Poems: The Academy of American Poets website provides a curated collection of nature poems by infamous poets. You can browse their selection of nature-themed poems and access accompanying analysis and biographical information about the poets.

Teaching Tolerance - Nature Poetry Lesson Plan: Teaching Tolerance offers a lesson plan focused on the poetry of nature that explores themes of identity, connection with nature, and social justice. The lesson plan includes goals, activities, and resources that can be tailored for high school students.

poems on their understanding of the natural world. Creative Expression -Introduce a creative expression activity where students can further explore their connection to nature through art, writing, or other mediums. -Provide art materials, writing materials, or digital tools for students to create their own nature-inspired poems, drawings, paintings, or photographs. -Encourage students to incorporate the poetic devices and imagery discussed earlier in the lesson. Presentation and reflection -Invite students to present and share their creative expressions with the class. -After each presentation, it facilitates a short discussion where students can reflect on their creative process, the emotions evoked, and the connections created with nature.		
<u>Summary and Conclusion:</u> -Summarize the main points discussed during the lesson, emphasizing the power of nature's poetry to evoke emotions, promote a deeper appreciation for the natural world, and inspire creative expression. -Encourage students to continue exploring the poetry of nature on their own and to look for opportunities to connect and appreciate nature in their daily lives.		Class Discussion

Activity	Methodology
<u>Activity:</u> The main lesson includes activities.	

Checks	Typology
Group discussion: Divide students into small groups and assign each group a poem about nature to analyze further. In their groups, students should discuss the poetic techniques, themes, and emotions conveyed in the	Class Discussion

poem. Next, conduct a discussion with the entire class in which each group presents their findings and engages in a dialogue about the different poems and their interpretations.

Skills acquired

Literary Analysis: Students develop the ability to analyze and interpret the poetry of nature, identifying poetic devices, such as imagery, symbolism, and figurative language, and understanding how they contribute to the overall meaning and impact of poetry.

Critical Thinking: Through the analysis of nature poetry, students improve their critical thinking skills by examining the poet's perspective, exploring the underlying themes and messages conveyed, and evaluating the effectiveness of poetic techniques in expressing the beauty and meaning of nature.

Observational skills: Through the study of the poetry of nature, students develop a greater awareness of their surroundings and the ability to observe and appreciate the details and beauty of the natural environment.

Language and vocabulary development: Students expand their vocabulary and language skills by encountering descriptive and sensory language in nature poetry. They learn to incorporate these elements into their own writing, allowing them to more effectively express their nature-related experiences and emotions.

Reflection and self-awareness: By exploring the poetry of nature, students are encouraged to reflect on their personal connections to nature, cultivating a deeper understanding of their own experiences, emotions, and sense of wonder in relation to the natural world.

Communication and Presentation: Students improve their communication skills by sharing and discussing their interpretations of nature poetry with their peers. They gain confidence in expressing their ideas, actively participating in class discussions, and giving presentations on their creative expressions.

Empathy and perspective-taking: By engaging with the poetry of nature, students develop empathy for different perspectives and experiences, understanding how poets' connections to nature can differ, and recognizing the diversity of human relationships with the natural world.

Lesson No. 4 – Environmental Ethics in Literature

Lesson plan

Keywords: Ethics, Literary Texts, Environmental Awareness, Moral Responsibilities

Timetable: lesson: 65 minutes and test: 15 minutes.

School: Two-year middle school

Objectives

- **Critical Thinking:** Students will develop critical thinking skills by analyzing the literature and identifying ethical issues surrounding environmental issues. They will learn to

evaluate the complex moral dilemmas presented in the texts and explore multiple perspectives.

- **Literary Analysis:** Through the examination of works such as "A Sand County Almanac" and "Disgrace," students will improve their ability to analyze literature. They will learn to identify themes, symbols, and motifs related to environmental ethics, and understand how authors use storytelling techniques to convey their messages effectively.
- **Communication skills:** Students will practice verbal communication through group discussions and presentations. They will learn to articulate their thoughts clearly, express their interpretations of texts, and engage in meaningful dialogues with their peers.
- **Ethical Awareness:** The class will promote ethical awareness by highlighting the moral responsibilities that humans have towards the environment. Students will reflect on their own values and attitudes towards nature and consider how literature can shape their ethical perspectives.
- **Empathy and Compassion:** By delving into the literature that explores the impact of human actions on the environment and other species, students will develop empathy and compassion. They will better understand the interconnectedness of all living things and the consequences of our choices.
- **Environmental knowledge:** Through the analysis of specific environmental issues presented in the literature, students will gain a deeper understanding of concepts such as land use, biodiversity loss, and animal rights. They will be better informed about real-world environmental challenges.

Contents	References	Methodology
<u>Introduction:</u> In this lesson, high school students will delve into the ethical dimensions of environmental issues represented in the literature. They will examine the works of Aldo Leopold's "A Sand County Almanac" and J.M. Coetzee's "Disgrace" to discuss the moral responsibilities that humans have towards the environment and how literature can help us address complex environmental issues. -Begin the lesson by asking students what they mean by environmental ethics and why it is important in today's world. -Explain that literature is a powerful means of exploring and understanding environmental issues from an ethical point of view. Introduce the works "A Sand County Almanac" by Aldo Leopold and "Disgrace" by J.M. Coetzee, mentioning that both texts present unique perspectives on environmental ethics.	Every country should find literary texts on environmental ethics. It is better for each country to analyze the texts in its own language instead of the texts in English.	Class Discussion Student Presentations

<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> Text analysis -Divide the class into two groups, assigning one group to analyze "A Sand County Almanac" and the other group to analyze "Disgrace." -In their respective groups, students should read and discuss key passages or chapters that deal with environmental issues, land use, biodiversity loss, or animal rights. -Encourage students to identify the ethical issues raised by the authors regarding human interactions with the environment and other species. -Each group should prepare a short presentation summarizing the results obtained, highlighting the ethical issues present in the assigned text. Class Discussion - Bring the two groups together and allow them to present their analyses of the literature. -Facilitate a classroom discussion of the ethical issues explored in each work and how they relate to real-world environmental issues. -Encourage students to share their thoughts on the moral responsibilities humans have to the environment and the implications of our actions on the planet and its inhabitants. The Role of Literature in Environmental Ethics -Lead a discussion on the importance of literature in shaping environmental ethics. -Discuss how literature can evoke empathy, challenge perspectives, and encourage critical thinking on environmental issues. -Ask students to consider how the authors' storytelling techniques have influenced	<u>Sources:</u> National Council of Teachers of English (NCTE): The NCTE website offers a collection of lesson plans, teaching resources, and articles related to literature teaching and environmental ethics. You can find valuable insights and ideas for designing your lesson. Website: https://ncte.org/ Environmental Literature: This website provides a curated list of books, essays, and poems that address environmental and ethical issues. It can be a great resource for selecting literary works to incorporate into your lesson. Website: https://www.environmentalhumnities.ed.ac.uk/environmental-literature/ ReadWriteThink: This platform, developed by the International Literacy Association (ILA) and NCTE, offers lesson plans, classroom resources, and interactive tools for teaching literature and ethics. You can search for specific themes or topics related to environmental ethics. Website: https://www.readwritethink.org/ Teaching tolerance: Although it focuses on social justice, teaching tolerance provides valuable resources for incorporating literature and ethics into the classroom, including topics related to environmental ethics. Website: https://www.tolerance.org/	Class Discussion Student Presentations

their understanding of the ethical dimensions in the works.	Aldo Leopold Foundation: For resources specific to the Aldo Leopold County Almanac, visit the Aldo Leopold Foundation website. They offer educational materials and tools related to conservation and ethics. Website: https://www.aldoleopold.org/	
<u>Summary and Conclusion:</u> - Summarize the key points of the lesson, emphasizing the ethical issues explored in the literature. -Encourage students to reflect on the moral responsibilities that human beings have towards the environment and how literature can inspire positive change. -Assign a follow-up activity where students can write a short essay or create a creative project that explores their own ethical reflections on environmental issues.		Class Discussion

Activity	Methodology
<u>Activity:</u> The main lesson includes activities.	

Checks	Typology
1. Class discussion: Engage the class in a post-class discussion, where students can share their insights and reflections on the ethical dimensions of the literature they have studied. Encourage them to refer to specific passages or examples from the texts. 2. Written Reflections: Assign students to write individual reflection papers on ethical themes and moral responsibilities explored in the literature. Ask them to connect the ideas discussed in the texts to real-world environmental issues. 3. Group presentations: Have students work in small groups to create presentations that summarize their analysis of their assigned texts.	Class Discussion

Skills acquired
1. Critical Thinking: Students will develop critical thinking skills by analyzing the literature and identifying ethical issues surrounding environmental issues. They will learn to evaluate the complex moral dilemmas presented in the texts and explore multiple perspectives.

2. **Communication skills:** Students will practice verbal communication through group discussions and presentations. They will learn to articulate their thoughts clearly, express their interpretations of texts, and engage in meaningful dialogues with their peers.
3. **Ethical Awareness:** The class will promote ethical awareness by highlighting the moral responsibilities that humans have towards the environment. Students will reflect on their own values and attitudes towards nature and consider how literature can shape their ethical perspectives.
4. **Empathy and Compassion:** By delving into the literature that explores the impact of human actions on the environment and other species, students will develop empathy and compassion. They will better understand the interconnectedness of all living things and the consequences of our choices.
5. **Environmental knowledge:** Through the analysis of specific environmental issues presented in the literature, students will gain a deeper understanding of concepts such as land use, biodiversity loss, and animal rights. They will be better informed about real-world environmental challenges.
6. **Empowerment for Positive Change:** By discussing the potential impact of literature on environmental ethics, students will feel empowered to contribute to positive change in their communities. They will see how literature can inspire action and advocacy for environmental conservation and sustainability.

Lesson No. 5 – Environmental Activism in Memories

Lesson plan

Keywords: Impact Activism, Inspiration and Awareness, Personal Travel, Memories.

Timetable: lesson: 65 minutes and test: 15 minutes.

School: Two-year middle school

Objectives
• Analyze memories: Evaluate memoirs written by environmental activists to identify key themes, personal motivations, challenges, and successes in their journeys as activists. • Understand the diverse perspectives: Recognize and appreciate the diversity of environmental issues, geographical contexts, and personal backgrounds presented in memoirs, promoting a broader understanding of environmental activism. • Connects Personal Experience to Activism: Examines how an author's personal experiences and connections to nature influence their engagement in environmental activism, allowing students to see the value of individual perspectives. • Assessing impact and strategies: Assess the effectiveness of the various strategies and approaches employed by environmental activists, as revealed in the memoirs, and reflect on the potential for positive change in addressing environmental challenges. • Reflect on empowerment: Reflect on the potential of memories to empower and inspire readers, considering how personal stories can motivate others to engage in environmental activism. • Synthesize learning: Synthesize insights from memories with broader concepts of environmental activism, understanding the complex interplay between personal narratives and global environmental issues.

- Communication skills: Develop oral communication skills through group discussions and presentations, effectively conveying their understanding of memories and their relevance to environmental activism.
- Critical Thinking: Applying critical thinking skills to analyze the underlying messages and lessons conveyed in memoirs, encouraging a deeper exploration of the connections between personal histories and broader environmental concerns.

Contents	References	Methodology
<u>Introduction:</u> 1. Start with a brief discussion about the importance of environmental issues and how they affect our lives and the world. 2. Explain that today's class will focus on exploring environmental activism through the personal stories of people who have worked to address these issues. 3. Define the term "memoir" and briefly discuss its purpose in sharing personal experiences.	Every country should find literary texts about environmental activism in Memoirs. It is better for each country to analyze the texts in its own language instead of the texts in English.	Class Discussion Student Presentations
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> Reading and analysis: -Introduce some memories of environmental activists that students will explore in this lecture (provide titles and authors). -Distribute printed excerpts from memoirs or project them on the board. -In pairs or small groups, ask students to read excerpts and discuss the following questions: i) What environmental issue does the author address in this memoir? ii) What prompted the author to engage in environmental activism? iii) What challenges has the author faced in his activist journey? iv) How does the author's personal experience contribute to his or her view of the issue? -Facilitate a class discussion, where groups share their findings and insights. Encourage	<u>Sources:</u> Certainly, here are some potential sources you could use for the lesson: "Silent Spring" by Rachel Carson: This groundbreaking work is not only a classic of environmental literature, but also a memoir that chronicles Carson's personal journey as an environmental activist, focusing on the dangers of pesticides and their impact on the environment. "The Story of Stuff" by Annie Leonard: While not a traditional memoir, this book offers a narrative exploration of the impact of consumerism on the environment, providing insights into the author's personal journey in raising awareness about waste and sustainability.	Class Discussion Student Presentations

students to compare different experiences and strategies.

Reflective Writing:

1. Ask students to individually ponder the following question: "Why do you think personal stories and memories are powerful tools for promoting environmental activism?"
2. Give students 10-15 minutes to write a short response in their journals.

Group Activity: Creating Book Blurbs:

1. Divide the class into small groups.
2. Assign each group one of the memories you introduced at the beginning of the lesson.
3. In their groups, students should discuss and brainstorm ideas for a blurb or book summary that captures the essence of the memoir and its importance in understanding environmental activism.
4. Each group presents the class with a blurb from their book, giving a brief overview of the memoir and emphasizing its meaning.

"The Water Will Come" by Jeff Goodell: A memoir that delves into the author's experiences with communities grappling with sea level rise due to climate change, offering a narrative perspective on the urgent need for environmental action.

"Braiding Sweetgrass" by Robin Wall Kimmerer: Blending indigenous wisdom, scientific observation, and personal reflection, this memoir offers a unique perspective on the relationship between humans and nature, highlighting the author's journey as a scientist and environmental advocate.

"The Boy Who Harnessed the Wind" by William Kamkwamba and Bryan Mealer: This memoir shows the personal journey of a young Malawi inventor who uses his skills to address environmental challenges in his community, emphasizing the intersection of innovation and environmental activism.

"Refuge: An Unnatural History of Family and Place" by Terry Tempest Williams: This memoir weaves together personal experiences, family history, and environmental activism, offering insights into the author's relationship with nature and her dedication to wilderness conservation.

"An Inconvenient Truth" by Al Gore: While not a memoir in the traditional sense of the term, this book provides a comprehensive exploration of climate change and its impacts, as well as Al Gore's personal journey in advocating

	for environmental awareness and policy change. "The World is Blue: How Our Fate and the Ocean's Are One" by Sylvia Earle: This memoir by oceanographer Sylvia Earle discusses her personal connection to the ocean and the urgent need for marine conservation, providing insights into her lifelong commitment to environmental activism. Make sure the sources you select align with your students' reading level and interests, and consider the excerpts that best highlight the memoir aspect and themes of environmental activism.	
<u>Summary and Conclusion:</u> - Recap the key points discussed during the lecture, emphasizing the impact of personal stories in conveying the importance of environmental activism. -Ask students to share a new thing they learned or an insight they gained from the lesson. <i>Note: Adjust the duration of each activity based on the pace of your lesson and the specific memories you choose to focus on. You may also want to consider incorporating multimedia elements such as short videos or audio clips of environmental activists sharing their stories.</i>		Class Discussion

Activity	Methodology
<u>Activity:</u> The main lesson includes activities.	

Checks	Typology
Literary Analysis Essays: Assign students a literary analysis essay that focuses on one of the memoirs studied during class. In the essay, students should analyze how	Class Discussion

the author's personal experiences are intertwined with their message of environmental activism. They should explore the literary devices, symbolism, and narrative techniques used to convey the activist's journey and environmental concerns. This assessment allows you to assess their understanding of both the literary aspects and the environmental themes presented in the memoir.

Skills acquired

- Literary analysis skills
- Critical thinking skills
- Compare & Contrast
- Interdisciplinary understanding
- Literature-Environment Connection
- Communication skills
- Articulation of the insights.
- Participation in discussions
- Empathy and the ability to take perspective
- Understanding the Different Perspectives
- Information research and synthesis
- Research Integration
- Reflection and self-awareness
- Personal Reflection
- Problem-solving and advocacy
- Advocacy Consideration
- Cultural & Global Awareness
- Global Perspectives

Lesson No. 6 – Literary Responses to Environmental Catastrophes

Lesson plan

Keywords: Narrative techniques, Catastrophic phenomena, Environmental impact.

Timetable: lesson: 65 minutes and test: 15 minutes.

School: Two-year middle school

Objectives

- Identify literary responses: Recognize and identify literary works that respond to major catastrophes or environmental events, such as oil spills, deforestation, or natural disasters.
- Analyze Ecological Impact: Analyzes how authors use literary techniques to convey the ecological impact of environmental catastrophes in their works, including descriptions of ecosystems, wildlife, and landscapes.
- Examine Emotional Resonance: Explore how literature evokes emotional responses by describing characters' reactions, psychological experiences, and the human toll of environmental catastrophes.

- **Assess social implications:** Assess how the literature portrays the social implications of environmental disasters, such as displacement, community response, ethical dilemmas, and social conflicts.
- **Appreciating Literary Techniques:** Understanding and appreciating the use of literary techniques, such as symbolism, imagery, metaphor, and tone, in conveying the multifaceted effects of environmental catastrophes.
- **Compare and contrast responses:** Compare and contrast literary responses to different types of environmental catastrophes, recognizing similarities and differences in how authors deal with ecological, emotional, and social dimensions.
- **Applying Critical Thinking:** Applying critical thinking skills to analyze the deeper meanings and messages conveyed through literature's engagement with environmental challenges.
- **Express Insights:** Express your insights and analysis consistently, both verbally and in writing, demonstrating your understanding of the complex interplay between literature and real-world problems.
- **Engage in discussion:** Engage in thoughtful classroom discussions about literary works that respond to environmental disasters, actively contributing to conversations about the connections between literature, society, and the environment.
- **Reflecting on advocacy:** Reflecting on the potential of literature to raise awareness and inspire action regarding environmental disasters, considering the role of storytelling in promoting positive change.

Contents	References	Methodology
<u>Introduction:</u> -Start with a discussion about the impact of environmental disasters, such as oil spills, deforestation, or natural disasters, on ecosystems and human lives. -Explain that literature often reflects and responds to these events, offering unique perspectives on their effects. -State the objective of the lesson: to explore how literature captures the complexity of environmental catastrophes.	Every country should find literary texts on literary responses to environmental catastrophe. It is better for each country to analyze the texts in its own language instead of the texts in English.	Class Discussion Student Presentations
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> Reading and analysis: -Present printed excerpts of literary works responding to different environmental catastrophes. Examples could include excerpts from novels, poems, short stories, or essays.	<u>Sources:</u> Certainly, here are some potential sources you could use for the lesson. "The Lorax" by Dr. Seuss: A classic children's book that tackles deforestation and its	Class Discussion Student Presentations

-In pairs or small groups, ask students to read the passages and answer the questions:

- i) What environmental catastrophe is depicted in the excerpt?
- ii) How does the author convey the ecological impact of the catastrophe?
- iii) What human emotions or experiences are depicted in the text?
- iv) Are there any social or ethical aspects of the catastrophe being addressed?

-Facilitate a class discussion, in which groups share their findings and insights from the excerpts.

Guided Analysis:

- On the board, create three columns: Ecological Impact, Emotional Impact, Social Impact.
- Using the information gathered from the abstracts, together as a class, list examples of how the literature deals with each type of impact for different environmental catastrophes.
- Discuss how authors use literary techniques (symbolism, imagery, tone, etc.) to effectively convey these impacts.

Creative Response Activities:

- Divide students into pairs or small groups.
- Assign each group a different type of environmental catastrophe (oil spill, deforestation, natural disaster, etc.).
- Have each group brainstorm and write a short paragraph in the style of a literary response, conveying the ecological, emotional, and social impacts of the assigned catastrophe. Encourage them to use descriptive language and literary techniques.
- Ask each group to share their paragraph with the class.

environmental consequences through whimsical storytelling.

"The Road" by Cormac McCarthy: This novel explores a post-apocalyptic world where a father and son face the aftermath of an undefined environmental catastrophe.

"The Poisonwood Bible" by Barbara Kingsolver: a novel that delves into the effects of deforestation and colonialism on both the environment and the lives of the characters in a Congolese village.

"Silent Spring" by Rachel Carson: While not a work of traditional fiction, this book has had a profound impact on environmental awareness and can be debated for its influence on literature's response to environmental catastrophes.

"The Water Knife" by Paolo Bacigalupi: a science fiction novel set in a future where water scarcity has led to the collapse of society in the American Southwest.

"When the Killing's Done" by T.C. Boyle: This novel explores the ethical dilemmas surrounding the management of invasive species in the Channel Islands and their ecological impact.

"Cadillac Desert" by Marc Reisner: A non-fiction work that explores the environmental and social consequences of water management and engineering projects in the American West.

"Flight Behavior" by Barbara Kingsolver: This novel addresses

	the effects of climate change on a rural community when an unusual phenomenon disrupts the migration of monarch butterflies. Remember to review and select appropriate excerpts or passages from these sources that align with the goals of your lesson and your students' reading level.	
<u>Summary and Conclusion:</u> -Lead a brief discussion on the power of literature to deal with environmental disasters and evoke emotional responses. -Ask students to reflect on how reading and analyzing literary responses to disasters can deepen their understanding of ecological and social issues. <i>Note: Depending on the complexity of the literary passages and the depth of the discussion, you may need to adjust the timing of each activity.</i>		Class Discussion

Activity	Methodology
<u>Activity:</u> The main lesson includes activities.	

Checks	Typology
<u>Literary Analysis Tasks:</u> -Response Essays: Assign students an essay in which they choose a literary work discussed in the lesson that responds to an environmental catastrophe. Ask them to analyze how the author conveys the ecological, emotional, and social impacts of the catastrophe through specific literary techniques. Assess their ability to support their analysis with evidence from the text. -Comparative Analysis: Have students compare and contrast literary responses to different types of environmental catastrophes. This assignment can showcase their critical thinking by assessing how various authors address distinct challenges and impacts in their works.	Class Discussion

Skills acquired

- Literary analysis skills
- Identifying Themes
- Character empathy
- Critical thinking skills
- Inference & Analysis
- Compare & Contrast
- Environmental Awareness
- Understanding complex problems
- Impact appreciation
- Interdisciplinary connections
- Literature-Reality Synthesis
- Communication skills
- Effective Expression
- Active participation
- Empathy and the ability to take perspective
- Understanding the human experience
- Information research and synthesis
- Ethical Considerations
- Exploring Moral Dilemmas
- Empowerment and advocacy

Lesson No. 7 – Human-Nature Interaction in Literature

Lesson plan

Keywords: Coexistence, Environmental Ethics, Exploitation, Harmony.

Timetable: lesson: 65 minutes and test: 15 minutes.

School: Two-year middle school

Objectives
• Analyzes Literary Themes: Analyzes how literature portrays the multifaceted relationship between humans and the natural world, focusing on themes of coexistence, exploitation, management, and harmony. • Identify Character Interactions: Identify and examine characters' interactions with nature in literary works, considering how these interactions reveal characters' attitudes, behaviors, and emotions. • Assess the impact on identity: assess how characters' interactions with nature shape their identities, values, and perspectives, illustrating the profound influence of the environment on individual development. • Discuss stewardship issues: Discuss the concept of stewardship as presented in the literature, understanding its role in encouraging responsible and ethical interactions between humans and the environment. • Explore Conflict and Harmony: Explore instances of conflict and harmony between humans and the natural world in literary works, analyzing how these dynamics reflect broader social attitudes.

- Applying critical thinking: Applying critical thinking skills to interpret the complex and nuanced ways in which literature addresses human-nature interaction and its implications.
- Express your insights verbally: Express your insights and interpretations of human-nature interaction consistently and confidently in class discussions.
- Applying Insights in Writing: Applying insights gained from characters' interactions with nature to written analysis, demonstrating the ability to connect textual evidence to broader themes.
- Reflect on personal connection: Reflect on how the literary representation of human-nature interaction resonates with their experiences and perspectives on the environment.
- Recognizing Cultural Significance: Recognizing the cultural significance of human-nature interaction in literature, appreciating its reflection of social values, beliefs, and historical contexts.

Contents	References	Methodology
<u>Introduction:</u> -Start with a discussion about the relationship between humans and the natural world. Ask students to share their perspectives on how literature might represent this relationship. -Introduce the objective of the lesson: to explore how literature delves into the dynamics of human-nature interaction and the impact on characters' identities and perspectives.	Every country should find literary texts on human-nature interaction in literature. It is better for each country to analyze the texts in its own language instead of the texts in English.	Class Discussion Student Presentations
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> Reading and analysis: -Present printed excerpts from literary works showing different aspects of human-nature interaction. Choose songs that highlight themes of coexistence, exploitation, management, and harmony. -In pairs or small groups, ask students to read the passages and answer the questions: i) How do the characters interact with nature? ii) What themes related to human-nature interaction are evident in the text?	<u>Sources:</u> Certainly, here are some potential sources you could use for the lesson: "The Call of the Wild" by Jack London: This novel explores the deep connection between a domestic dog and the wilderness, highlighting the transformative impact of nature on the protagonist's identity. "The Secret Garden" by Frances Hodgson Burnett: This classic novel portrays the healing power	Class Discussion Student Presentations

iii) How do these interactions shape the characters' identity or worldview? -Facilitate a class discussion, allowing groups to share their findings and insights from excerpts. Guided Analysis: On the board, create four columns: Coexistence, Exploitation, Administration, Harmony. As a class, list examples of excerpts that represent each of these themes. Discuss how the characters' interactions with nature exemplify these different dynamics. Character Identity and Worldview Activity: -Ask students to choose a character from the excerpts analyzed. -In pairs, have students create a dialogue between the chosen character and another character or entity from nature (e.g., a tree, an animal). -The dialogue should reflect the character's point of view on coexistence, exploitation, management, or harmony, based on their interactions in the literature. -Each pair presents their dialogue to the class, discussing how the character's interaction with nature has affected their identity and worldview.	of nature as characters interact with an overlooked garden, emphasizing themes of rejuvenation and coexistence. "Into the Wild" by Jon Krakauer: While not a nonfiction book, this book can provide insights into the extremes of human-nature interaction while chronicling a young man's real-life journey in search of a deeper connection to the wilderness. "Braiding Sweetgrass" by Robin Wall Kimmerer: Drawing on indigenous wisdom, this book weaves together personal narratives and scientific observations to explore the mutual relationships between humans and nature. "The Overstory" by Richard Powers: This novel delves into the characters' lives and their connections to trees, emphasizing themes of exploitation, activism, and the intricate web of life. "My Side of the Mountain" by Jean Craighead George: A young adult novel that explores self-reliance and coexistence with nature as a boy embarks on a journey of survival in the wilderness. "The Sea Around Us" by Rachel Carson: While primarily nonfiction, Carson's descriptive and poetic writing can provide insights into the beauty and fragility of marine ecosystems. Remember to review the content of each source to make sure it aligns with your students' reading level and the goals of your lesson.	
<u>Summary and Conclusion:</u>		Class Discussion

- Conduct a brief discussion on the complexity of human-nature interaction and its significance in literature.

-Ask students to reflect on how their analysis of characters' interactions with nature improves their understanding of the relationship between literature and the environment.

Activity	Methodology
<u>Activity:</u> The main lesson includes activities.	

Checks	Typology
Group discussion and presentation: -Activity: Divide the class into small groups and assign each group a different theme related to human-nature interaction (e.g., coexistence, exploitation, management, harmony). Ask each group to find examples from the literature discussed in the lesson that reflect their assigned theme. -Presentation: Ask each group to present their findings to the class, discussing the specific examples they found and explaining how these examples contribute to understanding the chosen theme. -Evaluation: Assess the quality of the examples chosen, the group's ability to explain connections to the theme, and their commitment to conducting thoughtful discussion in class.	Class Discussion

Skills acquired

- Literary analysis skills
- Critical thinking skills
- Inference and Interpretation
- Evaluation of Ethical Dilemmas
- Comparative analysis
- Empathy and the ability to take perspective
- Understanding the Characters
- Communication skills
- Effective Expression
- Participation in discussions
- Interdisciplinary Awareness
- Environmental Awareness

- Cultural Sensitivity
- Cultural context
- Analytical Application
- Consideration of environmental ethics
- Ethical reflection

Lesson No. 8 – Exploring Natural Symbolism and the Imaginary in Literature

Lesson plan

Keywords: Symbolism, Metaphors, Natural Imagery

Timetable: lesson: 65 minutes and test: 15 minutes.

School: Two-year middle school

Objectives
• Define natural symbolism and imagery: Explain the concepts of natural symbolism and imagery in literature, understanding how authors use elements of the natural world to convey deeper meanings and enhance the reader's experience. • Identify natural symbols: Recognize and identify common natural symbols used in literature, such as trees, water, animals, and celestial bodies, and understand the symbolic meanings associated with these elements. • Analyze texts for natural symbolism: Analyze selected excerpts from poems, short stories, or passages from literature to identify examples of natural symbolism and discuss how these symbols contribute to the themes and messages of the text. • Explore the role of natural imagery: Examines the role of natural imagery in literature, understanding how vivid and descriptive language evokes sensory experiences, enriches the reader's understanding of the narrative, and establishes emotional connections. • Interpreting emotional and experiential metaphors: Interpreting the use of natural symbols as metaphors for human emotions, relationships, and experiences, recognizing how the natural world serves as a vehicle for conveying complex human feelings and ideas. • Discuss Connections to the Environment: Engage in classroom discussions about the ways in which natural symbolism and imagery connect readers to the environment, fostering a deeper appreciation for the relationship between literature and the natural world. • Participate in collaborative analysis: Collaborate in small groups to analyze literary passages containing natural symbolism, promoting critical thinking and communication skills as students share their interpretations with peers.

Contents	References	Methodology
<u>Introduction:</u> -Start by asking students about their experiences with nature and how it makes them feel. Discuss the emotional	Every country should find literary texts on natural symbolism and imagery in literature. It is better for each country to analyze the	Class Discussion Student Presentations

connections people often have with natural environments. - Introduce the concept of natural symbolism and imagery in literature. Explain that the authors use elements of nature to convey deeper meanings and explore human emotions, relationships, and experiences. -Share a brief definition of symbolism and imagery in literature.	texts in its own language instead of the texts in English.	
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> Understanding Natural Symbolism: -Project a slide with examples of common natural symbols: tree (growth, life), water (change, renewal), sun (hope, enlightenment), etc. -Discuss the meanings associated with these symbols and how they could be used to convey deeper ideas in literature. Analysis of selected extracts: -Distribute handouts with selected excerpts from poems and short stories that use symbolism and natural imagery. -In small groups, ask students to read and analyze the passages to identify natural symbols and their possible meanings. -Each group presents their results to the class. Role of the natural imaginary: -Explain the concept of imagination in literature, where vivid and descriptive language creates mental images for readers. - Provide examples of descriptive natural images taken from various texts. -In pairs, ask students to choose one of the examples provided and discuss how the images enhance the reader's understanding of the emotions, relationships, or experiences depicted.	<u>Sources:</u> <u>Poems:</u> "I Wandered Lonely Like a Cloud" by William Wordsworth This classic poem beautifully depicts a field of daffodils, using natural imagery to convey a sense of peace, beauty, and connection to nature. "The Road Not Taken" by Robert Frost While also exploring the theme of choices, this poem includes the image of a divergent path through a forest, symbolizing the various directions of life. "A Bird Came Down for the Walk" by Emily Dickinson This poem uses vivid natural imagery to depict a bird's encounter with the human world, exploring the delicate balance between nature and civilization. <u>Literary texts:</u> "Lighting a Fire" by Jack London This tale features vivid descriptions of the harsh natural environment, using visuals to emphasize the protagonist's struggle for survival.	Class Discussion Student Presentations

	"The Scarlet Letter" by Nathaniel Hawthorne This novel incorporates the natural world as a backdrop for its characters and themes, with the forest serving as a symbol of freedom and secrecy. "Their Eyes Looked at God" by Zora Neale Hurston This novel uses nature to reflect the protagonist's emotional and spiritual journey, interweaving natural imagery with personal growth.	
<u>Summary and Conclusion:</u> -Summarize the key points discussed in the lesson: the use of natural symbols and imagery in literature to convey deeper meanings and connections to the environment. -Encourage students to continue exploring literature with a focus on natural symbolism and imagery to gain a deeper understanding of the relationships between the natural world and human experiences.		Class Discussion

Activity	Methodology
<u>Activity:</u> The main lesson includes activities.	

Checks	Typology
<u>Discussion and analysis:</u> After teaching the main concepts and examples of natural symbolism and imagery, divide students into small groups. Provide each group with a piece of literature that includes examples of symbolism and natural imagery. Ask them to identify and analyze these elements, discussing how they contribute to the deeper meanings and themes of the text. Have each group present their findings to the class, encouraging critical thinking and peer learning. Monitor discussions to ensure students are accurately interpreting symbolism and imagery and connecting them to human emotions, relationships, and experiences.	Class Discussion

Skills acquired

- Analytical Thinking
- Interpreting skills
- Literary Analysis
- Critical Reading
- Creative Expression
- Cultural Awareness
- Connection with nature
- Symbolic Thinking
- Emotional intelligence

Lesson No. 9 – Exploring Ecological Balance and Disintegration in Literature

Lesson plan

Keywords: Ecological Balance, Ecosystem, Natural Harmony, Biodiversity.

Timetable: lesson: 65 minutes and test: 15 minutes.

School: Two-year middle school

Objectives

- Defining ecological balance and disruption: understanding the concepts of ecological balance and disruption, recognizing how ecosystems are based on delicate interdependencies for sustainability.
- Identify literary representations: Recognize and identify instances in literature where ecological balance and rupture are portrayed, linking these themes to characters, settings, and plot developments.
- Analyze the consequences of disruption: Analyze the consequences of disrupting the ecological balance as described in literary works, capturing the far-reaching impacts on both the environment and human communities.
- Examining the interdependence of species: Examine how the authors describe the interdependence of species within ecosystems, understanding how the destruction of one species can affect the entire ecosystem.
- Discuss Symbolism and allegory: Explore how authors use symbolism and allegory to represent ecological balance and disintegration, identifying deeper meanings beyond the literal context.
- Engage in critical thinking: Develop critical thinking skills by evaluating the ethical and moral dilemmas presented in literary works related to environmental degradation and destruction.
- Cultivating environmental awareness: Cultivating awareness of the intricate relationships between human activities, ecosystems, and the environment, promoting a sense of responsibility towards environmental stewardship.
- Appreciating the role of literature: Appreciating the way literature serves as a platform for exploring and discussing ecological balance and breakdown, recognizing its potential to raise awareness and stimulate critical discussion.
- Synthesize knowledge: Synthesize the knowledge gained from the lecture to develop well-informed opinions about the importance of maintaining ecological balance and the potential consequences of its disruption.



Contents	References	Methodology
<u>Introduction:</u> -Start by discussing what students mean by the term "ecological balance" and why it is important for maintaining a healthy environment. - Introduce the concept of upsetting the ecological balance through human activities and potential consequences. -Explain that literature often reflects these ecological concepts, and today's class will explore how authors use their works to represent these themes.	Every country should find literary texts on Ecological Balance and Disintegration. It is better for each country to analyze the texts in its own language instead of the texts in English.	Class Discussion Student Presentations
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> 1. Understanding Ecological Balance and Disturbance: Define ecological balance and ecological breakdown, emphasizing how ecosystems are based on intricate interdependencies. -Share some examples of how human activities can upset the ecological balance, leading to negative consequences. 2. Analysis of selected extracts: -Distribute handouts with excerpts from stories, novels, or poems that address ecological balance and disintegration. -In pairs or small groups, have students read and analyze the steps to identify instances of disrupted ecosystems and their consequences. Discuss the effects on the environment and species. 3. Interdependence of species: -Choose a literary work that highlights the interdependence of species within an ecosystem. -Conduct a classroom discussion on how the author demonstrates the relationships	<u>Sources:</u> Certainly, here are some literature texts you might want to consider using lesson a: "The Lorax" by Dr. Seuss: This children's book offers a powerful allegory of environmental destruction and the consequences of upsetting the ecological balance. It features Onceler's exploitation of Truffula trees and the Lorax's efforts to protect the environment. "The Jungle" by Upton Sinclair: This novel exposes the harsh conditions of the meatpacking industry in the early twentieth century in the United States. While it does not focus solely on ecological balance, it provides a vivid portrait of how industrialization and human activities can negatively impact the environment and public health.	Class Discussion Student Presentations

between different species and the impact of disturbing this interdependence. 4. Group Discussion: -Ask questions to the class: "Why is it important for literature to address ecological balance?" and "How can these representations in literature promote awareness?" -Allow students to share their thoughts and perspectives. 5. Application and Reflection: i. Reflective Activity: Have students consider a scenario in which an imaginary ecosystem is disrupted due to human activities. Ask them to write a short paragraph that reflects on the potential consequences for different species and the environment. ii. Sharing and Discussion: Invite volunteers to share their thoughts with the class. Facilitate a brief discussion on the far-reaching impacts of disrupting ecological balance and the importance of understanding interdependencies. <u>Summary and Conclusion:</u>	"The Grapes of Wrath" by John Steinbeck: Set during the Great Depression, this novel follows the Joad family as they migrate to California in search of a better life. It portrays the ecological upheavals caused by the Dust Bowl and explores the relationship between human survival and the natural world. "Flight Behavior" by Barbara Kingsolver: This novel centers on the migration of monarch butterflies due to climate change. It explores the upheaval of ecological patterns and the impact of human actions on both local communities and the environment. "The Water Will Come: The Rising Seas, the Sinking of Cities, and the Remaking of the Civilized World" by Jeff Goodell: While not a literary work, this non-fiction book offers insight into how rising sea levels disrupt ecosystems and threaten coastal communities. It can provide real context for discussions about ecological breakdown. "The Sea Around Us" by Rachel Carson: This classic piece of nonfiction explores the interconnectedness of marine ecosystems. While not fictional, it serves as a basis for discussing ecological balance and destruction in the context of ocean ecosystems. <i>Remember to choose texts that are in line with your reading level, interests, and the goals of your lesson.</i>	Class Discussion

- Summarize the key points of the lesson: the representation of ecological balance and disruption in the literature and the effects of human activities on ecosystems.

-Encourage students to apply the knowledge gained from the lecture to their appreciation of literature and their role in promoting environmental awareness.

Activity	Methodology
<u>Activity:</u> The main lesson includes activities.	

Checks	Typology
Debate or discussion in class: Organize a classroom debate or guided discussion where students take on different roles representing various perspectives. Some students might argue in favor of human intervention to address ecological imbalances, while others argue for the need for minimal human interference to maintain natural harmony. Facilitate discussion by asking questions about ethical considerations, potential consequences, and the role of literature in promoting environmental awareness. This activity assesses students' critical thinking skills, ability to articulate complex topics, and engagement with ethical dilemmas related to ecological destruction. Activities of the Literary Analysis Group: Divide the class into small groups and provide each group with a different literary text that deals with ecological balance and disintegration. Assign them to identify specific passages or scenes that illustrate these themes. Ask them to discuss the consequences of disrupting the balance and interdependence of species within the ecosystem. Each group should present their findings to the class, highlighting key moments that show the ecological upheaval and its effects. This activity assesses students' ability to analyze and interpret literary texts while demonstrating their understanding of ecological concepts.	Class Discussion

Skills acquired

- Critical reading skills
- Interpretive skills
- Environmental Awareness
- Analytical Thinking
- Ethical Consideration
- Literary analysis skills
- Deeper understanding of literature

- Participation in critical discussion
- Application of conceptual knowledge
- Environmental Advocacy Skills
- Empathy and the ability to take perspective
- Critical Reflection

Lesson No. 10 – Exploring Urbanization and Wilderness in Literature

Lesson plan

Keywords: Man-Nature Relationship, Industrialization, Wilderness, Urbanization.

Timetable: lesson: 65 minutes and test: 15 minutes.

School: Two-year middle school

Objectives
• Defining urbanization and wilderness: understanding the concepts of urbanization and wilderness, recognizing their significance in literature and society. • Contrast Urban and Rural Settings: Compare and contrast urban and rural settings in literary works, identifying the distinct characteristics and atmospheres associated with each. • Analyzes the themes of urbanization and industrialization: explores how the authors use urban contexts to address the themes of urbanization, industrialization, and the impact of human development on natural landscapes. • Examine human-nature relationships: Investigate how characters' connections to urban or wild environments reflect broader human-nature relationships and societal attitudes towards nature. • Discuss environmental impact: Engage in discussions about the ecological consequences of urbanization, reflecting on the representation of human impacts on natural landscapes. • Cultivate critical thinking: Develop critical thinking skills by evaluating the role of the setting in shaping characters' identities, values, and conflicts. • Apply analytical skills: Apply analytical skills to identify patterns, contrasts, and connections between urban and wild themes in literary works. • Reflect on personal preferences: Reflect on one's preferences for urban or wild environments, considering how individual choices are influenced by literature and real-world experiences. • Participate in thoughtful discussions: Participate in thoughtful classroom discussions about the complexities of urbanization, industrialization, and the representation of wilderness in literature.

Contents	References	Methodology
<u>Introduction:</u> -Start with a brief discussion of what urbanization and wilderness mean. Ask	Every country should find literary texts about urbanization and wilderness. It is better for each	Class Discussion Student Presentations

students about their perceptions of urban and rural environments and their significance in literature. -Explain that today's lecture will delve into how authors use these settings to explore complex themes related to human development and the natural world.	country to analyze the texts in its own language instead of the texts in English.	
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> 1. Understanding Urbanization and Wilderness: -Define urbanization and wilderness, providing examples of each. - Discuss the historical context of urbanization and industrialization, highlighting their effects on natural landscapes. 2. Contrasting Literary Excerpts: -Distribute handouts with excerpts from literary works depicting urban and rural environments. -In pairs or small groups, have students read and analyze the passages, noting the contrasting images, emotions, and themes associated with urban and wild settings. 3. Character Connections to Settings: -Choose a literary work with characters deeply connected to urban or wild environments. -Lead a classroom discussion about how these settings shape the characters' experiences, decisions, and relationships, and how their connections reflect broader social issues. 4. Group Discussion: -Ask questions to the class: "How do authors use urbanization and wilderness to convey deeper meanings?" and "What can we learn about human-nature relationships from these representations?"	<u>Sources:</u> Certainly, here are some literature and poetry texts you might consider using for the lesson: <u>Literature texts:</u> "Walden" by Henry David Thoreau: This classic work explores Thoreau's experience of living in a cabin in the woods near Walden Pond. He deepens his reflections on the benefits of a simple life in nature and criticizes the effects of industrialization and urbanization on society. "The Jungle" by Upton Sinclair: Set in the early twentieth century, this novel depicts the harsh conditions of immigrant workers in Chicago's meatpacking industry. It exposes the negative impacts of urbanization and industrialization on both people and the environment. "The Road" by Cormac McCarthy: In this post-apocalyptic novel, a father and son travel through a barren landscape after an unspecified disaster. The story highlights the consequences of uncontrolled urbanization and the loss of wilderness.	Class Discussion Student Presentations

-Allow students to share their insights and interpretations. 5. Application and Reflection: i. Reflective Activity: Ask students to choose whether they prefer urban or wild environments, and explain why. Ask them to reflect on how their choice might shape their experiences and perspectives, drawing parallels with the experiences of characters in literary works. ii. Sharing and Discussion: Invite volunteers to share their thoughts with the class. It facilitates a brief discussion of the factors that influence individual preferences for urban or wild environments.	"Never Let Me Go" by Kazuo Ishiguro: While not set in a traditional wilderness, this dystopian novel raises ethical questions about the consequences of scientific advances and the erosion of the natural world due to human interference. <u>Poems:</u> "The Waste Land" by T.S. Eliot: This modernist poem reflects on the disillusionment and fragmentation of society after World War I. It incorporates images of urban decay and wilderness to explore the impacts of industrialization on culture and identity. "Lines Composed a Few Miles Above Tintern Abbey" by William Wordsworth: This romantic poem celebrates the beauty of nature and reflects on the impact of urbanization on the poet's connection to wilderness and his ability to find solace in it. "The Love of the City" by Stephen Vincent Benét: This poem presents an allegorical representation of a city's relationship with nature. Contrast the materialistic activities of the city with the indomitable and eternal spirit of the wilderness.	
<u>Summary and Conclusion:</u> -Summarize the key points of the lesson: contrast between urbanization and wild settings in literature and how authors use these settings to explore human-nature relationships.		Class Discussion

-Encourage students to continue exploring these themes in their readings and reflections.

Activity	Methodology
<u>Activity:</u> The main lesson includes activities.	

Checks	Typology
Assay or comparative analysis: Give students an essay or analysis assignment in which they choose a piece of literature discussed during class that features an urban or wild setting. Ask them to compare the depiction of this environment with another piece of literature they studied earlier in the year. They should analyze how the chosen setting contributes to the themes and character development in each work. This evaluation will demonstrate the ability to apply the concepts learned and to carry out comparative literary analyses.	Class Discussion

Skills acquired

- Literary Analysis
- Critical Thinking
- Comparative interpretation
- Contextual comprehension
- Analysis of human-nature relations
- Environmental Awareness
- Recognition of Symbolism
- Empathy and the ability to take perspective
- Discussion and debate
- Application to real-world problems
- Ethical Consideration

Mathematics

curated by Burcu Arman Aktay

Lesson No. 1 - The Beauty of Mathematics in Nature

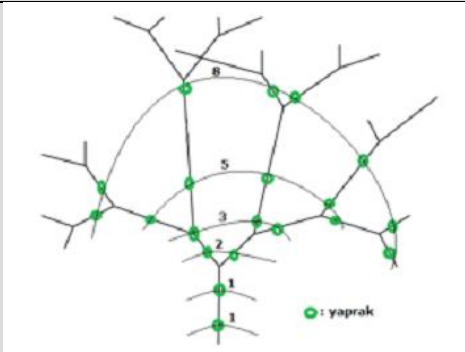
Lesson plan

Keywords: nature, math, fractal

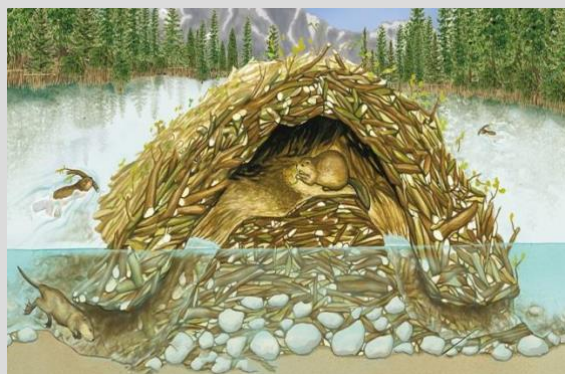
Timetable: lesson 40+40 minutes, activity 1 hour, test 20 minutes

School: High School

Objectives
It recognizes the mathematical examples we encounter in nature.

Contents	References	Methodology
Introduction (5 minutes): What are the examples of mathematics we encounter in nature?	https://www.youtube.com/watch?v=lg9RUaJe00c https://mehtapcelik-medium-com.translate.goog/do%C4%9Fada-matemati%CC%87k-cc5985d91c6e? x tr sl=tr& x tr tl=en& x tr hl=en-US& x tr pto=wapp& x tr hist=true	Discussion Brainstorming
Summary of prior knowledge (10 minutes):		
Presentation of new content (20-30 minutes): Nature presents us with the beauty of mathematics. Fractal geometry is also known as the geometry of nature. A geometric fractal is a pattern or pattern that repeats endlessly. The pattern is repeated in an ever-shrinking dimension. Therefore, when we		Conference Discussion

zoom in on a part of a geometric fractal, it looks exactly like the original. A fern is an example of this. When we look at a tree, we are actually looking at a mathematical beauty. Plants and trees follow the Fibonacci sequence. Each number in the Fibonacci sequence is equal to the sum of the two numbers that precede it. For example, 1,1,2,3,5,8,13,21,... To recognize the Fibonacci sequence in a tree, we need to calculate the number of leaves and the number of turns until we encounter a leaf in the direction of a leaf we have chosen. We can cover any plane we want, like a mosaic, only with regular hexagons, squares, and equilateral triangles. Their areas are equal; The hexagon is the hexagon with the smallest perimeter between the square triangle and the equilateral triangle. Bees create honeycombs from hexagons, so they do less work. The hexagonal shape is found in honeycombs, snowflakes, molecules, crystals, and many other areas. The shapes that are most pleasing to our eyes are those that respect the golden ratio (golden ratio: 1.618). In fact, today credit cards,



some books and some objects respect the golden ratio or come very close to it. For example, credit cards are very close to a golden rectangle (the ratio of the long side to the short side). The length of the credit card is approximately 8.6 cm. Its width is about 5.4 cm. Long side/short side: $8.6/5.4=1.593$. This ratio is very close to 1.618, which is the golden ratio. In other words, credit cards actually have the rectangular structure that looks more pleasing to our eyes. The shape of a soap bubble is determined by the surface tension. Surface tension shrinks the surface area, and the soap bubble contains less air. The surface area is reduced to a minimum for a given amount of air. This explains why soap bubbles take on a spherical shape. The edges of the soap bubbles meet at the triple intersection and form 120-degree angles. When chairs or tables with four legs, one of which is short, sway; Why don't 3-legged stools with a short leg swing? Three points not on the same line determine a plane; In other words, all 3 legs of a 3-legged stool always rest on a surface. In traffic, when vehicles are stopped at a red light,



they are usually caught at the next red light as well. Have you ever thought about what could be the reason for this?

Distance=Speed×Time. In other words, the distance between the traffic light and the next traffic light divided by the average speed of vehicles on that road gives the time.

Generally, during this time, vehicles will constantly run into a red or green light when approaching the next traffic light. Sometimes vehicles speed up to avoid being caught at a red light, and that's exactly why they accelerate.

Birds migrate in a V-shape. The reason for this is to ensure 60-70% energy efficiency. When birds in front of a flock flap their wings, they change the direction of airflow up and down. This way, the birds behind them can flap their wings without getting too tired, consuming less energy. Tired birds in front move behind. A flock of birds follows this route, especially during migration. When we look at the sky, the flocks of birds, which are very numerous, take on a V-shape; When viewed more generally, they are generally placed in a hexagonal shape. The

reason for this is to consume less energy. Because the hexagon has the smallest perimeter between hexagons, squares and equilateral triangles with equal areas, and therefore more birds can fit together and maximum energy efficiency is achieved. Mathematics is everywhere, we can gain new awareness by observing our environment, and nature really knows what to do and creates the most harmonious forms thanks to mathematics.

The beaver nest is shaped like a very large dam. The dam built by the beaver blocks the water at an angle of exactly 45 degrees. In other words, the beaver builds its dam in a completely planned way, not by chance. All hydroelectric power plants today are built at this angle. Beavers also don't completely block water. They build the dam to hold the water at the desired height and leave special channels to let excess water flow.

The figure shows the spruce tree and its climbing angle.

Summary and conclusion (5 minutes):

We have seen that there is mathematics in many parts of nature.

Activity	Methodology
Trial (2005): Catherine, the daughter of an extremely intelligent but also mentally unstable mathematician, never left her father in her entire life. Meanwhile, one day his sister Claire arrives and the balance changes. Catherine is forced to come to terms with her dominant behavior. On the other hand, he struggles with his father's pupil, Hal, who shows great interest in him. While she's making every effort to keep the balances and bridges strong, Catherine is also questioning how genetically influenced her father's brain structure, which is on the fine line between madness and genius. https://www.imdb.com/title/tt0377107/	Watch a movie

Verification	Typology
Which of the following is an example of how mathematics works in nature? - a- V-shaped flight of birds - b- Trees - c- Honey - d- Snail shell - e- All of the above Answer: And	Tests of multiple-choice questions prepared by the teacher

Skills acquired
Appreciating the aesthetic and artistic aspects of mathematics in nature Recognizing mathematical patterns in the natural world Improved mathematical appreciation and creativity

Lesson No. 2 - Climate Change Statistics

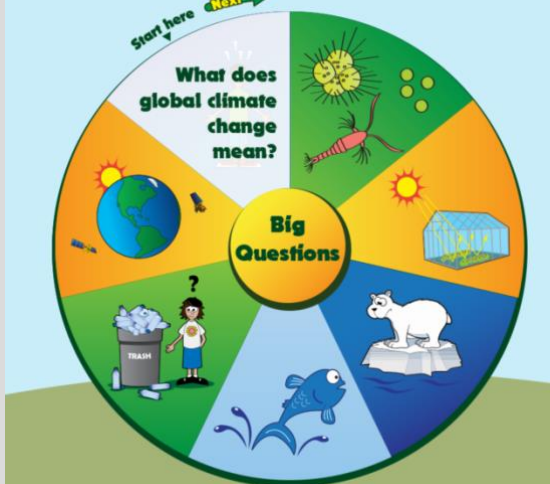
Lesson plan

Keywords: climate, climate change, statistics

Timetable: lesson 40+40 minutes, activity 1 hour, test 20 minutes

School: High School

Objectives
1. It defines what climate is. 2. Understands climate change. 3. It defines the harms of climate change. 4. Discuss the consequences of climate change.

Introduction (5 minutes): Welcoming students and creating a learning atmosphere. Start a video about climate catastrophe and discuss it	https://www.bbc.com/news/science-environment-45775309	Discussion
Summary of prior knowledge (10 minutes):		Brainstorming
Presentation of new content (20-30 minutes): Climate change refers to global warming (the continuous increase in the global average temperature) and its effects on the Earth's climate system. More broadly, climate change also includes previous long-term changes in the Earth's climate. The current increase in the global average temperature is faster than previous changes and is mainly due to the fact that humans burn fossil fuels. The use of fossil fuels, deforestation, and some agricultural and industrial practices increase greenhouse gases, particularly carbon dioxide and	https://www.youtube.com/watch?v=aGYjEyHBUTA https://www.bbc.com/news/science-environment-46384067 https://www.usgs.gov/faqs/what-are-some-signs-climate-change https://climateknowledgeportal.worldbank.org/	Conference

methane. Greenhouse gases absorb some of the heat that the Earth emits after it warms up due to sunlight. Larger amounts of these gases trap more heat in the Earth's lower atmosphere, causing global warming.

As deserts expand due to climate change, heat waves and wildfires are becoming increasingly common. Increased warming in the Arctic has contributed to melting permafrost, retreating glaciers, and losing sea ice. Higher temperatures also cause more intense storms, droughts, and other extreme weather conditions. Rapid environmental change in mountains, coral reefs, and the Arctic causes many living species to displace or become extinct. Even if efforts to minimize future warming are successful, some effects will persist for centuries. These include ocean warming, ocean acidification, and sea level rise.

Climate change threatens people with food and water shortages, increased flooding, extreme heat, more disease, and economic losses. Human migration and conflict can also be a consequence of this. The World Health

Organization (WHO) describes climate change as the greatest threat to global health in the 21st century. Societies can adapt to climate change through efforts such as protecting coastlines or expanding access to air conditioning, but some impacts are unavoidable. Poor countries are responsible for a small share of global emissions, but they have the least capacity to adapt and are the most vulnerable to climate change.

Many impacts of climate change are already being felt with the current level of warming of 1.2 °C (2.2 °F). Further warming would increase these effects and could trigger tipping points, such as the melting of the Greenland ice sheet. Under the 2015 Paris Agreement, countries collectively agreed to keep warming "well below 2°C. However, with the commitments made under the agreement, global warming will reach about 2.7 °C (4.9 °F) by the end of the century. Limiting warming to 1.5°C would require halving emissions by 2030 and achieving net-zero emissions by 2050.

Some effects of climate change, clockwise from top left: wildfires

exacerbated by heat and drought, worsening droughts endangering water supplies, and coral bleaching caused by marine heatwaves. To reduce emissions, it is necessary to generate electricity from low-carbon sources instead of burning fossil fuels. This change includes phasing out coal and natural gas power plants, significantly increasing the use of wind, solar, and other forms of renewable energy, and reducing energy consumption. Electricity produced from carbon-free sources will have to replace fossil fuels to power transport, heat buildings and run industrial plants. Carbon can also be removed from the atmosphere, for example by increasing forest cover and farming with methods that capture carbon in the soil.

The scientific method of gathering numerical information about certain events or situations, grouping and classifying them into series, and summarizing and analyzing the series with individual numbers such as the mean and ratio. In this sense, statistics is a technique of quantitative analysis.

Summary and conclusion (5 minutes):

Conference

Briefly on climate change; We can explain this as an increase in heat-trapping greenhouse gases in the atmosphere, an increase in average temperatures and, as a result, an unexpected change in climate.

Activity	Methodology
Before the Flood (2016): A look at how climate change affects our environment and what society can do to prevent the disappearance of endangered species, ecosystems, and native communities across the planet. https://www.imdb.com/title/tt5929776/	Watch Movie

Verification	Typology
6 questions 6 answers on climate change We have put together for you the most frequently asked questions and answers about climate change, which is the first item on the world's agenda. 1. Climate change? Global warming? Climate crisis? Which one is the right one? These three concepts, which we encounter every day on the sustainability agenda, refer to a single fact: the average temperature of the Earth's atmosphere is increasing rapidly by the day. Rising temperatures change the climatic characteristics. Changing climate characteristics lead to extreme weather events, i.e. crises. If the temperature rise is not controlled, ecosystems will be damaged, a water crisis will occur, the oceans and even the soil will suffer. All of these possibilities threaten sustainable living. 2. Are humans solely responsible for climate change? 97% of scientists agree on the answer to this question: yes, the increase in temperature in the atmosphere is caused by human activities. The excessive use of fossil fuels, deforestation, and environmental pollution damage to water, soil, and air lead to a rapid increase in greenhouse gases in the atmosphere and global warming. 3. How does climate change affect animals? Contrary to popular belief, it's not just polar creatures in melting glacier regions that are affected by climate	Feedback on teacher-prepared affirmations is received by asking questions in a discussion environment.

change. Change affects all living things on earth to a greater or lesser extent. Let's look at some examples: man-made damage to the environment changes the migratory routes of birds. Salmon, which rely on cold rivers to spawn, are rapidly becoming extinct. Deforestation puts wildlife at risk. Animals living in increasingly warm and polluted oceans are in danger. When all these negative effects of the climate are added to disproportionate and unfair hunting, the problems increase.

4. How does climate change affect people?

As we explained in the answer to the first question, human-induced change ultimately affects people the most. Agricultural land is shrinking and there is a risk of famine. The disproportionate use of water causes the thirst bells to ring. Extreme weather events force people to migrate. In many parts of the world, coastal habitats have to be evacuated due to rising water levels. While global warming is primarily caused by the activities of developed countries, many studies point out that poor countries will be the most affected by the findings.

5. How does climate change affect the oceans?

More than three-quarters of our world is made up of water, and of course water is heavily influenced by it. Warming ocean temperatures are melting the polar ice caps, changing ocean currents and fish migrations, and causing coral bleaching and extinction. The oceans are directly affected by climate change due to their important role in regulating the Earth's climate by absorbing greenhouse gas emissions. The large amounts of carbon dioxide absorbed are changing the chemistry of our oceans, making them more acidic. This adversely affects many marine and animal habitats. In addition, the warming of the ocean surface causes the extinction of some species, which affects the entire food chain.

6. Does deforestation play a role in climate change?

It's so much more than I expected... Forests are one of our most important natural carbon storage areas. Therefore, when forests decline, they lose their ability to store greenhouse gases. Burning trees release more carbon into the atmosphere. If we can slow and stop deforestation and manage natural soils in a healthy way, we could achieve up to a third of the emissions reductions needed by 2030 to prevent global temperatures from rising by more than 2°C. This

means a contribution equivalent to the complete cessation of the world's use of oil.

Skills acquired

Data analysis and interpretation
Understanding climate data and trends
Statistical and graphic skills

Lesson No. 3 - Counting the Number of Species in the Ecosystem

Lesson plan

Keywords: Ecosystem, types of ecosystems

Timetable: lesson 40+40 minutes, activity 1 hour lesson, test 20 minutes

School: High School

Objectives

1. It defines what an ecosystem is.
2. Indicate the types of ecosystems.
3. It provides information on the types of terrestrial and aquatic ecosystems.
4. Provides information on the count of the number of species.

Contents

Introduction (5 minutes):

What will be explained will be in the following order. What is ecology? Contents 1 What is ecology? 2 Types of ecosystems 3 Terrestrial ecosystems 4 Aquatic ecosystem The answer to the question "What is an ecosystem?" It is the interaction of living and non-living things in an area. In this lesson, we will learn about the ecosystem, i.e. the world we live in, which has an impact on all living things, and how to count the number of species in the ecosystem.

References

What is an ecosystem?
<https://docs.google.com/presentation/d/1uXZ8GHg3f-tFEyQthL0Erk3TF95zhU3NopEX5HL5y-c/htmlpresent>

Methodology

Presentation

Summary of prior knowledge (10 minutes):

Presentation of new content (20-30 minutes):

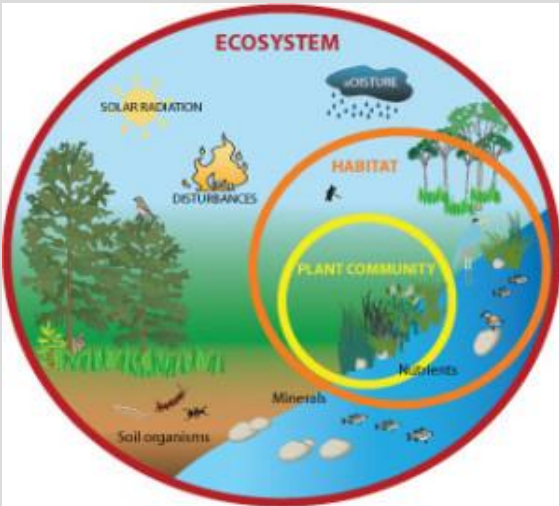
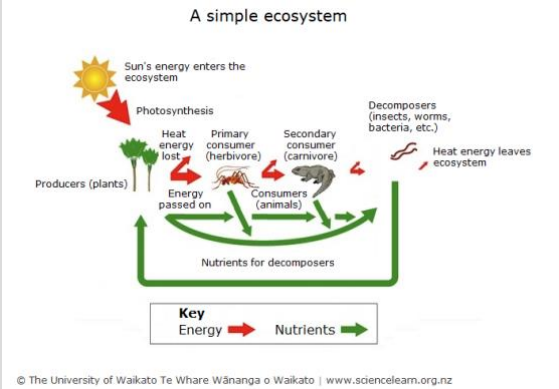
The name of the branch of science that studies the interaction and general relationships of living or non-living things is ecology. Ecosystem can be briefly defined as the communication of living and non-living beings.

Types of ecosystems The ecosystem is divided into two. It is divided into terrestrial ecosystem and aquatic ecosystem. Terrestrial ecosystem; Examples include the valley, the cave, the forest, the mountain, the desert, and the city. The aquatic ecosystem is; It can be specified as fresh water and salt water. Examples that support the definition can be given such as sea, ocean, swamp, and rivers.

Terrestrial ecosystem

There are many large ecological areas in the world for the terrestrial ecosystem. Biomes can be determined by factors such as geology, climate, soil, vegetation, etc. It also includes plants and animals. It would be correct to define desert biomes as hot, dry deserts. Aquatic biomes are divided into two:

<https://youmatter.world/en/definition/ecosystem-definition-example/>



Presentation Conference Discussion

freshwater biomes and saltwater biomes. The forest biome is divided into three main biomes: temperate tropical, rainforest, and boreal forest. Prairie biomes are divided into two categories: extended grasslands and temperate grasslands. There are two main tundra biomes, the polar region and the alpine tundra.

Aquatic ecosystem

Another part of the ecosystem that is referred to is the aquatic ecosystem. A drop of water containing living or non-living organisms is also part of the aquatic ecosystem. It is found within the aquatic ecosystem in wetlands where water is available. The aquatic ecosystem includes fungi, insects, reptiles, plants, and animals. It is well known that viruses are a very important part of the aquatic ecosystem. Viruses play a very important role in the nutrient and energy cycle. Like the terrestrial ecosystem, the aquatic ecosystem covers a very large area. It contains living or non-living entities.

Summary and conclusion (5 minutes):

We learned that the ecosystem is made up of terrestrial and aquatic

ecosystems, and by combining it with the counting argument in mathematics, we got information about species counting.

Activity	Methodology
When counting ecosystem types, the counting subject used is combined with a different counting task. For example, the students in the class are counted one by one. The activity continues by going out into the garden and counting the various creatures seen. Active work is carried out starting from the classroom and leaving the classroom to reach the school garden.	Teamwork
https://www.nature.com/scitable/knowledge/library/biodiversity-and-ecosystem-stability-17059965/	Reading the article

Verification	Typology
Which of the following statements is incorrect for the ecosystem? A) The ecosystem can be self-sustaining. B) It is made up of living and non-living beings. C) It is most abundant in living desert ecosystems. D) The ecosystem in which every living being can live is different. Answer: C) It is most abundant in living desert ecosystems. (Note: Ecosystems can be found in various environments, not just deserts. They exist in different habitats around the world.)	Tests already prepared by textbooks
Which of the following concepts is the most comprehensive when listed? A) Ecosystem B) Type C) Habitat D) Population Answer: A) Ecosystem (An ecosystem includes multiple types, habitats, and populations within it, making it the most comprehensive concept on the list.)	Tests already prepared by textbooks
How many types of ecosystems are there? We can talk about two types of ecosystems: terrestrial and aquatic.	Tests already prepared by textbooks

Skills acquired

Data analysis and interpretation
Understanding the concepts of biodiversity
Statistical skills

Lesson No. 4 - Geomathematics

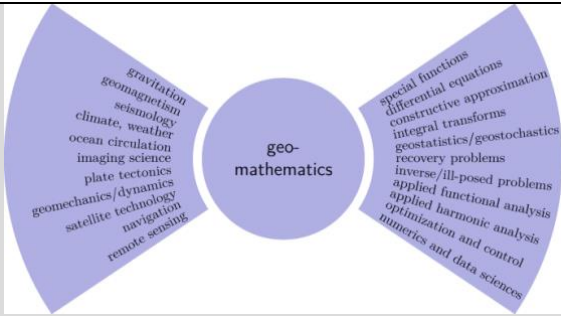
Lesson plan

Keywords: Geo, geomathematics

Timetable: lesson 40+40 minutes, activity 1 hour lesson, test 20 minutes

School: High School

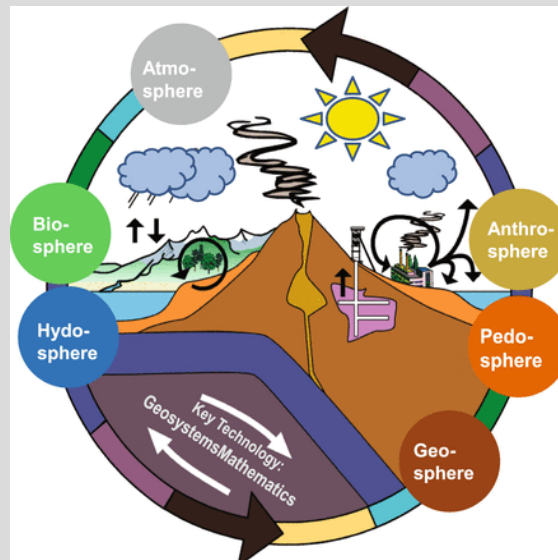
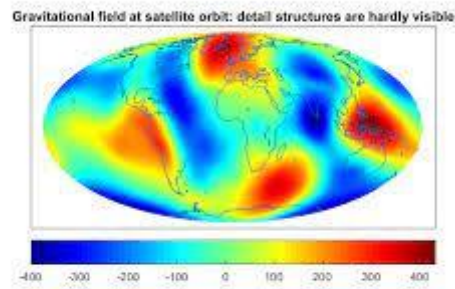
Objectives
1. Explain what geomathematics is. 2. Explain the connection between two disciplines.

Contents	References	Methodology
Introduction (5 minutes): What is Geomathematics? The use of methods, spaces, mathematical structures to solve earth science problems is called geomathematics.		Discussion Brainstorming
Summary of prior knowledge (10 minutes): Geomathematics is the application of mathematical methods to solve problems in the geosciences, including geology and geophysics, and specifically geodynamics and seismology Where do we use geosciences and where do we use mathematics?		Conference Discussion
Presentation of new content (20-30 minutes):	http://inverseprobleme.de/?page_id=253&lang=en	Conference

What is Geomathematics?

The use of methods, spaces, mathematical structures to solve earth science problems is called geomathematics. In fact, this discipline is twofold and provides motivation not only for understanding or solving earth science problems, but also for a better understanding and development of mathematical structures and methods. In recent years, the problems of the earth sciences have gained importance for two reasons.

The first of these is the growing concern for the future of our world, especially the rapid change in climate and environment and the dwindling groundwater resources, and the need to observe and quantitatively predict these changes in order to create correct conservation strategies, making the importance and use of mathematics in the field of earth sciences mandatory. The second reason is that, in recent decades, great advances in observation and measurement techniques have led to a significant increase in the quantity and quality of data collected. With the development of



computer technology, the need to accurately process and model this data using advanced mathematics has emerged. .		
Summary and conclusion (5 minutes): Mathematical geology, or geomathematics, in its broadest sense, deals with all applications of mathematics to the earth's crust. In mathematical geology the emphasis is given to geological process models that are mathematically modeled.		Conference

Activity	Methodology
A written report on this topic (DETERMINATION OF POSSIBLE TARGET AREAS FOR COPPER, LEAD AND ZINC MINERALIZATIONS IN THE EASTERN BLACK SEA REGION USING REMOTE SENSING AND GEO-MATHEMATICAL METHODS) IS READ. The activity involves reading books outside the classroom and discussing and informing about the topic in common groups when they come to class.	https://eticaret.mta.gov.tr/index.php?route=product/product&product_id=7500&tag=JEOMATEMATİK The linked report will be purchased and shared among the students.
Creation of posters to increase interest in geomathematics.	Poster design

Checks	Typology
How do mathematical geologists contribute to the understanding of climate change? a) Analyzing ice core samples for temperature trends b) Developing climate models to simulate future scenarios c) Studying cloud formations and their impact on weather patterns d) Directly measuring sea level using satellite technology Answer: b) Developing climate models to simulate future scenarios	Tests already prepared by textbooks
What mathematical concept is often used to predict climate trends and their impact on ecosystems?	Tests already prepared by textbooks

a) Mathematical analysis b) Probability theory c) Geometry d) Algebra	
Answer: a) Calculation	

Skills acquired

Analysis and interpretation of geospatial data Use of mathematical tools in geography and geology

Lesson no. 5 - Mathematical Biology

Lesson plan

Keywords: math, desert ants, sahara desert, homing vector

Timetable: lesson 40+40 minutes, activity 1 hour, test 20 minutes.

School: High School

Objectives
1. Understand the definition of mathematical biology. 2. Understand how and where it is used in daily life.

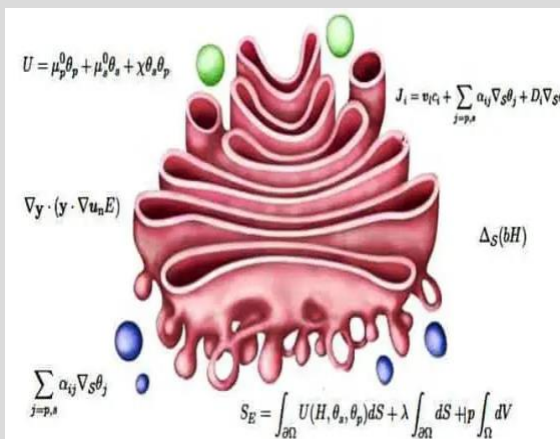
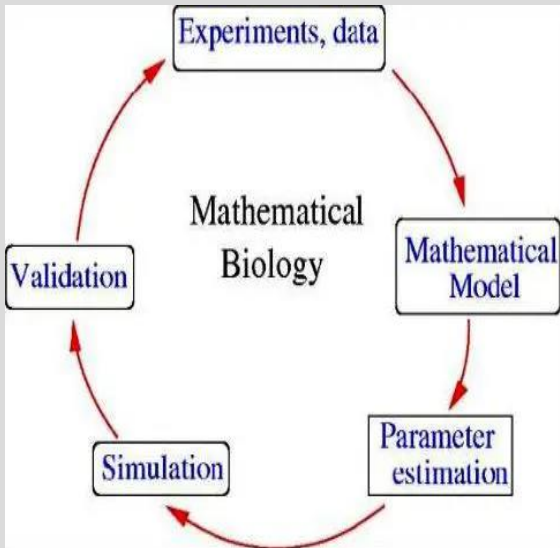
Contents	References	Methodology
Introduction (5 minutes): What is Mathematical Biology? In which areas is it used?		Brainstorming Discussion
Summary of prior knowledge (10 minutes): What is Biology? What areas of biology are related to mathematics?		Discussion

Presentation of new content (20-30 minutes):

Mathematics and biology are two concepts that are difficult to think of side by side. Biology is actually an experimental science, which means it needs experimentation to confirm its hypotheses. But biology isn't just about experiments. The part that deals with experiments is called "Experimental Biology", and the part that deals with theories and our subject, mathematical biology, is called "Theoretical/Theoretical Biology".

Contrary to popular belief, mathematics is not a science that deals only with abstract issues or is only used by engineers when making calculations. Essentially, math; It is the art of correct thinking with its symbols, rules, and methods. Similarly, biology is not a science based solely on memorization. Biomathematics acts as a bridge between these two great branches of science.

What is mathematical biology or biomathematics? Biomathematics or mathematical biology is the interdisciplinary science that develops



Conference

mathematical models to explain aspects of biology. Biomathematics is actually a sub-branch of "Applied Mathematics" in which mathematical modeling, abstractions, and technical analysis are performed.

It comes to the rescue when experimental biology is insufficient or field studies are impossible. That way, we don't have to wait for that process to happen to get information about a biological process. Biological systems are inherently extremely complex. However, thanks to simple mathematical models, we will have the ability to isolate and explain the basic elements and processes of this system.

In fact, many problems in biology have been solved using mathematical techniques developed in other fields, such as network analysis, group theory, differential equations, probability, chaos theory, and combinatorics. It is also expected that new mathematical techniques will be developed to solve some problems.

For example, the shape of a protein is an important factor in determining its functions. The folding

and entanglement of protein molecules is modeled using a branch of topology called knot theory. This will be bad news for those who choose social sciences because they are not very good at math. But mathematics now plays a vital role in biology. As a result, students need mathematical skills.

Where is biomathematics used? Biology, zoology, and botany once meant the study of animals and plants. The invention of the microscope shifted the emphasis to the cellular level, and more recently, the focus has become the molecular level. Mathematics was first used in the history of biology by the Swiss scientist Bernoulli in the mathematical analysis of smallpox in the 1760s.

In the years since, many other epidemic diseases have been modeled by various mathematicians. Although biomathematics entered the world of science about 250 years ago, it became popular and widespread in the early 1990s.

The human brain has 100 billion nerve cells connected by a biological system of axons and dendrites. Of course, we are faced with a complex

and interconnected system. Again, this complex system is managed with the collaboration of biology and mathematics. Systems biology is a rapidly developing interdisciplinary field of biological research. It aims to discover and understand the emergent properties of organisms. It focuses on complex interactions using a holistic approach. Systems biology makes extensive use of mathematical and computational models. As is well known, astronomy led to extraordinary developments in mathematical analysis in the eighteenth century. Biology could have a similar impact on mathematics in the future. Some scientists even argue that by 2100 biology and mathematics will change radically, just as mathematics and physics did in previous centuries.		
Summary and conclusion (5 minutes): To sum up, we can say that mathematical biology is a multidisciplinary field that uses mathematical models, tools, and techniques to study and understand biological processes, phenomena,		Conference

and systems. It involves applying mathematical concepts and methods to analyze and describe various aspects of biology, such as population dynamics, genetics, ecology, epidemiology, and more. Mathematical biology helps scientists and researchers make predictions, test hypotheses, and gain insight into complex biological phenomena by quantifying and representing them mathematically. This interdisciplinary approach enhances our understanding of the natural world and contributes to advances in fields such as medicine, ecology, and genetics.

Activity	Methodology
Watching a video about biomath: https://www.youtube.com/watch?v=ANQJsLj8c8k&t=19s&pp=ygUbbWVldG1hdGhzb3JnIGJpb21hdGhlfWF0aWNz	Watching Videos

Verification	Typology
Question 1: What mathematical model is commonly used to describe the spread of infectious diseases within a population? A) The Pythagorean theorem B) The Fibonacci sequence C) The SIR model d) The quadratic equation Answer 1: C) The SIR model	Tests already prepared by textbooks
Question 2: In a rabbit population, the population growth rate is modeled using the logistic growth equation. What does the logistic growth model take into account that the exponential growth model does not? A) Unlimited resources	Tests already prepared by textbooks

B) Linear population increase C) Load Capacity D) Seasonal variations Answer 2: C) Load Capacity	

Skills acquired

Applying Mathematics to Biological Systems Understanding eco-friendly concepts

Lesson No. 6 - Mathematics and Environment

Lesson plan

Keywords: geometric shapes, area calculation, environmental impact

Hours: 1 lesson (approx. 60 minutes)

School: High School

Objectives
Calculate areas of various shapes, including rectangles and circles. Understand the ecological implications of urban development and land use. Apply mathematical skills to assess the environmental impact of different land use scenarios.

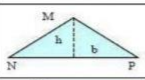
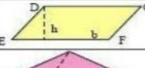
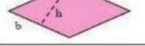
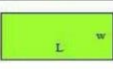
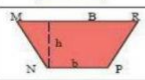
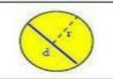
Contents	References	Methodology
Introduction (5 minutes): It begins with a discussion of why understanding the area of different forms is important in the context of urban planning and environmental conservation. Introduce the concept of area and its relevance to ecological concerns.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Discussion Brainstorming

Summary of prior knowledge (10 minutes):

Remind students how to calculate the area and environment of shapes

Summarize the key points, emphasizing the link between mathematical skills and their relevance in making informed environmental decisions.

It encourages students to think critically about the choices we make in urban planning and their impact on the environment.

NAME	FIGURE	AREA	PERIMETER CIRCUMFERENCE
TRIANGLE		$A = \frac{b \times h}{2}$	$P = MN + NP + PM$
PARALLELOGRAM		$A = b \times h$	$P = DE + EF + FG + GD$
RHOMBUS		$A = b \times h$	$P = b + b + b + b$ $P = 4b$
RECTANGLE		$A = L \times w$	$P = L + w + L + w$ $P = 2L + 2w$
SQUARE		$A = l^2$	$P = l + l + l + l$ $P = 4l$
TRAPEZOID		$A = \frac{(B + b) \times h}{2}$	$P = MN + NP + PR + RM$
CIRCLE		$A = \pi r^2$	$C = 2\pi r = \pi d$

Conference

Presentation of new content (20-30 minutes):

Present a real or hypothetical scenario involving urban development or land use choices.

Provide students with maps and measurements of different plots of land, some rectangular and some circular.

Have students calculate the areas of these plots and discuss the implications of different land use options on the environment

Engage in a classroom discussion about the environmental consequences of different land use choices.

Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).

Discussion
Brainstorming

It explores concepts such as green spaces, urban sprawl, and sustainable development.		
Summary and conclusion (5 minutes): Summarize the key points, emphasizing the link between mathematical skills and their relevance in making informed environmental decisions. It encourages students to think critically about the choices we make in urban planning and their impact on the environment.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Discussion Brainstorming

Activity	Methodology
Assign to groups of students problems related to the calculation of the area of different shapes and their applications in environmental contexts	Teamwork

Verification	Typology
Question: Which of the following formulas can be used to calculate the area of a circle? A) $A = \text{length} \times \text{width}$ $A = \text{length} \times \text{width}$ B) $A = \pi \times \text{radius}^2$ $A = \pi \times \text{radius}^2$ C) $A = 2 \times \pi \times \text{radius}$ $A = 2 \times \pi \times \text{radius}$ D) $A = \text{perimeter} \times \text{radius}$ $A = \text{perimeter} \times \text{radius}$ Answer: B) $A = \pi \times \text{radius}^2$ $A = \pi \times \text{radius}^2$	Tests of multiple-choice questions prepared by the teacher
Question: Imagine that a city is planning to build a new park. The available land is rectangular or circular in shape. How would you use your knowledge of calculating shape areas to help the city make an informed decision about which form of park would be most environmentally friendly? Explain your reasoning. Here's an example as an answer to guide what students care about: To determine which park shape would be most environmentally friendly, we can calculate rectangular and circular plot areas and consider factors such as land use efficiency and potential impact on the ecosystem:	Tests of open-ended questions prepared by the teacher

Rectangular Park: Calculates the area of the rectangle (length x width). This shape may be better suited for maximizing land use in a city with a grid layout.

Circular Park: Calculates the area of the circle ($\pi \times \text{radius}^2$). Circular parks could have benefits in terms of aesthetics and flow. The city should consider the following factors:

Land Use Efficiency: Compare the park area to the available land area. If the circular park area closely matches the rectangular park area, it may be a more efficient use of space.

Environmental impact: Consider the impact on local ecosystems. A circular park could minimize disruption to natural features or habitats, while a rectangular park could be designed to accommodate urban planning constraints.

Accessibility and aesthetics: Evaluate how well each shape integrates with the city's layout, community accessibility, and aesthetic appearance.

Ultimately, the city should make an informed decision by weighing these factors, including environmental impact, along with other urban planning considerations.

Skills acquired

Calculation of the area of rectangles and circles.
 Apply mathematical skills to real-world environmental scenarios.
 Critical thinking about land use and its ecological consequences.

Lesson No. 7 - Mathematics in Water Purification

Lesson plan

Keywords: water purification, clean water, algorithm
 Timetable: lesson 40+40 minutes, activity 40 hours, test 20 minutes.
 School: High School

Objectives

1. Knows the importance of water purification.
2. He knows the harms of drinking water that needs purification without purification.
3. Work on algorithms in mathematics.
4. Create a purification model with water purification experiment.
5. Learn the water content.

Introduction (5 minutes): We start the lesson by saying that water purification is important and that we will purify water with an experimental activity in this lesson. We will show that mathematics is also involved by carrying out the activities that we will carry out step by step during the water purification experiment, in algorithmic steps, just like a computer program.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Conference
Summary of prior knowledge (10 minutes): Water cycle: Examines the water cycle, explaining how water moves through the environment, including evaporation, condensation, precipitation, and runoff. Water sources: Discuss different water sources, such as rivers, lakes, groundwater, and reservoirs, and their importance in providing clean drinking water. Water pollution: Summarize the concept of water pollution and the various sources of contaminants, including industrial discharges, agricultural runoff, and household waste. Types of Water Contaminants: Explain the different types of water contaminants,	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Discussion Conference

including pathogens (bacteria and viruses), chemicals (heavy metals, pesticides), and suspended particles.

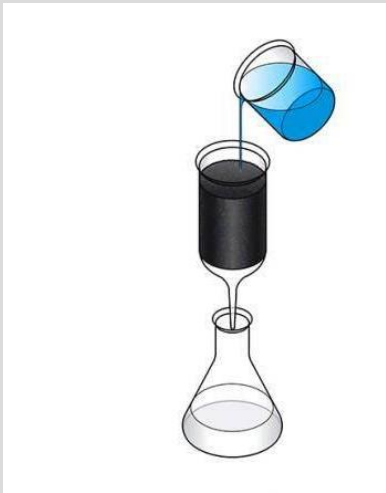
Health implications:
Discuss the potential health risks associated with consuming contaminated water, emphasizing the importance of safe drinking water.

Basic Chemistry: Provide a brief review of basic chemistry concepts such as solubility, pH, and chemical reactions. These are essential for understanding water treatment processes.

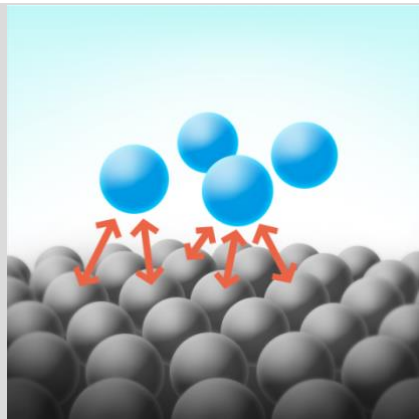
Water Treatment Goals:
Explain the primary goals of water purification, which include removing contaminants, making the water safe for consumption, and improving taste and odor.

Treatment methods:
Provide an overview of common water purification methods, such as filtration, coagulation, flocculation, sedimentation, disinfection (chlorination, UV treatment), and desalination (if applicable).

Environmental impact:
Discuss the

environmental impact of water purification processes and how they can affect aquatic ecosystems and the availability of freshwater resources. Water conservation: Highlight the importance of water conservation practices to reduce the need for extensive purification and protect water sources.		
Presentation of new content (20-30 minutes): Since water is our main drink, clean drinking water is very important for health. For this reason, you may have heard that you need to use purification systems that filter tap water in your home. In this project from the Experiments corner, we are trying to understand how activated carbon, which is frequently used in household water purification devices, separates water from pollutants. Good to know! Drinking water must not contain microorganisms, solid particles and harmful chemicals. Some of the substances present in the water may be present in certain amounts.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.). https://youtu.be/wsaBIOrvW4?si=L_UnUaavr0bgFzG8 https://youtu.be/5C-vyZfDhl8?si=zGl2GsXFaMKTlJqH 	Conference Watching Videos

Different methods are used to purify water. In water purification devices used at home, the water is mostly purified of foreign substances by passing it through a filter. Activated charcoal is one of the substances commonly used for this purpose.



Activated carbon is produced from materials containing high amounts of carbon (e.g. charcoal, wood). Its structure is similar to the graphite used in pencils, but it has a more irregular structure.

Activated charcoal keeps impurities in the water on its surface, allowing them to separate them from the water. The reason why activated carbon is particularly preferred for this process is that the surface area of activated carbon is very large. So much so that the surface area of 1 gram of activated carbon can vary between 500-1500 square meters. So, the surface area of 10 grams of activated charcoal - about 5 tablespoons - can cover the surface of a football field. Due to the cracks and gaps in its structure, there are many places on the surface of activated carbon where foreign

substances can stick in the water.

The process that allows foreign substances in the water to adhere to the surface of activated carbon is called adsorption. A substance can adhere to a solid surface as a result of physical or chemical interactions.

In physical adsorption, the interactions between molecules called Van der Waals forces, which allow the substance to adhere to the surface, are not as strong as chemical bonds. This interaction occurs due to electrical repulsion and the forces of attraction between atoms or groups of atoms if the molecules are close enough together.

The cracks on the surface of activated carbon can be of different widths, and their structures can be compared to cracks in the earth's crust. The distance between the molecules entering the spaces called micropores, which are less than 2 nanometers wide, and the surface of the activated carbon is sufficient for Van der Waals interactions to occur.

In this activity, we examine the change that activated charcoal

causes in the color of the energy drink by making sure that the molecules that give color in the blue energy drink adhere to the surface of the activated carbon. This can also help us understand how activated charcoal, commonly used in water purifiers, separates contaminants from water. Colored drinks are often colored using food coloring. In the ingredient list of the energy drink we used at our event, it was indicated that bright blue was used as a dye. This substance is one of the seven most commonly used dyes in foods. When the electrons in the dye molecules in the blue food coloring interact with the light, they absorb some of the rays in the visible wavelength and reflect the rays in the blue wavelength. That's why they appear blue. .		
Summary and conclusion (5 minutes): By learning the content of the water. The importance of purification is emphasized. Purification experiments are carried out, and mathematics is also emphasized in the purification process		Experience

Activity	Methodology
Experiment: We make a simple purification system What do we need? • A coloured drink (e.g. energy drink) • Activated charcoal (can be obtained at stores that sell aquarium supplies) • 5 glass glasses • Clock to keep time • Filter paper (paper filters used in filter coffee makers can be used) • Spoon • Transparencies pen or label What are we doing? First, we mark the glass tumblers as 0, a, b, A, and B using a pen or glass label. We add 1 teaspoon of activated charcoal to the glasses that we have marked with a and b. Next, we add 2 tablespoons (about 20 milliliters) of colored drink to the glasses that we have labeled 0, a, and b. We keep glass number 0 aside so that we can compare changes in beverage colors in other glasses after the processes we will apply in the future. After waiting 5 minutes, we filter the mixture into the glass we have labeled as A through the filter paper and collect the filtrate in the glass we have labeled A. At this stage, you can notice how the color of the drink changes. We wait for the third glass, which we labeled as b, for 1 hour. During this process, you can stir the contents of the glass from time to time. After 1 hour, we filter this mixture through the filter paper and collect the filtrate in the glass that we have labeled as B. At the end of the activity, we compare the colors of the mixtures in the glass that we have labeled 0, A and B. Caution: Never drink beverages that have come into contact with activated charcoal. However, beverages that come into contact with activated charcoal, which can be used in drinking water filters, can be consumed. What happened?	Experiment

You may have noticed that when we pour the colored drink into glasses containing activated charcoal, bubbles form in the liquid. The reason for this is that the drink that diffuses through the cracks and pores in the structure of the activated charcoal causes air to escape into these spaces. The color of the energy drink we used at our event was blue. When we mixed the energy drinks with activated charcoal, the mixtures turned into a black slurry. After waiting 5 minutes, the color of the mixture we filtered through the filter paper turned lighter blue than its initial state. When we let the mixture sit longer, we can see that the color of the energy drink becomes lighter. Therefore, if you wait long enough, the drink will become completely colorless. When we mix the blue energy drink with activated charcoal, the liquid moves through the cracks on the surface of the activated charcoal and enters the pores. At this stage, the color molecules of the drink adhere to the surface of the activated charcoal. Over time, as the amount of adsorbed substance increases, the color of the drink mixed with activated charcoal becomes lighter.	

Verification	Typology
Question: What is the main role of activated carbon in the water purification process? A) To kill bacteria and viruses. B) To increase the pH of the water. C) To adsorb and remove organic contaminants. D) To add minerals to enhance the taste. C) To adsorb and remove organic contaminants	Tests prepared by the teacher
Question: Which of the following methods is commonly used to turn hard water into soft water? A) Addition of salt (sodium chloride). B) Boil the water. C) Filtration by means of activated carbon. D) Increase the pH of the water. Answer: A) Addition of salt (sodium chloride). Question 2 explained: Adding salt, typically in the form of sodium chloride, is a common method of softening hard water through a process called ion exchange. Salt replaces	Tests prepared by the teacher

calcium and magnesium ions in the water, reducing the hardness of the water.	

Skills acquired

Critical Thinking: They will develop critical thinking skills by analyzing the effectiveness of different water purification methods and making informed decisions based on their observations.
Problem Solving: Students will encounter challenges during the experiment, encouraging them to brainstorm solutions and solve problems as they arise.

Lesson No. 8 - Observation in Mathematics

Lesson plan

Keywords: Observations, Data Collection, Data Analysis, Interpretation

Hours: 1 lesson (approx. 60 minutes)

School: High School

Objectives
Collect and record observational data related to the environment. Analyze and interpret collected data using mathematical concepts. Understand the importance of data-driven decision-making in environmental issues.

Contents	References	Methodology
Introduction (5 minutes): Start by discussing the importance of making informed decisions about environmental issues. Explain that data collection and analysis play a crucial role in understanding and addressing environmental challenges.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Discussion Conference
Summary of prior knowledge (10 minutes):	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Conference

Review the basic concepts of data collection, including data types (qualitative and quantitative), data sources, and data presentation (charts, graphs).		
Presentation of new content (20-30 minutes): Divide students into pairs or small groups. Provide each group with a set of observation activities related to the environment. For example, measuring and recording temperature at different points on the school campus. Have students collect data, record their observations, and write down the time and location of each measurement. Discuss the challenges and experiences encountered during data collection. Emphasize the importance of consistency and accuracy in the collection of environmental data.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Teamwork Data analysis Discussion
Summary and conclusion (5 minutes): Summarize the key points of the lesson, highlighting the role of observational data in environmental decision-making.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Conference

Emphasize the importance of mathematical skills in analyzing and interpreting data in the context of the environment.

Activity	Methodology
Observation in nature (school garden)	Observation Data collection and analysis

Verification	Typology
Question: Why is accurate data collection important for understanding environmental issues? Answer: Accurate data is essential because it provides the basis for making informed decisions and taking appropriate action to address environmental challenges.	Tests of open-ended questions prepared by the teacher
Question: What types of data can be collected in environmental observations? Answer: Various types of data can be collected during environmental observations, such as temperature, air quality, wildlife observations, and pollution levels.	Tests of open-ended questions prepared by the teacher

Skills acquired

Practical skills when collecting and recording data.
Critical thinking in the context of environmental issues.

Lesson No. 9 - Sustainable Environment and Mathematics

Lesson plan

Keywords: sustainability, environment, data analysis, renewable energy, eco-friendly practices

Hours: 1 lesson (approx. 60 minutes)

School: High School

Objectives
Understand the mathematical principles behind sustainability. Learn how mathematics can be used to address environmental challenges. Apply mathematical skills to analyze sustainability data.

Contents

References

Methodology

Introduction (5 minutes): Start by discussing the concept of sustainability and why it is important for the environment. It highlights that mathematics plays a crucial role in analyzing, measuring, and promoting sustainable practices.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Discussion Brainstorming
Summary of prior knowledge (10 minutes): Review mathematical concepts relevant to sustainability, such as percentages, ratios, and basic algebraic equations. Discuss how mathematics can be used to quantify and evaluate environmental data.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Conference Discussion
Presentation of new content (20-30 minutes): Introduce key mathematical topics related to sustainability, including: ● Percentage change and its use to monitor improvements in resource efficiency. ● Reports to compare the use of renewable and non-renewable resources. ● Algebraic equations to model environmental scenarios, such as	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.). https://www.pbslearningmedia.org/resource/buac17-math-ess-envir-math/envir-mathematics-and-environmental-sustainability/	Conference Discussion

population growth or pollution levels. Provide students with real-world sustainability data, such as energy consumption, waste production, or carbon emissions, from different sources. Teach students to perform calculations and analyses using the mathematical concepts discussed. Encourage discussions about how these calculations can inform sustainable decision-making.		
Summary and conclusion (5 minutes): Summarizing the key points of the lesson and the main conclusions. Summarize the main mathematical principles related to sustainability. It emphasizes the importance of mathematics in making informed decisions for a more sustainable environment.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Conference

Activity	Methodology
Enter the activity to be carried out by describing it (workshop, games, group work, etc.).	Enter the methodology used. If you don't find it in the list, create a new one by writing the text and share it so that it can be included in the methodologies.

Verification	Typology
Question: How can percentages be used to measure improvements in resource efficiency for sustainable practices? Answer: Percentages help quantify changes in resource use over time, making it possible to assess the impact of sustainable practices.	Tests of open-ended questions prepared by the teacher
Question: Give an example of how algebraic equations can be used to model an environmental scenario. Answer: Algebraic equations can model population growth, pollution levels, or renewable energy production over time.	Tests of open-ended questions prepared by the teacher

Skills acquired

Conceptual knowledge as a mathematical analysis of sustainability data. Critical thinking about sustainable practices and their mathematical evaluation. Understand the role of mathematics in addressing environmental challenges and promoting sustainability.

Lesson No. 10 – Mathematics in Nature

Lesson plan

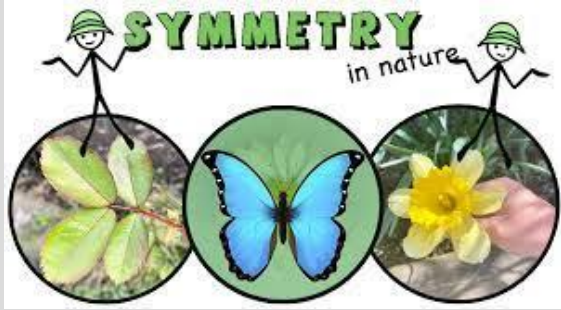
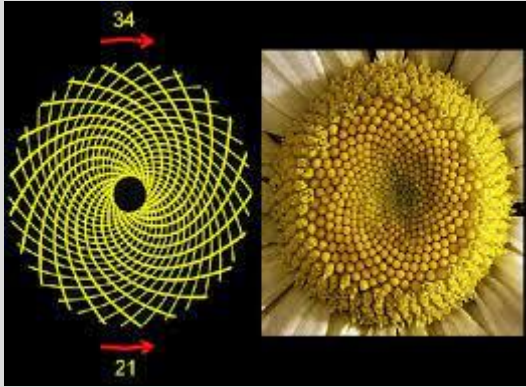
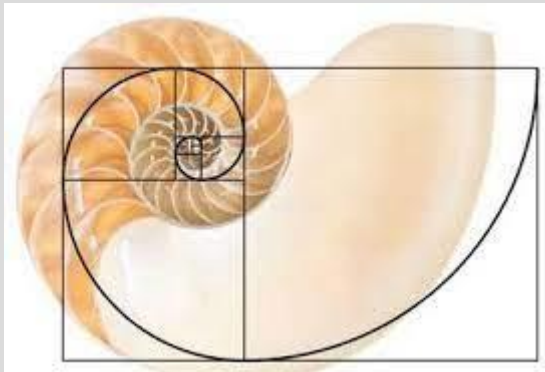
Keywords: Fibonacci sequence, fractals, symmetry, golden ratio, tessellations

Hours: 1 lesson (approx. 60 minutes)

School: High School

Objectives
Recognize and appreciate mathematical patterns and concepts in the natural world. Understand the role of mathematics in the description and explanation of natural phenomena. Apply mathematical thinking to solve problems inspired by nature.

Contents	References	Methodology
Introduction (5 minutes): It begins with a discussion of the ubiquity of mathematics in the natural world. Explain that mathematical patterns and principles can be	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Discussion Conference

observed in everything from plant growth to animal behavior.		
Summary of prior knowledge (10 minutes): Review basic mathematical concepts, such as symmetry, geometric shapes, and patterns. Discuss the importance of mathematical modeling in understanding natural phenomena.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.). 	Conference Discussion
Presentation of new content (20-30 minutes): It features various examples of mathematical patterns in nature, including the Fibonacci sequence in flower petals, fractals in tree branches, and symmetry in butterfly wings. Introduce concepts such as the golden ratio and tessellations found in shells and honeycombs. It shows images or specimens of nature that show mathematical patterns. Have students identify and describe the mathematical patterns they observe. Encourage students to brainstorm real-world applications of these mathematical concepts.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.). https://www.nctm.org/Publications/Mathematics-Teacher/2007/Vol101/Issue2/Mathematics-in-Nature/ https://www.scientificamerican.com/article/fibonacci-numbers-in-nature/  	Conference Brainstorming

		
Summary and conclusion (5 minutes): Summarize the main mathematical models and concepts observed in nature. It emphasizes the role of mathematics in understanding and appreciating the beauty of the natural world.	Any link to the pre-prepared lesson or material to be used (videos, apps, slides, etc.).	Conference

Activity	Methodology
Searching for mathematics in nature in the schoolyard	Observer

Verification	Typology
Question: Give an example of the Fibonacci sequence in nature and explain its meaning. Answer: An example is the arrangement of sunflower seeds, which follows the Fibonacci sequence. This model allows for efficient packaging and growth.	Tests of open-ended questions prepared by the teacher
Question: How can mathematical concepts such as symmetry and tessellations be applied in fields other than mathematics? Answer: Symmetry and tessellations are used in art, architecture, and design to create aesthetically pleasing and functional structures.	Tests of open-ended questions prepared by the teacher

Skills acquired

Observation and recognition of mathematical patterns in nature. Application of mathematical concepts to real-world examples. Critical thinking about the role of mathematics in the explanation of natural phenomena. Appreciation for the connections between mathematics and the natural world.

History

curated by Evangelia Dialyna

Lesson No. 1 – Industrial Revolution

Lesson plan

Keywords: industrialization, mass production, climate change, greenhouse gases, fossil fuels, deforestation.

Timetable: 45 minutes lesson, 30 minutes activity, 10 minute test.

School: Two-year middle school

Objectives

1. Understanding the Industrial Revolution:

Explain the main features, causes, and consequences of the Industrial Revolution.

It analyzes the social, economic, and technological changes brought about by the Industrial Revolution.

Discuss the impact of industrialization on various aspects of society, such as urbanization, working conditions, and population growth.

2. Exploring the Relationship Between Industrialization and Climate Change:

✓ Investigate the links between the Industrial Revolution and the emergence of climate change as a global problem.

✓ It examines the role of increased carbon emissions, deforestation, and other human activities in driving climate change during and after the Industrial Revolution.

✓ Discuss the concept of carbon footprint and its connection to industrialization and consumerism.

3. Recognize the environmental impact of industrialization:

✓ Explore the long-term environmental consequences of the Industrial Revolution, such as air and water.

✓ pollution, habitat destruction and resource depletion.

✓ Review case studies that highlight the specific environmental challenges caused by industrialization.

✓ Analyze historical events or examples that demonstrate the negative effects of industrialization on ecosystems and biodiversity.

4. Understand the importance of sustainable practices:

✓ Discuss the concept of sustainability and its relevance in addressing the challenges posed by industrialization and climate change.

✓ Identify sustainable alternatives to industrial practices, such as renewable energy sources, green technologies, and responsible resource management.

✓ Encourage critical thinking about personal and collective actions that can contribute to a more sustainable future.

5. Promote Critical Thinking and Problem-Solving Skills:

✓ Engage students in critical analysis and evaluation of different perspectives on the industry

✓ Revolution and climate change.

- ✓ Encourage students to reflect on the ethical implications of past and present industrial practices.
 - ✓ Promote creative thinking through brainstorming innovative solutions and strategies to mitigate the environmental impacts of industrialization.
6. Develop Communication and Collaboration Skills:
- ✓ Encourage students to participate in group discussions, debates, or presentations to share their knowledge, insights, and opinions.

Contents	References	Methodology
<u>Introduction:</u> Welcoming students and creating a learning atmosphere. <u>Contents:</u> Climate change has become one of the most pressing global challenges of our time, with far-reaching implications for our environment, society, and future generations. At the same time, the Industrial Revolution represents a pivotal point in history that transformed the world in unimaginable ways. By understanding the intricate link between these two phenomena, we can gain crucial insights into the causes of climate change, the consequences we face today, and the potential solutions that lie ahead. So, let's embark on a journey through time to explore the intricate interplay between the Industrial Revolution and climate change and delve into the lessons we can learn to shape a sustainable future for our planet.	<u>Video:</u> https://www.youtube.com/watch?v=otqzQqzUcy4 https://www.youtube.com/watch?v=xLhNP0qp38Q https://www.youtube.com/watch?v=zhL5DCizj5c https://www.youtube.com/watch?v=3Yqn8rpy-Ss <u>Sources:</u> https://kids.britannica.com/students/article/Industrial-Revolution/275053 https://education.nationalgeographic.org/resource/industrial-revolution-and-technology/ https://www.khanacademy.org/humanities/big-history-project/acceleration/bhp-acceleration/a/the-industrial-revolution <u>Presentations:</u> The First Industrial Revolution	Class Discussion Student Presentations Problem-Based Learning (PBL)
Summary of prior knowledge	-	-
<u>Introducing new content:</u> The History of the Industrial Revolution: The Industrial Revolution, which began in the late 18th century in Britain and later spread to other parts of the world, was a	<u>Video:</u> https://www.youtube.com/watch?v=zjK7PWmRRyg https://www.youtube.com/watch?v=G4H1N_yXBIA	Class Discussion Student Presentations Problem-Based Learning (PBL)

period of transformation characterized by significant advances in technology, manufacturing, and agriculture. It marked a shift from agricultural economies to industrialized societies, leading to profound changes in the social, economic, and cultural aspects of life.

During this period, inventions such as the steam engine, mechanized textile production, and the development of the coal and iron industries fueled unprecedented economic growth. The use of new energy sources and the introduction of factory-based production methods have revolutionized various industries, leading to increased productivity and mass production.

The impact of the Industrial Revolution on climate change:

While the Industrial Revolution brought significant progress and improved living standards, it also had unintended consequences for the environment, particularly with regard to climate change. Key factors contributing to climate change as a result of the Industrial Revolution include:

a. Increased greenhouse gas emissions:
The burning of fossil fuels, such as coal, oil, and natural gas, to power machinery and transportation systems became central to industrial activities. This reliance on fossil fuels has released significant amounts of carbon dioxide (CO₂) and other greenhouse gases into the atmosphere, trapping heat and contributing to the greenhouse effect.

b. Deforestation and land use change:
Industrialization has led to extensive deforestation as forests have been cleared for raw materials, the expansion of urban areas, and for agricultural purposes. This loss of trees has reduced the Earth's ability to absorb CO₂ through photosynthesis, leading to increased atmospheric CO₂ levels.

<https://www.youtube.com/watch?v=SDRxfuEvqGg&t=111s>

Sources:

<https://www.landmarkacademyhub.co.uk/climate-change-impacts-of-the-industrial-revolution/>

<https://www.history.com/news/industrial-revolution-climate-change>

https://news.un.org/en/story/2022/01/1110722?gclid=CjwKCAjwqZSI BhBwEiwAfoZUIPqRSOI-PQzLjAqbKPzAhSDLdzX4dTgmlNuslIJZfAS4WRgQpEXGExoCc8gQAvD_BwE

c. Changes in Agricultural Practices:
The Industrial Revolution brought changes in agricultural practices, including the use of synthetic fertilizers and mechanized agriculture. These practices, in addition to increasing food production, have also released significant amounts of nitrous oxide (N₂O), a potent greenhouse gas, into the atmosphere.

Consequences of climate change:

The consequences of climate change, influenced by the Industrial Revolution, are far-reaching and impact various aspects of our planet and society. Some notable consequences include:

at. Rising global temperatures:
Increased greenhouse gas emissions have led to an increase in global temperatures, resulting in phenomena such as global warming and climate upheaval. This warming trend affects weather patterns, increases the frequency and intensity of extreme weather events, and threatens ecosystems and biodiversity.

b. Melting of the polar ice caps and sea level rise:
Global warming has accelerated the melting of polar ice caps and glaciers, contributing to sea level rise. As sea levels rise, coastal areas face increased risks of flooding, erosion, and displacement of human populations.

c. Changes in ecosystems and biodiversity:
Climate change disrupts ecosystems, affecting the distribution and behavior of species. Rising temperatures, altered precipitation patterns, and habitat destruction put a strain on ecosystems, leading to biodiversity loss and potential ecosystem collapse.

d. Impacts on human health and well-being:
Climate change poses risks to human health, including increased heat-related diseases, the spread of disease, reduced

food security, and water scarcity. Vulnerable populations, such as those in poverty or without access to health care, are particularly affected.		
<u>Summary and Conclusion:</u> The Industrial Revolution, while it helped shape our modern world, also had far-reaching consequences for climate change. Heavy reliance on fossil fuels, deforestation, and changes in agricultural practices have led to increased greenhouse gas emissions, rising temperatures, melting polar ice caps, and the destruction of ecosystems. Understanding the historical context and impact of industrialization on climate change is critical to developing sustainable practices and mitigating their effects.		Class Discussion Student Presentations Problem-Based Learning (PBL)

Activity	Methodology
Debates: Organize a debate where students take on different roles and perspectives related to climate change and the Industrial Revolution. Assign students to teams representing various stakeholders such as industrialists, environmentalists, policymakers, and workers. Students can research and prepare arguments in support of their assigned roles and engage in structured debate. This activity fosters critical thinking, persuasive communication, and understanding multiple points of view.	Problem-Based Learning (PBL) Collaborative learning Flipped classroom
Case Studies: Provide students with case studies that explore specific cases where industrialization has affected the environment and contributed to climate change. Students can analyze and discuss case studies, identifying causes, consequences, and potential solutions. This activity develops analytical skills, problem-solving, and the ability to apply knowledge to real-world situations.	Problem-Based Learning (PBL) Collaborative learning Flipped classroom

Verify	Typology
What is the Industrial Revolution? a) A political revolution in Europe during the eighteenth century. b) A period of rapid industrialization and technological advances in the eighteenth and nineteenth centuries. c) A movement for the defense of workers' rights during the nineteenth century. d) A series of protests against environmental pollution in the twentieth century. Which of the following factors contributed to the acceleration of industrialization during the Industrial Revolution? a) Introduction of steam power and mechanized production.	Multiple-choice questions

- (b) Increased agricultural productivity and agrarian reforms.
- c) Growth of international trade and colonization.
- d) All of the above.

How did the Industrial Revolution affect climate change?

- a) It has led to an increase in greenhouse gas emissions due to the burning of fossil fuels.
- b) It has caused deforestation and biodiversity loss.
- c) It has contributed to air and water pollution.
- d) All of the above.

Which statement best describes the relationship between the Industrial Revolution and climate change?

- a) The Industrial Revolution had no impact on climate change.
- b) Climate change was the sole cause of the Industrial Revolution.
- c) The Industrial Revolution accelerated climate change through increased carbon emissions and environmental degradation.
- d) Climate change was a positive outcome of the Industrial Revolution.

What role did the burning of fossil fuels play in the industrial revolution and climate change?

- a) Fossil fuels were not used during the Industrial Revolution.
- b) The burning of fossil fuels was the main source of energy during the Industrial Revolution, leading to increased greenhouse gas emissions and climate change.
- c) The burning of fossil fuels has not contributed to climate change.
- d) The use of renewable energy sources replaced fossil fuels during the Industrial Revolution.

How did the Industrial Revolution impact the natural environment?

- a) It has not had a significant impact on the natural environment.
- b) It has caused an increase in pollution and degradation of land, air and water.
- c) It has led to the conservation and conservation of natural resources.
- d) The Industrial Revolution led to the expansion of forests and wildlife habitats.

Which statement accurately describes the current understanding of climate change?

- a) Climate change is a natural event and not influenced by human activities.
- b) Climate change is caused solely by human activities.
- c) Climate change is a complex phenomenon influenced by both natural factors and human activities.
- d) Climate change is a hoax and not supported by scientific evidence.

Skills acquired

Critical Thinking: Students can develop critical thinking skills by analyzing the causes and consequences of the Industrial Revolution and its impact on climate change. They can assess different perspectives, identify biases, and draw informed conclusions.

Research skills: Learning about the Industrial Revolution and climate change involves conducting research and gathering information from various sources. Students can learn how to identify and evaluate credible sources, extract relevant information, and synthesize their findings.

Problem-solving: The lesson can emphasize the need for solutions to mitigate the negative effects of industrialization on the climate. Students can develop problem-solving skills by brainstorming and coming up with innovative ideas to address the challenges of climate change, such as transitioning to renewable energy sources or implementing sustainable practices.

Communication skills: Exploring the Industrial Revolution and climate change requires effective communication of ideas and arguments. Students can improve their communication skills by presenting the results of their research, participating in class discussions, and engaging in debates on the complex issues related to industrialization and climate change.

Data analysis: The class may involve examining data related to climate change, such as temperature records or carbon dioxide emissions. Students can learn how to interpret and analyze data, identify trends and patterns, and use data to support their arguments or draw conclusions.

Environmental awareness: Understanding the impacts of the Industrial Revolution on climate change can promote a sense of environmental awareness and responsibility. Students can develop a deeper understanding of environmental issues, their interconnectedness, and the importance of sustainable practices for a more sustainable future.

Empathy and Global Perspective: Studying the Industrial Revolution and climate change can help students develop empathy by understanding historical and current impacts on different communities and regions. It can also encourage them to take a global perspective and consider the international implications of climate change and the need for global cooperation.

Lesson No. 2 – The Great London Smog in 1952

Lesson plan

Keywords: smog, pollution, industrialization, human health.

Timetable: 45 minutes lesson , 30 minutes activity, 10 minute test.

School: Two-year middle school

Objectives
Understand the history and context of London's Great Smog in 1952. It explores the reasons and factors that contributed to the formation of smog. It examines the consequences of smog on human health, the environment, and the economy. Reflect on the importance of Great Smog in shaping environmental regulations and public awareness.

Promote critical thinking and discussion on the balance between industrial development and environmental protection.

Contents	References	Methodology
<u>Introduction:</u> Several significant environmental events have occurred in recent years, one of which was the Great London Smog in 1952. This environmental disaster is a stark reminder of the harmful effects of air pollution on human health and the environment. In December 1952, London experienced a severe smog episode that lasted for almost a week. This event, known as the Great Smog or the Great Smoke, is the result of a combination of fog and high levels of air pollution caused by industrial emissions, domestic coal burning, and unfavorable weather conditions.	<u>Video:</u> "London Fog Disaster (1952)":Link: https://www.youtube.com/watch?v=8Yj8Z0gPtPQ "The Great Smog of London 1952":Link: https://www.youtube.com/watch?v=imOEF8BUI70 "The Great Smog of London 1952":Link: https://www.youtube.com/watch?v=7PfFJy7PVQs "The Great London Smog (1952)":Link: https://www.youtube.com/watch?v=wyeLj8yowos "The Great London Smog - 1952":Link: https://www.youtube.com/watch?v=J0jY6sTr6Sw "The Great London Smog Disaster of 1952":Link: https://www.youtube.com/watch?v=bzCS05ihVak	Class Discussion Student Presentations Problem-Based Learning (PBL)
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> The Great London Smog in 1952 was mainly caused by a combination of weather conditions, industrial emissions, and domestic burning of coal. The impact of smog on the city and its inhabitants has been severe. Here are the causes and impacts of the Great Smog: Causes:	<u>Sources:</u> The Guardian - "London's killer smog of 1952":Link: https://www.theguardian.com/environment/2012/dec/05/london-killer-smog-1952 BBC - "The Great Smog of London 1952":Link:	Class Discussion Student Presentations Problem-Based Learning (PBL)

Weather conditions: In December 1952, a period of unusually cold weather settled over London, leading to temperature inversions. This weather pattern trapped pollutants close to the ground instead of dispersing them into the upper atmosphere.

Industrial emissions: London had a high concentration of industries, particularly power plants and coal-fired factories, which released large amounts of sulfur dioxide (SO₂) and other pollutants into the air. These emissions, combined with stagnant weather conditions, created thick smog.

Domestic burning of coal: During that time, many households in London relied on coal for heating and cooking. The widespread use of low-quality charcoal, combined with inadequate ventilation, has led to significant smoke production, increasing pollution levels.

Impacts:

Health consequences: The Great Smog has had a devastating impact on public health. High levels of air pollution, containing sulfur dioxide, particulate matter, and other harmful pollutants, have led to respiratory problems, increased hospitalizations, and a spike in deaths. Thousands of people have experienced breathing difficulties, exacerbation of existing health conditions, and long-term health complications.

Visibility and transportation disruptions: Dense smog has severely reduced visibility, sometimes to a few meters, causing disruptions in transportation, including road closures, disruption to air travel, and suspension of public transportation services. This has resulted in significant economic and logistical challenges for the city.

https://www.bbc.co.uk/history/vents/great_smog

Historic United Kingdom - "The Great Smog of 1952":
Connection:
<https://www.historic-uk.com/HistoryUK/HistoryofBritain/Great-Smog/>

British Library - "The Great Smog of London":Link:
<https://www.bl.uk/the-great-smog-of-london>

National Geographic - "The Great Smog of London":Link:
<https://www.nationalgeographic.org/thisday/dec5/great-smog-london/>

Imperial College London - "The Great Smog of 1952":Link:
<https://www.imperial.ac.uk/news/2152/the-great-smog-of-1952/>

The Met Office - "The Great Smog of London 1952":Link:
<https://www.metoffice.gov.uk/weather/learn-about/weather/case-studies/great-smog>

Historic England - "The Great Smog":
Link:
<https://historicengland.org.uk/research/inclusive-heritage/the-great-smog/>

The Open University - "The Great Smog of 1952":Link:
<http://www.open.edu/openlearn/history-the-arts/history/social-economic-history/the-great-smog-1952>

Economic and social impact: The Great Smog had a significant economic impact on London. Businesses, schools, and other institutions have been forced to close, resulting in lost productivity and financial losses. Smog has also had social implications, causing anxiety and fear among the population and raising concerns about the health risks of air pollution. Policy changes: The Great Smog brought attention to the problem of air pollution and spurred significant changes in environmental legislation. In response to public outcry and the health crisis, the UK government passed the Clean Air Act in 1956, which aimed to regulate industrial emissions, reduce domestic burning of coal, and improve air quality standards. Public Awareness and Environmental Movement: The Great Smog has raised awareness of the harmful effects of air pollution and sparked a growing environmental movement. It highlighted the need for stricter environmental regulations, cleaner energy sources, and public support for healthier living conditions. The Great London Smog in 1952 was a turning point in tackling air pollution and shaping environmental policies, not only in the UK but also globally. It has highlighted the serious consequences of uncontrolled pollution and led to significant efforts to improve air quality and protect public health.		
<u>Summary and Conclusion:</u> Acid rain poses a significant threat to monuments, the environment and human health. Understanding its causes, consequences, and potential solutions is key to preserving our cultural heritage and ensuring a sustainable future. By taking collective and individual action, we can work to minimize acid rain and its detrimental effects on our world		Class Discussion

Activity	Methodology
<u>Activity: Analysis of the impact of the Great London Smog in 1952</u> <u>Objective:</u> To engage high school students in research and analysis of the impact of the Great Smog of London in 1952 on public health and the environment. <u>Materials:</u> Research materials (books, articles) and computers or tablets with internet access. <u>Method:</u> -Divide students into small groups and assign each group a specific aspect of the research impact, such as public health, transportation, economic consequences, or policy changes. Instruct groups to conduct thorough research using available resources (books, articles, reliable websites) to gather information on their assigned topic. Encourage them to take notes and record important accomplishments. -Data collection and analysis: Ask each group to collect relevant data to support their findings. -Instruct groups to analyze the collected data and identify key trends or patterns related to the assigned topic. -Allocate time to each group to present the research results to the class. Encourage them to engage the audience by providing clear explanations, sharing compelling data, and highlighting the importance of their findings. -Allow for a short Q&A session after each presentation to facilitate discussion and deepen understanding.	Workshop Problem-based learning Collaborative learning Cooperative Learning

Checks	Typology
True or False Questions: True or False: The Great London Smog occurred in the year 1952. True or False: The Great Smog was caused by a combination of weather conditions and air pollution. True or False: The Great Smog has primarily affected the respiratory health of London residents. True or False: The use of low-quality charcoal for heating and cooking contributed to the severity of the Great Smog. True or false: The Great Smog led to the implementation of the Clean Air Act in the UK. True or false: the Great Smog had no impact on transport and public services in London. True or false: The Great Smog lasted only a few hours and dissipated quickly. True or false: The Great Smog has caused a significant increase in death rates in London. True or false: The Great Smog has raised public awareness of the dangers of air pollution and led to improved environmental regulations. True or false: The Great London Smog is considered a significant event in the history of environmental policy.	True or False Questions:

Please note that the answers to the questions are as follows:

True

True

True

True

True

False

False

True

True

True

Skills acquired

Historical Knowledge: Students gain a deeper understanding of the historical context, causes, and events surrounding London's Great Smog in 1952. They learn about the impact it has had on the city, its residents, and subsequent political changes.

Critical Thinking: Through analysis of the causes, consequences, and responses to the Great Smog, students develop critical thinking skills. They learn to evaluate multiple factors, consider the complexity of air pollution and its effects, and analyze the long-term implications of environmental disasters.

Research and Data Analysis: Students engage in the search for primary and secondary sources to gather information about the Great Smog. They learn to analyze data, interpret statistical information, and draw evidence-based conclusions. They develop skills in computer literacy and research methodology.

Environmental Awareness: By studying Great Smog, students deepen their understanding of the environmental impacts of air pollution. They become more aware of the importance of clean air, sustainable practices, and the need for environmental regulations to protect public health.

Communication skills: Students improve their communication skills through class discussions, presentations, and written assignments related to the Great Smog. They learn to effectively articulate their understanding of the topic, engage in respectful debates, and express their ideas clearly and persuasively.

Empathy and Public Health Awareness: Students develop empathy by studying the health impacts of London residents. They gain an understanding of the importance of public health measures, environmental justice, and the need to protect vulnerable populations from environmental risks.

Policy Analysis: Students explore the policy changes that have resulted from the Great Smog and their subsequent impacts. They learn to analyze environmental policies, evaluate their effectiveness, and understand the role of governance and public awareness in shaping environmental regulations.

Civic Engagement and Activism: Through learning about the Great Smog, students can be inspired to take action and advocate for environmental protection. They develop a sense of civic

responsibility, understand the power of collective action, and recognize their role in creating a sustainable future.

Reflective thinking: Students are encouraged to reflect on the lessons learned from the Great Smog and its relevance to today's environmental issues. They develop a capacity for critical self-reflection and consider their individual and collective responsibility in mitigating the impacts of air pollution and addressing climate change.

Lesson No. 3 – Effects of Acid Rain on Monuments

Lesson plan

Keywords: Pollution, pH, Human health, Erosion.

Timetable: lesson 45 minutes, activity 20 minutes, test 10 minutes.

School: Two-year middle school

Objectives
Understand what acid rain is and how it forms. Identify the impact of acid rain on monuments and historical structures. Analyze the consequences of acid rain on the environment and human health. Explore possible solutions and preventative measures to minimize acid rain. Develop an awareness of individual and collective actions that can help reduce acid rain.

Contents	References	Methodology
<u>Introduction:</u> Acid rain is a significant environmental problem caused by the release of pollutants into the atmosphere. This class will focus on how acid rain affects monuments, the consequences of acid rain, and solutions to mitigate its harmful effects.	<u>Video:</u> https://www.youtube.com/watch?v=WldWjqZsGgg https://www.youtube.com/watch?v=Nf8cuvl62Vc https://www.youtube.com/watch?v=iHzKwnubg2A	Class Discussion Student Presentations Problem-Based Learning (PBL)
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> Acid rain refers to rain, snow, fog, or any form of precipitation that has a lower pH value than regular rainwater. It is caused by emissions of sulfur dioxide (SO₂) and nitrogen oxides (NO_x) into the atmosphere, mainly from human activities.	<u>Sources:</u> Intergovernmental Panel on Climate Change (IPCC): Website: https://www.ipcc.ch/ NASA Climate Change: Website: https://climate.nasa.gov/	Class Discussion Student Presentations Problem-Based Learning (PBL)

Formation:

1. Pollutant emissions: The burning of fossil fuels, such as coal, oil, and natural gas, in power plants, industrial processes, and vehicles releases sulfur dioxide (SO₂) and nitrogen oxides (NO_x) into the air. These pollutants are mainly responsible for the formation of acid rain.

2. Atmospheric reactions: Once released into the atmosphere, sulfur dioxide (SO₂) and nitrogen oxides (NO_x) undergo chemical reactions with oxygen, water vapor, and other compounds. Sulfur dioxide reacts with oxygen to form sulfur trioxide (SO₃), while nitrogen oxides react with oxygen to form nitrogen dioxide (NO₂).

3. Acid formation: Sulfur trioxide (SO₃) and nitrogen dioxide (NO₂) further react with water vapor in the atmosphere, forming sulfuric acid (H₂SO₄) and nitric acid (HNO₃), respectively. These acids can dissolve in rainwater or other forms of precipitation, resulting in acid rain.

4. Long-distance transportation: Once formed, acid rain can be carried by winds over long distances, hitting areas far from the original emission sources. This means that regions can experience acid rain even if they are not located near major industrial areas.

When acid rain falls to the ground, it can have detrimental effects on the environment, including damage to vegetation, aquatic ecosystems, soil fertility, and man-made structures such as monuments and buildings, especially those made of materials such as limestone or marble, which are more vulnerable to acid corrosion.

The impact of acid rain on monuments can be significant, leading to several consequences:

National Geographic Climate Change:

Website:

<https://www.nationalgeographic.com/environment/climate-change/>

United Nations Framework Convention on Climate Change (UNFCCC):

Website: <https://unfccc.int/>

Climate Change: Evidence and Causes (National Academy of Sciences):

Website:

<https://www.nap.edu/resource/18730/climate-change-evidence-and-causes>

Our World in Data - Climate Change:

Website:

<https://ourworldindata.org/climate-change>

-Surface erosion: Acid rain contains acidic components, such as sulfuric acid and nitric acid, which can corrode and dissolve the surfaces of monuments over time. This erosion can result in the loss of fine details, textures, and intricate designs.

-Color fading: Acid rain can cause discoloration and fading of the original pigments and finishes on the surfaces of monuments. This can lead to a dull and weathered appearance, diminishing the aesthetic value of the monument.

-Structural damage: Continuous exposure to acid rain can weaken the structural integrity of monuments. Acidic components can penetrate the porous surfaces of materials such as limestone or marble, leading to cracking, crumbling, or disintegration of the monument over time.

-Damage to statues: Sculptures and statues on monuments are particularly susceptible to the effects of acid rain. The intricate features and delicate areas of the statues can erode faster, resulting in the loss of facial details, limbs, or other elements of the sculpture.

-Loss of historical value: Acid rain can cause irreversible damage to historical monuments, eroding their historical significance and cultural value. It diminishes the tangible link with the past and can result in the loss of an important heritage for future generations.

-Expensive restoration: Restoration and preservation efforts at monuments damaged by acid rain can be costly and time-consuming. Repairing and preserving damaged surfaces and structures requires specialized skills, materials, and resources.

-Environmental impact: Acid rain not only affects monuments, but also has wider environmental consequences. Acidic water runoff from monuments can contaminate soil and water bodies, leading to

acidification of lakes, rivers, and streams. This can harm aquatic life, plants, and the overall health of the ecosystem.

Consequences of acid rain:

-Environmental damage: Acid rain can cause acidification of lakes, rivers, and soil, which can damage aquatic ecosystems, including fish, amphibians, and plants. It can also contribute to biodiversity loss and upset the ecological balance.

-Damage to forests: Acid rain can leach essential nutrients from the soil, making it harder for trees to absorb them. This can lead to nutrient deficiencies, weakened trees, and increased susceptibility to diseases and pests.

-Corrosion of infrastructure: Acid rain can corrode building materials, including metal structures, bridges, and pipes. This can lead to structural damage, increased maintenance costs, and compromised safety.

-Damage to crops and vegetation: Acid rain can damage agricultural crops and sensitive vegetation. It can interfere with nutrient absorption, affect photosynthesis, and reduce yields.

Solutions to Mitigate Acid Rain:

-Reduced emissions: Implement stricter regulations and technologies to reduce sulfur dioxide (SO₂) and nitrogen oxides (NO_x) emissions from power plants, industries, and vehicles. This can be achieved through the use of cleaner fuels, improved combustion processes, and the installation of emission control devices.

-Adoption of renewable energy: Encourage the transition to renewable energy sources, such as solar and wind power, which produce little or no emissions that contribute to acid rain.

-International cooperation: promoting international collaboration to tackle the problem of acid rain. This may involve sharing knowledge, best practices, and technologies among countries to collectively reduce emissions.

-Conservation and restoration: Implement conservation practices to protect vulnerable ecosystems affected by acid rain. This can include reforestation, watershed management, and soil conservation measures.

-Calcination and neutralization: Apply lime or other neutralizing agents to affected water bodies and soils to help restore pH balance and mitigate the effects of acid rain.

-Public awareness and education: raising public awareness of the causes and consequences of acid rain. Educational campaigns can promote responsible actions, such as saving energy, reducing pollution, and promoting sustainable practices.

-Monitoring and research: continuously monitor and assess the impact of acid rain on the environment to inform decision-making and improve mitigation strategies. Research efforts can focus on developing more effective technologies and understanding the long-term effects of acid rain.

Implementing these solutions requires a coordinated effort by governments, industries, and individuals to reduce emissions, protect vulnerable ecosystems, and promote sustainable practices. By tackling the problem of acid rain, we can minimize its environmental impact and protect our ecosystems and infrastructure.

Summary and Conclusion:

Acid rain poses a significant threat to monuments, the environment and human

Class Discussion

health. Understanding its causes, consequences, and potential solutions is key to preserving our cultural heritage and ensuring a sustainable future. By taking collective and individual action, we can work to minimize acid rain and its detrimental effects on our world

Activity	Methodology
<u>Laboratory of Conservation and Conservation of Monuments:</u> <u>Objective:</u> To engage students in a creative and critical thinking activity focused on the conservation and preservation of monuments affected by acid rain. <u>Materials:</u> Images or descriptions of monuments damaged by acid rain and art materials (such as drawing materials, clay, or construction paper). <u>Procedure:</u> -Introduce students to various examples of monuments that have been affected by acid rain. --Show pictures or provide descriptions of the damage caused to these monuments. -Divide students into small groups and assign each group a specific acidrain-damaged monument to focus on. -Instruct groups to research the history, significance, and architectural features of their assigned monument. -Encourage students to brainstorm creative ideas to preserve and conserve the monument. -They should consider both preventative measures and recovery techniques. -Provide art materials and ask groups to create visual representations or models that showcase their conservation proposals and conservation strategies. They can use drawings, clay sculptures, or collages, depending on the materials available. -After the groups have completed their work, ask each group to present the proposed strategies to the class, explaining the reasoning behind their choices. -Facilitate a class discussion to explore the different approaches and evaluate the effectiveness of the proposed strategies. -Encourage students to reflect on the importance of preserving cultural heritage, considering the impact of acid rain and the role it can play in protecting monuments.	Workshop Problem-based learning Collaborative learning Cooperative Learning

Checks	Typology
What is acid rain? a) Slightly acidic rainwater b) Rainwater with a pH greater than 7	Multiple-choice questions

- c) Rainwater that has a lower pH than regular rainwater
- d) Rainwater that contains excess nutrients

What are the main components responsible for the formation of acid rain?

- a) Carbon dioxide (CO₂) and methane (CH₄)
- b) Nitrogen oxide (NO) and carbon monoxide (CO)
- c) Sulphur dioxide (SO₂) and nitrogen oxides (NO_x)
- d) Ozone (O₃) and hydrochloric acid (HCl)

Which of the following materials used in monuments is particularly vulnerable to damage from acid rain?

- a) Stainless steel
- b) Aluminium
- c) Concrete
- d) Limestone

What is the main mechanism by which acid rain affects monuments?

- a) Causes color fading and discoloration.
- b) It erodes the surfaces of monuments through chemical reactions.
- c) It weakens the structural integrity of monuments over time.
- d) It causes the loss of fine details and textures on the surfaces of monuments.

What are the environmental consequences of acid rain?

- a) Acidification of lakes and rivers
- b) Increased crop yield
- c) Conservation of biodiversity
- d) Increased vegetation growth

How can acid rain be mitigated?

- a) Increased emissions of sulphur dioxide and nitrogen oxides
- b) Promoting the use of fossil fuels
- c) Application of neutralizing agents to the affected areas
- d) Encourage deforestation

Which of the following is an example of a monument that has been significantly affected by acid rain?

- a) Eiffel Tower in Paris
- b) Taj Mahal in India
- c) Statue of Liberty in New York
- d) Sydney Opera House in Australia

What is the importance of preserving monuments affected by acid rain?

- a) To maintain their aesthetic value
- b) Preventing soil erosion
- c) Protecting cultural heritage and history
- d) Promoting tourism

How does acid rain contribute to the corrosion of the metal structures of monuments?

- a) Reacting with oxygen in the air
- b) Melting the metal surface
- c) Promoting the growth of algae and moss
- d) Causing thermal expansion and contraction

What pH value indicates the acidity of rainwater?

- a) pH 7
- b) pH 5
- c) pH 9
- d) pH 11

Note: The correct answers to the questions are as follows:

- c) Rainwater that has a lower pH than regular rainwater
- c) Sulphur dioxide (SO₂) and nitrogen oxides (NO_x)
- d) Limestone
- b) It erodes the surfaces of monuments through chemical reactions.
- a) Acidification of lakes and rivers
- c) Application of neutralizing agents to the affected areas
- b) Taj Mahal in India
- c) Protecting cultural heritage and history
- b) Melting the metal surface
- b) pH 5

Skills acquired

Scientific knowledge: Students gain a solid understanding of the scientific concepts related to acid rain, including its formation, composition, and effects on monuments. They develop knowledge about chemical reactions, pH levels, and the environmental impacts of acid rain.

Critical thinking: Students learn to analyze and evaluate the effects of acid rain on monuments. They develop critical thinking skills by examining the causes, consequences, and potential solutions related to acid rain and monument conservation.

Research skills: Through research activities, students gain skills in gathering information, analyzing data, and synthesizing knowledge about acid rain and its impact on monuments. They learn to use various resources, such as books, articles, and online materials, to deepen their understanding of the topic.

Problem-solving: Students engage in activities that require them to propose solutions and strategies for the preservation of monuments affected by acid rain. They develop problem-solving skills by considering different approaches, weighing the pros and cons, and evaluating the feasibility and effectiveness of proposed solutions.

Communication skills: Students have the opportunity to present their ideas, research findings, and proposed strategies to the class. They develop communication skills by articulating their thoughts clearly, using appropriate terminology, and effectively conveying their understanding of the topic.

Environmental awareness: Students become more aware of the environmental impacts of acid rain beyond the degradation of monuments. They develop an understanding of wider consequences, such as effects on ecosystems, water bodies, and vegetation. They also gain a sense of responsibility towards environmental conservation and sustainable practices.

Cultural Appreciation: Students develop an appreciation for the cultural and historical value of monuments and their vulnerability to acid rain. They recognize the importance of preserving cultural heritage and understand the role monuments play in connecting us to the past and shaping our identities.

Collaboration and teamwork: Through group activities and discussions, students learn how to collaborate effectively, share ideas, and work together toward a common goal. They develop teamwork skills by actively listening, respecting different perspectives, and building on the contributions of others.

Empathy and Cultural Sensitivity: Students cultivate empathy by understanding the impact of acid rain on monuments and the loss of cultural heritage. They develop cultural sensitivity by recognizing the value of monuments to different communities and societies, promoting respect for different cultures.

Awareness of global issues: Students gain awareness of global environmental issues and the interconnectedness of human activities with the health of the planet. They develop a sense of environmental stewardship and an understanding of their role in creating a sustainable future.

Lesson No. 4 – Chernobyl Disaster

Lesson plan

Keywords: Human health, long-term health effects, nuclear reactor, radioactive contamination.

Timetable: lesson 45 minutes, activity 20 minutes, test 10 minutes.

School: Two-year middle school

Objectives
It explains the historical context and timeline of the Chernobyl disaster.
Understand the causes and events that led to the disaster.
Identify and analyze the consequences of the Chernobyl disaster on human health, the environment and society.
Assess the lessons learned from the Chernobyl disaster in terms of nuclear safety and the environmental impact of nuclear energy.
Discuss the wider implications of the Chernobyl disaster on nuclear energy as a source of energy and the need for responsible management of nuclear technology.
The goal of this lesson is to provide students with a comprehensive understanding of the Chernobyl disaster.

Contents	References	Methodology
<u>Introduction:</u>	<u>Video:</u>	Class Discussion

The Chernobyl disaster, which occurred on April 26, 1986 in the Soviet Union (now Ukraine), is one of the most catastrophic nuclear accidents in history. This lecture is intended to provide an overview of what happened during the Chernobyl disaster, explore its historical context, discuss its consequences, and delve into the broader connections between nuclear energy, nuclear reactions, and the environment.	"Chernobyl Disaster 1986 - Full Documentary":Link: https://www.youtube.com/watch?v=TXUWVy6S4y4 "The Chernobyl Disaster Explained - Exploring with Josh":Link: https://www.youtube.com/watch?v=SYp9Y64-mvo "Chernobyl: the disaster behind the Iron Curtain":Link: https://www.youtube.com/watch?v=nIWTOOiNCTA "The Battle of Chernobyl":Link: https://www.youtube.com/watch?v=yiCXcN391fg "Chernobyl disaster: what happened?":Link: https://www.youtube.com/watch?v=FLABKSB3AjM "Chernobyl: 30 years later":Link: https://www.youtube.com/watch?v=6k_XEzgmQgg "Chernobyl disaster: the last survivors":Link: https://www.youtube.com/watch?v=TzZ8IEaJ0Dk "Chernobyl: the real story":Link: https://www.youtube.com/watch?v=7rlb0p5ViFc	Student Presentations Problem-Based Learning (PBL)
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> Historical context: To understand the Chernobyl disaster, it is important to consider its historical context. At that time, the Soviet Union was actively pursuing nuclear energy as a source of energy, and the Chernobyl Nuclear Power Plant, located near the city of Pripyat, was one of its flagship installations. The plant featured	<u>Sources:</u> World Health Organization (WHO) - Chernobyl:Link: https://www.who.int/chernobyl/en/ United Nations Programme for Chernobyl Recovery and Development:Link:	Class Discussion Student Presentations Problem-Based Learning (PBL)

RBMK reactors, a design known for its operational flexibility but also for its inherent flaws.

The Chernobyl disaster: On April 26, 1986, during a routine safety test at reactor 4 of the Chernobyl nuclear power plant, a combination of design flaws, operator error, and inadequate safety measures led to a catastrophic series of events. The test involved simulating a power outage and evaluating the reactor's ability to sustain cooling until backup power was restored. Due to a faulty reactor design and insufficient safety protocols, the test triggered an uncontrolled power surge and subsequent explosion. The explosion released a significant amount of radioactive material into the atmosphere, forming a radioactive plume that spread over much of Europe. The immediate explosion resulted in the deaths of two plant workers, while many others died from acute radiation sickness in the weeks and months that followed. The disaster also led to the evacuation and abandonment of the nearby city of Pripjat.

Aftermath of the Chernobyl disaster:

-Human impact: The Chernobyl disaster had serious consequences for human health. Acute radiation sickness has affected thousands of people, with long-term effects such as increased cancer rates, especially thyroid cancer among children exposed to radioactive iodine. The exact number of deaths caused by the disaster is up for debate, with estimates ranging from several thousand to tens of thousands.

-Environmental impact: The release of radioactive materials contaminated the surrounding area, creating an exclusion zone around the plant that remains limited to this day. The environment, including flora and fauna, has been significantly affected, with long-term consequences for ecosystems. Radiation has also contaminated water bodies, soil, and

<https://www.un.org/en/events/chernobylday/>

Chernobyl Nuclear Power Plant - Official website:Link:
<https://www.chornobyl.com/>

Chernobyl disaster - National Geographic:Link:
<https://www.nationalgeographic.com/history/topics/disasters-and-accidents/chernobyl-disaster/>

Chernobyl: 30 years on - The Guardian:Link:
<https://www.theguardian.com/environment/chernobyl>

Chernobyl: facts about the nuclear disaster - Live Science:Link:
<https://www.livescience.com/39961-chernobyl.html>

Chernobyl accident - International Atomic Energy Agency (IAEA):Link:
<https://www.iaea.org/topics/chernobyl-accident>

farmland, affecting food chains and agricultural practices. -Socio-economic impact: The Chernobyl disaster caused widespread economic and social upheaval. The evacuation of Pripyat and other affected areas has caused thousands of displaced people and long-term economic hardship. Cleanup and containment efforts have required significant resources and have had a lasting impact on the affected regions. Lessons learned and the link with nuclear energy and the environment: -Safety measures and design improvements: The Chernobyl disaster highlighted the critical importance of robust safety and reactor design measures in the nuclear industry. Design flaws in the RBMK reactor have been fixed and safety protocols around the world have been improved. The lessons learned from Chernobyl helped improve reactor safety and emergency preparedness. -Nuclear energy and environmental concerns: The Chernobyl disaster has raised public awareness of the potential environmental risks associated with nuclear energy. While nuclear power can generate large amounts of energy with minimal greenhouse gas emissions, accidents such as Chernobyl underscore the need for strict safety regulations, comprehensive risk assessments, and responsible waste management. The balance between the benefits and risks of nuclear energy remains an ongoing discussion.		
<u>Summary and Conclusion:</u> The Chernobyl disaster is a tragic reminder of the catastrophic consequences that can result from nuclear accidents. It serves as a crucial lesson on the importance of strict security measures.		Class Discussion

Activity	Methodology
<u>Activity:</u> Assessment of the impact of the Chernobyl disaster <u>Objective:</u> To engage high school students in research and analysis that explores the impacts of the Chernobyl disaster on human health, the environment and society. <u>Materials:</u> <u>Research materials</u> (books, articles) and computers or tablets with internet access <u>Procedure:</u> -Divide students into small groups and assign to each group a specific aspect of the research impacts, such as human health effects, environmental consequences, or social and economic impacts. Instruct groups to conduct thorough research using available resources (books, articles, reliable websites) to gather information on their assigned topic. Encourage them to take notes and record important accomplishments. -Data collection and analysis: Ask each group to collect relevant data and statistics to support their findings. This may include information on the number of individuals affected, radiation levels, environmental changes, economic costs, or social changes. -Instruct groups to analyze the data collected, identify key trends or patterns, and draw conclusions based on the information collected. -Allocate time to each group to present the research results to the class. Encourage them to provide clear explanations, share compelling data and images, and highlight the importance of their findings. Allow for a short Q&A session after each presentation to facilitate discussion and deeper understanding.	Workshop Problem-based learning Collaborative learning Cooperative Learning

Checks	Typology
True or False Questions: True or false: The Chernobyl disaster happened in 1986. True or false: The Chernobyl nuclear power plant is located in Ukraine. True or false: The Chernobyl disaster was caused by a nuclear explosion. True or false: The Chernobyl disaster released a significant amount of radioactive materials into the environment. True or false: The Chernobyl disaster resulted in the immediate evacuation of nearby towns. True or false: the Chernobyl disaster had long-term consequences on health and the environment. True or false: The Chernobyl disaster is considered one of the worst nuclear accidents in history.	True or False Questions:

True or false: The Chernobyl disaster led to improvements in nuclear safety regulations around the world.

True or false: The Chernobyl exclusion zone remains uninhabitable due to high levels of radiation.

True or false: The Chernobyl disaster has raised awareness about the risks and impacts of nuclear energy.

The answers to the questions are as follows:

True

True

False

True

True

True

True

True

True

True

Skills acquired

Historical knowledge: Students gain a deeper understanding of the Chernobyl disaster, including the causes, events, and consequences of the nuclear accident. They develop the historical context and knowledge of this significant event.

Scientific understanding: Students learn about nuclear energy, radiation, and the environmental and health impacts of a nuclear disaster. They develop an understanding of the scientific principles related to nuclear energy and its potential risks.

Critical Thinking: Through analysis of the causes, responses, and long-term effects of the Chernobyl disaster, students develop critical thinking skills. They learn to assess complex situations, assess risk factors, and consider ethical and environmental implications.

Research and Data Analysis: Students engage in research, studying primary and secondary sources to gather information about the Chernobyl disaster. They learn to analyze data, interpret scientific information, and draw evidence-based conclusions. They develop skills in computer literacy and research methodology.

Environmental awareness: By studying the Chernobyl disaster, students deepen their understanding of the environmental consequences of a nuclear accident. They become more aware of the importance of nuclear safety, environmental protection, and the need for responsible energy practices.

Communication skills: Students improve their communication skills through class discussions, presentations, and written assignments related to the Chernobyl disaster. They learn to articulate their understanding of the topic, express their ideas clearly, and engage in respectful debates.

Empathy and Social Awareness: Students develop empathy by studying the human and environmental impacts of the Chernobyl disaster. They gain an understanding of the importance of disaster preparedness, the challenges faced by affected communities, and the need for support and assistance.

Interdisciplinary connections: The study of the Chernobyl disaster allows students to make connections between various disciplines, such as history, science, geography, and social studies. They value the interconnectedness of environmental, technological, and social issues.

Ethical Considerations: Students explore the ethical dimensions of the Chernobyl disaster, including the responsibility of governments, industries, and individuals in preventing and responding to such incidents. They develop an awareness of the ethical implications of technological advances and the need for ethical decision-making.

Lesson No. 5 – The Energy Crisis of 1973 and the Rise of Renewable Energy Sources

Lesson plan

Keywords: Oil Dependence, Energy Transition, Renewable Energy Sources, Sustainability and Environmental Concerns

Timetable: lesson 45 minutes, activity 20 minutes, test 10 minutes.

School: Two-year middle school

Objectives
- Understand the causes and impact of the 1973 energy crisis. - It explores the importance of renewable energy sources as a solution to energy crises. - Identify the different types of renewable energy sources and their benefits. - It analyzes the challenges and opportunities associated with the transition to renewable energy . - Discuss the role of individuals and communities in promoting the adoption of renewable energy.

Contents	References	Methodology
Introduction: The energy crisis of 1973 represented a significant turning point in global energy consumption and marked the beginning of a renewed focus on renewable energy sources. Before 1973, the world relied heavily on fossil fuels, especially oil, as its main sources of energy. However, the crisis has led to a re-evaluation of energy policies, resulting in a greater emphasis on renewable energy alternatives. This class will delve into the history of the 1973 energy crisis, its impact on the adoption of	Video: Title: "The Oil Crisis of 1973: How the Energy Crisis Changed Everything". Connection: https://www.youtube.com/watch?v=KQBXyV5r9o Title: "The Oil Crisis of 1973 Explained". Connection: https://www.youtube.com/watch?v=XJrY5zTkX3w Title: "The oil crisis of 1973 and its consequences". Connection:	Class Discussion Student Presentations Problem-Based Learning (PBL)

renewable energy sources, and an overview of the various renewable energy options.	https://www.youtube.com/watch?v=bwAY_DJysbl Title: "The Energy Crisis of the 1970s Explained". Connection: https://www.youtube.com/watch?v=dX3AmPSJHaQ Title: "Renewable Energy Revolution". Connection: https://www.youtube.com/watch?v=taO9bzqZmkU	
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> Causes: In response to political tensions in the Middle East, the Organization of the Petroleum Exporting Countries (OPEC) imposed an oil embargo on several countries, including the United States, in October 1973. -Supply disruptions: The embargo has led to severe oil shortages in affected countries, causing fuel rationing, long queues at gas stations, and skyrocketing oil prices. Impact: -Economic consequences: The sharp rise in oil prices has caused significant economic disruption, leading to recessions and inflation in many countries heavily dependent on oil imports. Geopolitical realignment: Nations have sought to diversify their energy sources and reduce dependence on oil-producing countries. -Energy policy change: Governments have begun to explore alternative energy options to mitigate the vulnerability of their economies to future oil shocks.	Sources: "Energy Crisis (1970)" - Encyclopedia Britannica: Link: https://www.britannica.com/event/energy-crisis-1970s "Energy Crisis: Causes, Effects, and Solutions" - National Geographic: Link: https://www.nationalgeographic.org/encyclopedia/energy-crisis/ "Renewable Energy" - U.S. Energy Information Administration (EIA): Link: https://www.eia.gov/energyexplained/renewable-sources/ "The Rise of Renewable Energy" - World Resources Institute (WRI): Link: https://www.wri.org/insights/rise-renewable-energy "Renewable Energy Explained" - Union of Concerned Scientists (UCS): Link: https://www.ucsusa.org/resources/renewable-energy-explained "The Energy Crisis of the 1970s and the Birth of the Solar Industry" - Solar Energy Industries Association (SEIA): Link:	Class Discussion Student Presentations Problem-Based Learning (PBL)

The Rise of Renewable Energy Sources:

-Government incentives: Governments have introduced policies and incentives to promote the development of renewable energy, such as tax credits, grants, and research funding.

-Raising public awareness: The energy crisis has raised awareness of the limits of fossil fuels and the need for sustainable energy sources.

Types of renewable energy sources:

-Solar energy: Photovoltaic cells and solar thermal systems harness the sun's energy to generate electricity or heat.

-Wind energy: Wind turbines convert wind into electrical energy through the rotation of their blades.

-Hydropower: Uses the gravitational pull of flowing or falling water to generate electricity.

-Geothermal energy: Taps into the Earth's internal heat to produce electricity or heating/cooling for buildings.

-Biomass energy: Biomass, such as organic waste and agricultural residues, can be converted into heat, electricity, or biofuels.

-Wave energy: can be harnessed by the movement of the waves

-Tidal energy: produced by the natural rise and fall of tides caused by the gravitational interaction between the Earth, sun and moon

History of Renewable Energy Sources:

A. Humans have been using renewable energy sources for centuries, such as windmills and water wheels to grind grain or pump water.

<https://www.seia.org/history-energy-crisis-1970s-and-birth-solar-industry>

"History of Renewable Energy" - United States Department of Energy (DOE): Link: <https://www.energy.gov/eere/renewables/history-renewable-energy>

"The Energy Crisis and Its Implications for Renewable Energy" - World Renewable Energy Congress (WREC): Link: <https://wrec2020.org/the-energy-crisis-and-its-implications-for-renewable-energy/>

B. Modern Advancements: -Mid-20th century: Research and development efforts have increased, leading to improvements in solar cells, wind turbine technology, and geothermal systems. 1970s and beyond: The energy crisis of 1973 accelerated interest in and investment in renewable energy technologies, spurring innovation and cost reductions. -Recent advancements: Advances in renewable energy have led to increased efficiency, cost-effectiveness, and widespread adoption, making renewables a vital part of today's global energy mix.		
<u>Summary and Conclusion:</u> The energy crisis of 1973 was a transformative event that highlighted the importance of diversifying energy sources and reducing dependence on fossil fuels. It spurred the adoption of renewable energy sources, such as solar, wind, wave, tidal, hydro, geothermal, and biomass, which have since become integral components of the world's energy portfolio.		Class Discussion

Activity	Methodology
<u>Activity:</u> Analysis of the impact of the 1973 energy crisis and the increase in renewable energy sources <u>Objective:</u> Understand the causes and consequences of the 1973 energy crisis and the consequent rise of renewable energy sources. <u>Materials:</u> -Computer or research materials -Drawing paper or whiteboard -Markers -Handout with questions and space for answers <u>Arrangement:</u>	Workshop Problem-based learning Collaborative learning Cooperative Learning

-Start the activity by providing a brief overview of the 1973 energy crisis and its causes. -Explain that the energy crisis has led to higher fuel prices, energy shortages, and a change in global energy -Research activities: -Divide students into small groups and provide them with access to computers or research materials. Ask each group to research and gather information about the 1973 energy crisis, its impact on various countries, and the consequent increase in renewable energy sources. -Encourage them to explore the development of technologies specific to renewable energy and countries that have become leaders in renewable energy production. -Gather students together and ask each group to share their findings with the rest of the class. - Discuss the following points: ○ The main causes and consequences of the 1973 energy crisis. ○ How the crisis has affected different countries and sectors. ○ Changing energy policies and a greater focus on renewable energy sources. ○ Significant advances in renewable energy technologies. ○ Countries that have become leaders in renewable energy production. ○ The long-term impact of the energy crisis and the rise of renewables on global energy systems. -Reflection and analysis: -Hand out the handout with questions related to the topic. -Instruct students to answer questions individually based on their research and group discussion. Questions may include: ○ What were the main causes of the 1973 energy crisis and how did it affect global energy systems? ○ Describe the main renewable energy sources that have gained popularity since the crisis. How do they work? ○ How has the energy crisis affected energy policies in different countries? Provide examples. ○ It identifies and explains a country that has become a leader in renewable energy production. What strategies have they adopted? ○ Discuss the long-term implications of the 1973 energy crisis and the rise of renewable energy sources on global energy security and sustainability. Conclude the activity by summarizing the key points discussed during the group activity and individual reflections. Emphasize the importance of understanding historical energy crises and the importance of renewable energy sources in mitigating future energy challenges.	

Verify	Typology
Question 1: What triggered the energy crisis of 1973? A) The Arab-Israeli Yom Kippur War B) The Iranian Revolution	Multiple-choice questions:

- C) The Cuban Missile Crisis
- D) The Vietnam War

Answer: A) The Arab-Israeli War of Yom Kippur

Question 2:

During the 1973 energy crisis, what resource became scarce and led to a significant increase in fuel prices?

- A) Natural gas
- B) Coal
- C) Petroleum
- D) Uranium

Answer: C) Petroleum

Question 3:

What organization was set up in response to the energy crisis of 1973 to coordinate energy policies among member countries?

- A) United Nations
- (b) World Trade Organisation
- (c) International Monetary Fund
- (d) Organization of the Petroleum Exporting Countries (OPEC)

Answer: D) Organization of the Petroleum Exporting Countries (OPEC)

Question 4:

What important step did many countries take after the 1973 energy crisis to reduce their dependence on fossil fuels?

- A) Embracing renewable energy sources
- B) Increased nuclear energy production
- C) Implement carbon capture and storage
- D) Drilling for more oil reserves

Answer: A) Embracing renewable energy sources

Question 5:

Which renewable energy source gained popularity and significant investment after the 1973 energy crisis?

- A) Solar energy
- B) Wind energy
- C) Geothermal energy
- D) Hydropower

Answer: A) Solar energy

Question 6:

Which country became a world leader in wind power generation after the 1973 energy crisis?

- A) Germany
- B) China

- C) United States
- D) Denmark

Answer: D) Denmark

Question 7:

What renewable energy technology uses heat from the Earth's interior to generate electricity?

- A) Solar thermal energy
- B) Tidal energy
- C) Geothermal energy
- D) Biomass energy

Answer: C) Geothermal energy

Question 8:

What renewable energy source is primarily generated by capturing ocean wave and tidal energy?

- A) Wave power
- B) Solar energy
- C) Hydropower
- D) Biomass energy

Answer: A) Wave power

Question 9:

Which renewable energy source uses kinetic wind energy to generate electricity?

- A) Solar energy
- B) Geothermal energy
- C) Wind energy
- D) Hydropower

Answer: C) Wind energy

Question 10:

Which international agreement, signed in 2015, aims to combat climate change and accelerate the transition to renewable energy?

- A) Kyoto Protocol
- B) Paris Agreement
- (c) Montreal Protocol
- (d) Copenhagen Agreement

Answer: B) Paris Agreement

Skills acquired

Knowledge and understanding: Students will gain knowledge and understanding of the causes, consequences, and historical context of the 1973 energy crisis. They will also

develop a comprehensive understanding of renewable energy sources, including their benefits, challenges, and significance in the global energy landscape.

Critical Thinking: Students will improve their critical thinking skills by analyzing the factors that led to the 1973 energy crisis and its impact on energy policies, economies, and international relations. They will also assess the potential of renewable energy sources as alternatives to fossil fuels.

Research and Computer Literacy: Through the lecture, students will practice researching and evaluating information from various sources to gain insights into the 1973 energy crisis and the rise of renewable energy. They will learn to differentiate reliable sources, extract relevant information, and draw evidence-based conclusions.

Analytical skills: Students will develop analytical skills by examining the causes and effects of the 1973 energy crisis, as well as the economic, environmental, and social implications of switching to renewable energy sources. They will learn to identify patterns, draw connections, and assess the long-term impacts of energy-related events.

Communication: Students will improve their communication skills by expressing their understanding of the 1973 energy crisis and renewable energy sources through oral presentations, written reports, or class discussions. They will learn to articulate complex concepts and effectively convey their ideas to others.

Environmental awareness: Students will develop a greater awareness of environmental issues related to energy consumption, such as climate change and pollution. They will understand the role of renewable energy sources in mitigating these challenges and promoting sustainability.

Problem Solving: Students will be encouraged to think critically and propose solutions to address energy-related challenges, considering the lessons learned from the 1973 energy crisis. They will explore innovative approaches to promote the adoption of renewable energy, energy efficiency and sustainable practices.

Lesson No. 6 – Ozone Depletion

Lesson plan

Keywords: ozone layer, thinning, chlorofluorocarbons (CFCs), ozone hole, UV radiation

Timetable: lesson 45 minutes, activity 20 minutes, test 10 minutes.

School: Two-year middle school

Objectives

- Understand the concept of the ozone layer and its significance in protecting life on Earth.
- Explore the causes and factors that contribute to ozone depletion.
- Examine the environmental and health consequences of ozone depletion, including the increased risk of harmful ultraviolet (UV) radiation.
- Recognize the role of human activities, especially the use of ozone-depleting substances, in ozone depletion.
- Review international efforts and agreements, such as the Montreal Protocol, aimed at mitigating ozone depletion and phasing out ozone-depleting substances.
- Reflect on personal and collective actions that can contribute to the protection and conservation of the ozone layer.

Contents	References	Methodology
<u>Introduction:</u> The ozone layer, a natural layer of ozone gas found in the stratosphere, acts as a shield, protecting life on Earth from harmful ultraviolet (UV) radiation emitted by the sun. It acts as a vital barrier, filtering out the most harmful UV rays and ensuring the health and well-being of both humans and ecosystems. However, since the end of the twentieth century, human activities have inadvertently introduced substances into the atmosphere that have had a detrimental effect on the ozone layer. These substances, known as ozone-depleting substances (ODS), include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and other industrial chemicals commonly found in aerosols, refrigerants, and foaming agents.	<u>Video:</u> "The ozone layer": Connection: https://www.youtube.com/watch?v=YQVxvLg2yqY "Explanation of the depletion of the ozone layer": Connection: https://www.youtube.com/watch?v=yPLvsr9-Vy4 "What is the ozone layer and how does it work?": Connection: https://www.youtube.com/watch?v=kHUoMhsBf1M "Ozone depletion": Connection: https://www.youtube.com/watch?v=FK8ODpLU4hQ "Ozone depletion and climate change": Connection: https://www.youtube.com/watch?v=duBH_2fBKbc	Class Discussion Student Presentations Problem-Based Learning (PBL)
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> History: The history of ozone depletion dates back to the 1970s, when scientists began to observe a significant decrease in ozone concentrations in the stratosphere. In 1985, an important discovery was made by British scientists, Joe Farman, Brian Gardiner and Jonathan Shanklin, who detected a significant ozone hole over Antarctica during the spring season. This discovery has sparked global concern and initiated extensive research into the causes and consequences of ozone depletion. Scientists have found that ozone depletion has been caused primarily by the release of	<u>Sources:</u> NASA - Ozone: Website: https://www.nasa.gov/subject/5670/ozone/ National Geographic - Ozone Depletion: Website: https://www.nationalgeographic.org/encyclopedia/ozone-depletion/ NOAA Earth System Research Laboratory - Ozone Depletion:	Class Discussion Student Presentations Problem-Based Learning (PBL)

man-made chemicals called ozone-depleting substances (ODS), including chlorofluorocarbons (CFCs) and halons. These substances were commonly used in aerosols, refrigerants, foaming agents, and fire extinguishers because of their non-toxic and non-flammable properties.

Impact:

Increased ultraviolet (UV) radiation: The thinning of the ozone layer allows higher levels of UV radiation to reach the Earth's surface. UV radiation is divided into three categories: UVA, UVB, and UVC. While UVA rays and a small portion of UVB reach the surface naturally, excessive exposure to UVB rays, resulting from ozone depletion, poses serious health risks. Increased UV radiation can cause skin cancer, cataracts, weakened immune systems, and DNA damage in humans and other organisms.

Environmental effects: The depletion of the ozone layer has significant ecological consequences. UV radiation affects plant life by interfering with photosynthesis and reducing yields. Phytoplankton, at the base of marine food chains, is also sensitive to increased exposure to UVB rays, which disrupts aquatic ecosystems. In addition, UV radiation can damage coral reefs, compromising marine biodiversity.

Climate change: Ozone depletion and climate change are interlinked, but they have distinct causes. While ozone depletion refers to the destruction of ozone molecules in the stratosphere, climate change involves altering Earth's climate patterns due to greenhouse gas emissions. However, some substances that deplete the ozone layer, such as CFCs, also have potent greenhouse gas properties, contributing to global warming.

Politics and international cooperation: The discovery of the ozone hole and growing scientific evidence have

Website:

<https://www.esrl.noaa.gov/csd/assessments/ozone/>

United Nations Environment Programme (UNEP) - Ozone Secretariat:

Website: <https://ozone.unep.org/>

Environmental Protection Agency (EPA) - Protection of the Ozone Layer:

Website:

<https://www.epa.gov/ozone-layer-protection>

World Meteorological Organization (WMO) - Ozone layer:

Website:

<https://public.wmo.int/en/our-mandate/environment/ozone-layer>

spurred global action. In 1987, the Montreal Protocol on Substances that Deplete the Ozone Layer was adopted, with subsequent amendments and adjustments. The treaty aimed to phase out the production and consumption of substances that deplete the ozone layer. The success of the Montreal Protocol has demonstrated the effectiveness of international cooperation in addressing global environmental issues.

Recovery and ongoing challenges: Efforts under the Montreal Protocol have led to a gradual recovery of the ozone layer. However, full recovery is expected to take several decades. Some challenges remain, including identifying and regulating new ozone-depleting substances, enforcing compliance, and the need for ongoing research and monitoring to assess the long-term effects of ozone depletion.

Solutions:

-Phasing out ozone-depleting substances (ODS):

- Strictly enforce the norms and protocols established by international agreements such as the Montreal Protocol.
- Promote the development and use of environmentally friendly alternatives to ODS in various industries, such as aerosol, refrigeration, and foam production.
- Implement appropriate disposal and recycling measures for products containing ODS to prevent their release into the atmosphere.

-Public awareness and education:

- Conduct educational campaigns to raise awareness about the importance of the ozone layer and its depletion.
- Engage schools, communities, and the media to disseminate information

about the impacts of UV radiation and the actions individuals can take to protect themselves and the environment.

- Incorporate the ozone layer and environmental protection issues into school curricula to promote a sense of responsibility and environmental stewardship among students.

-Advancement of scientific research and monitoring:

- Support ongoing research to better understand the processes and mechanisms underlying ozone depletion.
- Strengthen global monitoring networks to monitor ozone depletion and assess the effectiveness of mitigation efforts.
- Encourage collaboration between scientists, research institutes and governments to share data and results related to the depletion of the ozone layer.

-International cooperation:

- Strengthen international cooperation and collaboration to collectively address the challenges of ozone depletion.
- Share best practices, technological advances, and policy frameworks among countries to facilitate the effective implementation of ozone protection measures.
- Assist developing countries in the transition to ozone-friendly technologies and practices through financial and technical support.

-Continuous recovery of the ozone layer:

- Monitor the recovery of the ozone layer and adjust mitigation strategies accordingly.
- Support ongoing efforts to phase out newly identified ozone-depleting substances.

- Regularly review and update international agreements and protocols to address emerging challenges and evolving scientific knowledge. -Climate Change Mitigation: - Recognise the interlinkages between ozone depletion and climate change and implement measures that address both problems at the same time. - Promote the reduction of greenhouse gas emissions to mitigate climate change, as some substances that contribute to climate change also have ozone-depleting properties.		
<u>Summary and Conclusion:</u> The history of ozone layer depletion began with alarming discoveries in the 1970s and led to the identification of ozone-depleting substances. The impact of ozone depletion includes increased UV radiation, health risks, ecological consequences, and its relationship to climate change. The international response, exemplified by the Montreal Protocol, demonstrates the power of collective action. While progress has been made, continued efforts are needed to ensure the recovery and preservation of the ozone layer for future generations.		Class Discussion

Activity	Methodology
<u>Activity 1:</u> Demonstration of the ozone layer <u>Objective:</u> To introduce students to the concept of the ozone layer and its importance in protecting the Earth from harmful UV radiation. <u>Procedure:</u> - Start by explaining the ozone layer and its role in protecting the Earth from UV radiation. - Conduct a demonstration using a UV light source and a model of the Earth.	Problem-based learning Collaborative learning Cooperative Learning

● Illuminate the model with UV light and discuss the effects of UV radiation without the ozone layer. ● Gradually introduce a layer of protective material (e.g. cling film) to represent the ozone layer and observe the difference. ● Discuss the potential causes of ozone depletion and its consequences.	
Activity 2: Studying ozone-depleting substances Objective: To explore the different substances that contribute to ozone depletion and to understand their sources and alternatives. Procedure: ● Divide students into small groups and assign each group a different substance that depletes the ozone layer (e.g., chlorofluorocarbons, halons, carbon tetrachloride). ● Have students research and create a presentation about their assigned substance, including its chemical properties, uses, and impact on the ozone layer. ● Encourage students to identify alternatives to their assigned substance and discuss their environmental impact. ● Organize a class discussion where each group presents their findings and engages in a Q&A session.	Problem-based learning Collaborative learning Cooperative Learning

Checks

Typology

True or False Questions: Question 1: Is the ozone layer located in the Earth's upper atmosphere? Answer: True Question 2: Ozone depletion is mainly caused by natural processes such as volcanic activity. Answer: False (Ozone depletion is mainly caused by human activities and the release of ozone-depleting substances). Question 3: Ozone depletion occurs only in the polar regions. Answer: False (While ozone depletion is more pronounced in the polar regions, it also occurs globally). Question 4: Chlorofluorocarbons (CFCs) are one of the main contributors to ozone depletion. Answer: True Question 5: The depletion of the ozone layer has no direct impact on human health. Answer: False (Ozone depletion can lead to increased levels of harmful ultraviolet radiation, which can have adverse effects on human health, such as skin cancer and cataracts).	True or False Questions:

Question 6: The Montreal Protocol is an international agreement aimed at phasing out the production and use of substances that deplete the ozone layer.

Answer: True

Question 7: The depletion of the ozone layer has no impact on the environment or ecosystems.

Answer: False (Ozone depletion can have detrimental effects on ecosystems, including damage to marine life, reduced crop yields, and disruption of food chains).

Question 8: The ozone hole refers to a complete absence of ozone in the atmosphere.

Answer: False (The ozone hole refers to a significant decrease in the concentration of ozone in a specific region, observed primarily over Antarctica.)

Question 9: The ozone layer is gradually recovering thanks to global efforts to reduce ozone-depleting substances.

Answer: True

Question 10: The use of aerosol sprays contributes significantly to ozone depletion.

Answer: True

Skills acquired

1. **Scientific knowledge:** Students will develop a solid understanding of the ozone layer, its role in protecting the Earth, and the causes and consequences of ozone depletion. They will learn about the science behind ozone depletion, including the chemistry of substances that deplete the ozone layer and the impact of ultraviolet radiation.
2. **Research and Analysis:** Through activities and tasks related to ozone depletion, students will practice conducting research from reliable sources and analyzing scientific data. They will learn to critically evaluate information, identify credible sources, and synthesize information to form informed opinions.
3. **Environmental Awareness:** Students will gain a greater awareness of the importance of environmental issues and the impact of human activities on the Earth's atmosphere. They will develop a sense of responsibility towards the conservation of the environment and the need to protect the ozone layer.
4. **Critical Thinking:** The study of ozone depletion encourages students to think critically about complex scientific concepts. They will learn to examine cause-and-effect relationships, analyze data, and assess the implications of ozone depletion for human health, ecosystems, and climate.
5. **Communication skills:** Engaging in discussions, group work, and presentations related to ozone depletion will improve students' communication skills. They will learn to articulate their ideas, listen to and respect different perspectives, and effectively communicate scientific concepts to their peers.
6. **Problem-solving:** Students will develop problem-solving skills by exploring alternative solutions and strategies to address ozone depletion. They will learn about sustainable

alternatives to ozone-depleting substances and consider the social, economic, and environmental implications of implementing these solutions.

7. Collaboration and teamwork: Many ozone-depleting activities involve group work, presentations, and discussions. Students will learn how to collaborate effectively, share responsibilities, and work in teams to achieve common goals.
8. Environmental Advocacy: By studying ozone depletion, students can develop a sense of advocacy for environmental issues. They can be motivated to raise awareness, engage in sustainable practices, and advocate for policies that protect the ozone layer and the environment.

Lesson No. 7 – Immigration due to climate change

Lesson plan

Keywords: displacement, migration, environmental challenges, climate-induced impact, vulnerability

Timetable: 45 minutes lesson , 40 minutes activity, 10 minute test.

School: Two-year middle school

Objectives

- Raising awareness: The main goal is to raise awareness among students about the relationship between climate change and migration. Students should understand how environmental factors and climate-related events contribute to population displacement and migration patterns.
- Understanding Impacts: Helping students understand the various impacts of climate-induced migration on individuals, communities, and countries. This includes discussing the social, economic, environmental, and humanitarian consequences of displacement due to climate change.
- Analyze case studies: Explore specific case studies of regions or communities affected by climate-induced migration. This can include examples such as Pacific island nations, African countries, or coastal areas vulnerable to sea level rise. By analyzing real-world scenarios, students can understand the specific challenges and dynamics involved.
- Develop empathy and perspective-taking: Encourage students to develop empathy and perspective-taking skills by understanding the experiences and difficulties faced by climate migrants. This may involve examining personal narratives, testimonies, or media resources that highlight the human side of climate-induced migration.
- Assess policy responses: Discuss and evaluate existing policies and international frameworks aimed at addressing the challenges of climate-induced migration. Encourage critical thinking and analysis of the effectiveness, gaps, and potential improvements of these policies.
- Promoting Global Citizenship: Fostering a sense of global citizenship by discussing the responsibilities and roles of individuals, communities, and governments in addressing climate change and its impacts on migration. Encourage students to explore potential solutions, advocacy strategies, and ways to support affected communities.
- Promoting resilience and adaptation: Highlight the importance of resilience and adaptation in the face of climate change. Discuss strategies and initiatives that can help communities better address environmental challenges, mitigate displacement, and promote sustainable livelihoods.

- Encourage critical thinking: Foster critical thinking skills by engaging students in discussions and activities that require them to analyze multiple perspectives, consider the complexities of the problem, and assess the interplay between climate change, migration, and other socio-political factors.
- Inspire action: Motivate students to take action in their own lives and communities to address climate change and its impact on migration. Encourage them to explore opportunities for personal involvement, support, and sustainable choices.

Contents	References	Methodology
<u>Introduction:</u> Immigration due to climate change refers to the phenomenon of people being displaced from their homes or countries due to environmental factors associated with climate change. Climate change can lead to a range of environmental challenges such as rising sea levels, extreme weather events, desertification, and loss of arable land, which in turn can impact livelihoods, food security, and overall living conditions. These factors often force individuals and communities to migrate in search of safer and more sustainable living environments.	<u>Video:</u> Climate change-related migrants: what can be done? https://www.youtube.com/watch?v=A3AuCQml7IQ	Class Discussion Student Presentations Problem-Based Learning (PBL)
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> The impact of climate change migrations on humanity is multifaceted and can have both positive and negative consequences. Some key impacts are: 1. Displacement and humanitarian crisis: Climate-induced migration can result in mass displacement of people, leading to humanitarian crises. Communities forced to leave their homes face numerous challenges, including loss of livelihoods, limited access to basic services, and increased vulnerability to poverty, health risks, and exploitation. It can put a strain on resources and infrastructure in receiving areas, leading to social and economic tensions. 2. Pressure on host countries: The influx of migrants due to climate change can put significant pressure on host	<u>Sources:</u> United Nations Refugee Agency (UNHCR) - The UNHCR website provides information and reports on climate-induced displacement and migration. Connection: https://www.unhcr.org/climate-change-and-displacement.html International Organization for Migration (IOM) - IOM focuses on migration issues, including those related to climate change and environmental factors. Connection: https://www.iom.int/what-we-do/environment-and-climate-change	Class Discussion Student Presentations Problem-Based Learning (PBL)

countries, especially those with limited resources and capacity to absorb and integrate large numbers of people. This can put a strain on social services, infrastructure, and labor markets, potentially leading to social unrest and conflict between host communities and migrants.

3. Economic impacts: Climate-induced migration can have both positive and negative economic impacts. On the bright side, migrants can contribute to the workforce, fill workforce gaps, and boost economic growth in host countries. However, the sudden influx of migrants can also put a strain on local economies, particularly in areas with limited job opportunities, leading to increased competition for resources and potential wage suppression.
4. Cultural and social changes: Migration due to climate change can lead to cultural and social changes in both sending and host communities. Migrants often bring with them their own traditions, languages and customs, enriching the cultural fabric of their new communities. However, cultural clashes and tensions can arise, requiring efforts to promote inclusivity, cultural understanding, and social integration.
5. International relations and security: Climate-induced migration can have implications for international relations and security. It can put a strain on relations between countries, especially when large numbers of people cross borders in search of safety and resources. Displacement and climate change-related conflicts can also exacerbate political instability, increase the risk of social unrest, and create conditions conducive to radicalisation and conflict.
6. Environmental impacts: Large-scale migration due to climate change can also have environmental consequences. Increasing population density in host areas can lead to overburdened resources, deforestation, and land

World Bank - The World Bank conducts research and publishes reports on climate change and migration, examining their social and economic impacts.

Connection:

<https://www.worldbank.org/en/topic/environment/brief/climate-change-and-migration>

Intergovernmental Panel on Climate Change (IPCC) - The IPCC provides scientific assessments of climate change, including its impacts on human migration.

Connection:

<https://www.ipcc.ch/>

National Geographic - National Geographic presents articles and stories related to climate-induced migrations, exploring personal experiences and global impacts.

Connection:

<https://www.nationalgeographic.com/environment/article/climate-migration>

Climate Refugees - The Climate Refugees website offers resources, news, and reports on climate-induced migration and displacement.

Connection:

<http://www.climaterefugees.com/>

degradation. In addition, migration itself can contribute to carbon emissions if displaced populations move to areas with a higher carbon footprint or if the transport methods used are carbon-intensive.

Addressing the impacts of climate-induced migration requires international cooperation, global policies, and targeted investments in resilience, adaptation, and mitigation measures. It is essential to prioritise the protection of human rights, the provision of humanitarian assistance and the promotion of sustainable development to mitigate the negative impacts on affected communities and promote a more inclusive and resilient future for all.

Some **examples** of immigration due to climate change are:

Low-lying Pacific island nations, such as Tuvalu and Kiribati, are facing the threat of rising sea levels. These nations are vulnerable to coastal erosion and saltwater intrusion, making their lands uninhabitable. As a result, residents of these islands are looking to relocate and have become among the first refugees of climate change.

Sub-Saharan Africa: Climate change has contributed to increased drought and desertification in many parts of sub-Saharan Africa. These environmental challenges have had severe impacts on agricultural productivity, leading to food shortages and displacement of people. In countries such as Somalia and Sudan, prolonged drought has resulted in a large-scale migration of people in search of water and food.

Bangladesh: Bangladesh is one of the most vulnerable countries to climate change due to its low delta geography and high population density. The country regularly experiences devastating floods and cyclones, displacing millions of people each year. Sea level rise also poses a significant threat to the

country's coastal regions, forcing many to migrate inland. Central America: Climate change is exacerbating existing environmental problems in Central America, such as deforestation and land degradation. These factors, combined with extreme weather events such as hurricanes and prolonged droughts, have led to poor harvests, economic instability, and increased migration from countries such as Honduras, Guatemala, and El Salvador. Small Caribbean island states: Many Caribbean islands are highly vulnerable to the impacts of climate change, including hurricanes, storm surges, and coral reef degradation. These events damage infrastructure, disrupt economies, and displace residents. For example, the devastation caused by Hurricane Irma in 2017 led to a significant outflow of people from affected islands such as Barbuda.		
<u>Summary and Conclusion:</u> The examples highlight the complex relationship between climate change and human migration. As climate change continues to intensify, the number of people displaced due to environmental factors is expected to increase, necessitating international cooperation and adaptation policies to address the challenges of climate-induced migration.		Class Discussion

Activity	Methodology
<u>Activity 1: "Climate Change Simulation"</u> <u>Objective:</u> To help students understand the impact of climate change on migration through a simulation activity. <u>Arrangement:</u> Divide students into small groups, assigning each group a specific region or community that is affected by climate change.	Problem-based learning Collaborative learning Cooperative Learning

● Provide each group with information about current climate conditions, environmental challenges, and potential consequences for their assigned region. ● Instruct groups to discuss and brainstorm the effects of these climate challenges on the people living in the region. Encourage them to consider factors such as water scarcity, food insecurity, extreme weather events, and displacement. ● Each group should create a simulation scenario that reflects the challenges faced by their assigned region. This may include role-playing activities, discussions, or short presentations. ● Give each group time to present their simulation to the class. During presentations, students are expected to explain the specific impacts of climate change on migration and highlight the choices and decisions that individuals or communities might face. ● Engage the class in a discussion after each presentation, encouraging students to reflect on the challenges, decisions, and emotions experienced during the simulations. ● Summarize the main highlights of the activity, emphasizing the link between climate change, environmental challenges, and migration.	
<u>Activity 2: "Mapping climate-induced migration"</u> <u>Objective:</u> To help students visualize and analyze patterns of climate-induced migration using mapping techniques. <u>Instructions:</u> ● Provide students with datasets, maps, or case studies that highlight regions or countries experiencing climate-induced migrations. ● Have students use online mapping tools or physical maps to identify and mark areas affected by climate change and associated migration. ● Guide students in analyzing migration patterns and trends. Encourage them to consider factors such as geographical features, climate-related events, and socioeconomic factors that influence migration flows. ● In small groups, ask students to discuss and present their findings. They should explain the patterns they have observed, the reasons behind these migration patterns, and the potential impacts on the areas of origin and destination. ● It facilitates a class discussion to compare and contrast the results of different groups. It encourages students to consider the similarities, differences, and underlying causes of climate-induced migration in various regions.	Problem-based learning Collaborative learning Cooperative Learning

- Discuss the potential implications of these migration patterns on affected regions, as well as the challenges and opportunities for both migrants and host communities.

Checks	Typology
True or False Questions: Question 1: Immigration due to climate change occurs only in low-lying coastal areas. Answer: False. Immigration due to climate change can occur in various regions and not only in coastal areas. It can also happen in regions experiencing drought, desertification, or other climate-related environmental challenges. Question 2: Climate-induced migration is driven solely by environmental factors and has no social or economic components. Answer: False. Climate-induced migration is influenced by a combination of environmental, social and economic factors. While environmental challenges play a significant role, socio-economic factors and the ability to adapt to changing conditions also impact migration decisions. Question 3: Climate change-related migrations are a recent phenomenon and have never occurred in the past. Answer: False. While the scale and intensity of climate-induced migration may increase due to climate change, migration influenced by environmental factors has occurred throughout history. Examples include the migration of the Dust Bowl to the United States in the 1930s and the drought of the Sahel in Africa in the 1970s. Question 4: Climate-induced migration mainly affects developing countries, while developed countries remain unaffected. Answer: False. Climate-induced migration can impact both developing and developed countries. While developing countries are often more vulnerable to the impacts of climate change due to limited resources and infrastructure, developed countries can also experience climate-related displacement and the arrival of climate migrants. Question 5: Climate-induced migration always leads to permanent relocation, and return to the original location is not possible. Answer: False. Climate-induced migrations can range from temporary displacement to permanent relocation, depending on the severity and duration of environmental challenges. In some cases, individuals or communities may return to their original location if conditions improve or if they are able to adapt to the changing environment.	True or False Questions

Skills acquired

1. **Critical Thinking:** Students develop the ability to analyze complex issues related to climate change and migration. They learn to evaluate multiple perspectives, identify cause-and-effect relationships, and make informed judgments about the impacts and solutions of climate-induced migrations.
2. **Empathy and understanding:** By studying the personal stories and experiences of climate migrants, students cultivate empathy and a deeper understanding of the challenges faced by individuals and communities affected by climate change. They learn to appreciate the human side of migration and develop a sense of compassion towards those affected by environmental displacement.
3. **Research and Analysis:** Students gain research skills as they explore various sources, collect data, and analyze information about the relationship between climate change and migration. They learn to assess the credibility of sources, extract relevant data, and draw evidence-based conclusions.
4. **Global Awareness:** The class broadens students' understanding of global issues, fostering a sense of global citizenship. They become aware of the interconnectedness between climate change, migration, and social, economic, and environmental factors. This awareness encourages a sense of responsibility towards global challenges and encourages them to take action.
5. **Problem-Solving and Decision-Making:** By examining the challenges and potential solutions related to climate-induced migration, students improve their problem-solving and decision-making skills. They learn to assess the feasibility and effectiveness of different strategies, consider the implications of various courses of action, and propose informed solutions to address the impacts of climate change on migration.
6. **Cultural competence:** Through the study of different regions and communities affected by climate-induced migration, students develop cultural competences. They gain an appreciation for different cultural perspectives, values, and traditions, promoting respect and understanding for different populations. This expertise is essential to promote inclusivity and collaboration in an increasingly globalized world.

Lesson No. 8 – Wars and the Environment

Lesson plan

Keywords: environmental degradation, scarcity of resources, economic tensions.

Timetable: lesson 45 minutes, activity 20 minutes, test 10 minutes.

School: Two-year middle school

Objectives

1. **Understanding the Links:**
 - Explain the relationship between climate change and wars, highlighting how climate change can contribute to conflicts and intensify existing tensions.
 - Discuss how wars, in turn, create environmental problems and exacerbate environmental degradation.
2. **Explore Case Studies:**
 - Review specific case studies or historical examples where climate change has been linked to conflict or war.

- Analyze the environmental consequences of these conflicts and their long-term impact on ecosystems, biodiversity and natural resources.
3. Recognizing multifaceted impacts:
 - Identify and discuss the various ways in which climate change can indirectly contribute to conflict, including resource scarcity, displacement, and economic upheaval.
 - Explore the environmental consequences of wars, such as infrastructure damage, pollution, deforestation, and habitat destruction.
 4. Foster Critical Thinking:
 - Encourage critical analysis of the complex relationships between climate change, wars, and environmental problems.
 - Engage students in discussions about the underlying factors and the factors that link these phenomena, considering social, economic, and political dynamics.
 5. Promoting empathy and global awareness:
 - Develop empathy for communities affected by conflicts induced by climate change and environmental destruction.
 - Cultivate a sense of global awareness and responsibility in addressing the challenges posed by climate change and armed conflict.
 6. Encourage Solutions and Action:
 - Explore potential solutions and approaches to mitigate the impacts of climate change on conflict and the environment.
 - It encourages students to reflect on individual and collective actions that can contribute to environmental conservation, conflict prevention, and sustainable peacebuilding efforts.

Contents	References	Methodology
<u>Introduction:</u> The relationship between climate change and wars is complex, with both factors influencing and exacerbating each other. On the one hand, climate change can contribute to conflicts by amplifying existing tensions and creating conditions that increase the likelihood of violence. On the other hand, wars themselves can have serious environmental consequences, causing significant environmental degradation and creating new environmental problems. Understanding these interlinkages is key to addressing the twin challenges of climate change and armed conflict, while striving for a sustainable and peaceful future. Climate change causes wars: Climate change can act as a "threat multiplier" that exacerbates existing vulnerabilities and tensions within societies. The impacts of climate change, such as resource scarcity,	<u>Video:</u> "Can climate change cause wars?" Link: https://www.youtube.com/watch?v=E8bb8XKqbTU "How the climate is a victim of the war in Ukraine ABCNL" Link: https://www.youtube.com/watch?v=E8bb8XKqbTU	Class Discussion Student Presentations Problem-Based Learning (PBL)

water stress, land degradation, and extreme weather events, can contribute to conflict in a number of ways. Competition for dwindling resources, such as water or arable land, can escalate into violence, as communities and even nations compete for essential means of survival. Displacement and migration resulting from the impacts of climate change can strain resources, disrupt social structures, and increase existing social and political tensions, potentially leading to conflict. In addition, the economic and social upheavals caused by climate change can create conditions of instability and unrest, providing a fertile ground for conflict to arise.

Wars create environmental problems: wars themselves have a profound and lasting impact on the environment. Armed conflicts often result in the destruction of critical infrastructure, including power plants, factories, transportation networks, and water and sanitation systems. Damage to infrastructure can lead to environmental pollution, the release of hazardous substances, and the destruction of ecosystems. Chemical agents, explosives, and weapons used in warfare can contaminate soil, water sources, and ecosystems, posing long-term health risks to both humans and wildlife. In addition, conflicts can contribute to deforestation, habitat destruction, and biodiversity loss due to military operations, displacement, and unsustainable exploitation of natural resources. The post-conflict period can also present challenges, as hasty and unsustainable development practices in reconstruction efforts can exacerbate environmental problems and hinder long-term sustainability.

Acknowledging the interplay between climate change and wars is critical to addressing the interconnected challenges they pose. By mitigating the impacts of climate change, promoting sustainable development, and working towards peaceful conflict resolutions, societies can strive to protect the environment, improve

resilience, and build a more sustainable future for generations to come.		
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> Climate Change and Conflicts/Wars: Scarcity of resources: Climate change can lead to scarcity of vital resources such as water and arable land. This scarcity can intensify competition and disputes between communities or even nations, leading to conflicts and wars. Displacement and migration: Climate change-induced events, such as sea level rise, droughts, or extreme weather events, can displace communities, forcing them to migrate. This mass displacement can strain resources and increase social tensions, potentially contributing to conflicts or exacerbating existing ones. Economic tensions: The impacts of climate change can disrupt economies, particularly in regions that depend on climate-sensitive sectors such as agriculture and fisheries. Economic instability and resource scarcity can contribute to social unrest and political instability, creating conditions conducive to conflict. Wars and environmental impacts: 1. Destruction of infrastructure: Wars often result in the destruction of critical infrastructure, including power plants, factories, transportation networks, and water and sanitation systems. Damage to infrastructure can lead to environmental pollution, the release of hazardous substances, and the destruction of ecosystems. 2. Pollution and contamination: Armed conflicts can result in the release of pollutants, hazardous waste, and the use of chemical agents. These can contaminate soil, water sources, and ecosystems, posing health risks to both humans and wildlife.	<u>Sources:</u> 1. Stockholm International Peace Research Institute (SIPRI) - SIPRI conducts research on the connections between climate change, conflict and security. Connection: https://www.sipri.org/ 2. Center for Climate and Security - The Center for Climate and Security focuses on the security implications of climate change, including its role in conflicts and wars. Connection: https://climateandsecurity.org/ 3. United Nations Environment Programme (UNEP) - UNEP conducts research and reports on climate change, conflict and environmental security. Connection: https://www.unep.org/ 4. International Committee of the Red Cross (ICRC) - The ICRC explores the humanitarian and legal aspects of conflicts exacerbated by climate change. Connection: https://www.icrc.org/en 5. Climate Diplomacy - Climate Diplomacy is a platform that examines the links between climate change, security, and diplomacy. Connection:	Class Discussion Student Presentations Problem-Based Learning (PBL)

3. Deforestation and land degradation: Wars can lead to deforestation due to military operations, timber exploitation, or the displacement of communities. Forest loss contributes to habitat destruction, biodiversity loss, soil erosion and exacerbates climate change.
4. Loss of environmental governance: During times of war, institutions and systems for environmental protection and governance can be weakened or neglected. This can lead to unregulated exploitation of natural resources, illegal logging, poaching, and ecosystem degradation.
5. Post-conflict challenges: After the end of conflicts, the process of rebuilding and rebuilding can put a strain on resources and often prioritizes short-term needs over long-term environmental sustainability. This can lead to hasty and unsustainable development practices, further exacerbating environmental problems.

Examples where climate change has been linked to conflict are:

1. Darfur conflict (2003–present): The Darfur conflict in Sudan has been attributed, in part, to environmental factors induced by climate change. Drought and desertification have resulted in scarcity of resources, especially water and pastures. This has led to competition between pastoralists and farmers, exacerbating existing ethnic tensions and contributing to the conflict.
2. Syrian Civil War (2011-ongoing): Climate change has been cited as a contributing factor to the Syrian civil war. Prolonged drought, coupled with poor water management practices and failed agriculture, has led to significant migration from the countryside to cities and social unrest. These factors, along with political and social tensions, eventually turned into a full-scale civil war.

<https://www.climate-diplomacy.org/>

6. United Nations Environment Programme (UNEP) - UNEP provides information on the environmental impacts of armed conflict and conducts research on post-conflict environmental assessments. Connection: <https://www.unep.org/>
7. Environmental Law Institute (ELI) – ELI offers resources and reports on the environmental consequences of wars and conflicts, including case studies and policy recommendations. Connection: <https://www.eli.org/>
8. International Committee of the Red Cross (ICRC) - The ICRC examines the humanitarian and environmental consequences of armed conflicts, including the impact on ecosystems and natural resources. Connection: <https://www.icrc.org/en>
9. Stockholm International Peace Research Institute (SIPRI) - SIPRI conducts research on the environmental dimensions of armed conflict, including the impact on ecosystems, biodiversity and the environment. Connection: <https://www.sipri.org/>

3. Lake Chad Basin Crisis (ongoing): The impacts of climate change, such as rising temperatures and erratic rainfall patterns, have contributed to the shrinkage of Lake Chad. The shrinking of the lake has resulted in resource scarcity, reduced agricultural productivity, and economic decline in the region. These factors have contributed to social tensions, conflicts over resources, and provided a breeding ground for extremist groups to exploit grievances. 4. South Sudan conflict (2013–present): Environmental factors influenced by climate change, such as extreme weather events and varying rainfall patterns, have contributed to food insecurity and competition for resources in South Sudan. These factors, combined with political tensions, have escalated into a violent conflict in the country. 5. Boko Haram insurgency (ongoing): Climate change-induced desertification and land degradation in Nigeria's northeastern region have contributed to food insecurity and economic decline. These environmental challenges, along with social and political factors, have created conditions that extremist groups such as Boko Haram have exploited to recruit and mobilize support. Recognizing and addressing the complex relationship between climate change, conflict, and their environmental impacts is essential for promoting peace, sustainable development, and the protection of ecosystems and natural resources.		
<u>Summary and Conclusion:</u> The relationship between climate change and wars is complex and multifaceted. Although it is difficult to establish a direct causal link, there is growing evidence to suggest that climate change may contribute to conflict and exacerbate existing tensions. The impacts of climate change, such as		Class Discussion

resource scarcity, environmental degradation, and displacement, can create conditions that increase the likelihood of conflict.

For example, prolonged droughts, desertification, or extreme weather events can lead to competition for limited resources such as water and land, potentially escalating into conflict. Displacement and migration resulting from the impacts of climate change can strain resources, increase social tensions and contribute to conflict. In addition, disruptions related to climate, economies, and livelihoods can create social unrest and political instability, creating conditions conducive to conflict.

However, it is crucial to recognize that climate change is rarely the sole cause of wars. Conflicts arise due to a complex interplay of political, economic and social factors. Climate change acts as a 'threat multiplier', exacerbating existing vulnerabilities and contributing to a range of societal and environmental challenges that can ultimately increase the risk of conflict.

Understanding the connection between climate change and conflict is important for addressing both the causes and consequences of climate change. By mitigating the impacts of climate change, promoting sustainable development, and addressing the root causes of conflict, societies can work to reduce the potential for conflicts exacerbated by climate change.

Activity	Methodology
<u>Activity:</u> Profiles of climate migrants <u>Objective:</u> To promote empathy and understanding by exploring the personal stories of climate migrants. <u>Arrangement:</u>	Collaborative learning Cooperative Learning

● Provide students with a selection of articles, videos, or interviews that present personal stories of climate migrants. ● Divide students into small groups and assign each group a specific climate migrant profile to explore. ● In their groups, students research and analyze the experiences, challenges, and motivations of climate migrants. ● Each group creates a presentation or poster that highlights key aspects of the individual's history, including the climate-related factors that led to migration, the impacts on their lives, and their aspirations for the future. ● Give each group time to present their profiles to the class, followed by a discussion of the broader implications and personal connections of the stories.	

Checks	Typology
True or False Questions: Question 1: Climate change is a direct and unique cause of wars. Answer: False. Climate change is not the only cause of wars. It can contribute to conflicts by exacerbating existing tensions and creating conditions conducive to violence, but other factors, such as political, economic and social factors, also play a significant role in the initiation of wars. Question 2: Wars have no impact on the environment and do not create environmental problems. Answer: False. Wars can have serious impacts on the environment and create various environmental problems. They can cause infrastructure damage, pollution, deforestation, habitat destruction, and the release of hazardous substances, which can lead to long-lasting environmental degradation. Question 3: Resource scarcity induced by climate change can contribute to conflict and escalating tensions. Answer: True. Resource scarcity caused by climate change, such as scarcity of water or arable land, can increase competition, intensify disputes, and escalate tensions between communities or nations, potentially leading to conflict. Question 4: Wars can lead to pollution and environmental contamination. Answer: True. Wars can cause environmental pollution and contamination through the use of explosives, chemical weapons, and the destruction of infrastructure. These activities can release pollutants, hazardous substances, and cause long-term environmental consequences. Question 5: Climate change-induced displacement and migration have no link to conflict and war. Answer: False. Climate change-induced displacement and migration can strain resources, increase social tensions, and contribute to conflict.	True or False Questions

Competition for limited resources, as well as challenges related to the integration of displaced populations, can exacerbate existing conflicts or create new ones.

Question 6: Wars can contribute to deforestation and habitat destruction.
Answer: True. Wars can lead to deforestation and habitat destruction due to military operations, displacement of communities, and unsustainable exploitation of natural resources. These activities can lead to biodiversity loss and ecological damage.

Question 7: Climate change is the leading cause of wars and conflicts globally.

Answer: False. Climate change is not the main cause of wars and conflicts globally. Although it may be a contributing factor, conflicts arise from a complex interplay of various political, economic, social, and historical factors.

Question 8: Wars have no long-term impacts on the environment.

Answer: False. Wars can have long-term impacts on the environment, including the destruction of ecosystems, soil contamination, and challenges in post-conflict environmental rehabilitation. The consequences of wars can persist for years or even decades.

Skills acquired

1. **Critical Thinking:** Students develop the ability to analyze and evaluate complex issues related to climate change, wars, and their environmental impacts. They learn to evaluate connections, identify cause-and-effect relationships, and think critically about the factors that contribute to conflict and environmental degradation.
2. **Research and analysis:** Students gain research skills while exploring the interconnections between climate change, wars, and environmental problems. They learn to collect and analyze information from various sources, examine case studies, and evaluate evidence supporting these connections.
3. **Global Awareness:** The class broadens students' understanding of global issues, fostering a sense of awareness about the interconnectedness between climate change, conflict, and environmental challenges. They develop an understanding of the global implications of these issues and the need for international cooperation.
4. **Systems thinking:** Students develop an understanding of the complex systems at play in climate change, wars, and the environment. They recognize the interplay between environmental, social, political, and economic factors, and how these factors interact to shape environmental conflicts and problems.
5. **Ethical Awareness:** Students gain an appreciation for the ethical dimensions of climate change, wars, and their environmental impact. They consider the consequences for human well-being, social justice, and environmental sustainability, promoting a sense of responsibility and ethical decision-making.
6. **Empathy and perspective-taking:** Students develop empathy and understanding of the human and ecological impacts of climate change-induced conflicts. They gain a broader perspective on the experiences and challenges faced by affected communities, promoting empathy and a sense of responsibility towards vulnerable populations.

Lesson No. 9 – Interactions between Human Civilization and the Natural Environment

Lesson plan

Keywords: human-nature relationship, environmental impact, ecological consequences, sustainability, historical interactions

Timetable: 45 minutes lesson , 30 minutes activity, 10 minute test.

School: Two-year middle school

Objectives
● Understanding the concept of human civilization and its dependence on the natural environment: The class aims to provide students with a clear understanding of what constitutes human civilization and how it relies on the natural environment for resources, ecosystem services, and overall well-being. Students will gain insight into the intricate interconnections between human societies and the natural world. ● Explore the historical interactions between human civilization and the natural environment: The lecture seeks to examine historical periods and key civilizations to highlight how humans have interacted with and shaped the natural environment throughout history. Students will learn about the practices, challenges, and consequences of these interactions, fostering an appreciation for the historical context of our current environmental challenges. ● Identify and analyze the environmental consequences of human activities: The goal is to enable students to recognize and critically analyze the environmental consequences arising from human interactions with the natural environment. Students will explore topics such as deforestation, pollution, climate change, and habitat destruction, and understand the impacts of these activities on ecosystems and biodiversity. ● Promote environmental awareness and responsibility: The class aims to cultivate a sense of environmental awareness and responsibility in students. By examining the consequences of human actions, students will develop an understanding of the importance of sustainable practices, conservation efforts, and the preservation of the natural environment. Students will be encouraged to reflect on their role as individuals within the broader context of human civilization and its impact on the environment. ● Encourage Critical Thinking and Problem-Solving: The class seeks to promote critical thinking skills by encouraging students to analyze complex environmental issues and propose potential solutions. Students will engage in discussions, debates, and case studies to develop their skills to assess environmental challenges, assess different perspectives, and propose viable solutions to mitigate the negative impacts of human activities on the natural environment. ● Inspire personal and collective action for sustainability: The goal is to motivate students to take action and make informed choices that contribute to a more sustainable future. Through the lecture, students will be able to make environmentally conscious decisions in their daily lives, advocate for sustainable practices, and actively participate in initiatives aimed at preserving and protecting the natural environment.

Contents	References	Methodology
<u>Introduction:</u>	<u>Video:</u>	Class Discussion

The interactions between human civilization and the natural environment have shaped the course of history and influenced the trajectory of human societies since time immemorial. Over the centuries, humans have been closely connected to their surroundings, drawing resources, inspiration, and sustenance from the natural world. However, these interactions have also had profound consequences for the environment, as human activities have resulted in environmental degradation, biodiversity loss, and climate change. Recognizing the complexity and importance of the relationship between human civilization and the natural environment is essential to understanding the challenges we face in creating a sustainable future. By examining historical interactions, environmental consequences, and contemporary efforts toward conservation and sustainability, we can gain insight into the intricate and ever-changing relationship between human societies and the natural world. Exploring this theme allows us to explore the delicate balance between human progress and the preservation of the planet's ecosystems, inspiring us to strive for a harmonious coexistence with nature.	"Human impact on the environment":Link: https://www.youtube.com/watch?v=NNijmxsKGn0 "The Story of Stuff":Link: https://www.youtube.com/watch?v=9GorqroigqM "The History of Environmentalism": Link: https://www.youtube.com/watch?v=6NNF8WzuF0Q "The Plastic Age: A Documentary feat. Pharrell Williams":Link: https://www.youtube.com/watch?v=koN2dzZJ5dE	Student Presentations Problem-Based Learning (PBL)
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> The interactions between human civilization and the natural environment have a long and complex history spanning thousands of years. Over different time periods and cultures, humans have interacted with the natural world in a variety of ways, shaping and being shaped by their environment. The following is an overview of the historical interactions between human civilization and the natural environment: Hunter-gatherer societies (prehistoric era): Early human societies were hunter-gatherers who relied on the natural environment for their survival. They	<u>Sources:</u> National Geographic - Human impact on the environment:Link: https://www.nationalgeographic.org/encyclopedia/human-impact-environment/ United Nations Environment Programme (UNEP) - Our Planet:Link: https://www.unep.org/interactive/ourplanet/ World Wildlife Fund (WWF) - Human impacts on the environment:Link:	Class Discussion Student Presentations Problem-Based Learning (PBL)

hunted animals for food, gathered wild plants, and moved in search of resources. These societies had a direct and intimate relationship with nature, depending on its abundance and fluctuations.

Agricultural Revolution (Neolithic Era):

Around 10,000 BC, humans began to transition from a nomadic hunter-gatherer lifestyle to settled farming communities. This marked a significant change in the relationship between humans and the environment. People began cultivating crops, domesticating animals, and creating permanent settlements. This agricultural revolution allowed for the growth of civilizations and the development of more complex social structures.

Ancient civilizations: From the ancient Egyptians and Mesopotamians to the Indus Valley and the Mayans, many primitive civilizations developed in close connection with their natural environment. They built advanced irrigation systems, built monumental structures, and exploited natural resources for their economic, religious, and cultural activities. However, in some cases, unsustainable practices such as deforestation and land degradation have led to the decline of civilizations.

Classical periods: During the classical periods of Greece, Rome, and China, human interactions with the environment became more sophisticated. These civilizations have made significant advances in architecture, engineering, and urban planning. They built aqueducts, roads, and complex sewer systems, demonstrating a growing understanding of the influence of the natural environment on public health and sanitation.

Medieval Era: The medieval period saw a combination of technological advancements and ecological challenges. The expansion of agriculture

<https://www.worldwildlife.org/threats/impacts-of-humans-on-the-environment>

Encyclopedia Britannica - Human impact on the environment:Link:

<https://www.britannica.com/science/human-impact-on-the-environment>

National Park Service - Cultural Resources and Environment:Link:

<https://www.nps.gov/subjects/culturalresources/index.htm>

led to deforestation, soil erosion, and the creation of vast feudal estates. However, it was also a time of ecological awareness, with the rise of forest conservation laws and the establishment of protected areas for hunting.

Industrial Revolution: The 18th and 19th centuries led to the Industrial Revolution, which had profound effects on the natural environment. The invention of steam power, the rise of factories, and rapid urbanization have led to increased pollution, deforestation, and resource extraction. This period marked a significant shift towards an exploitative and often unsustainable relationship with nature.

Environmental movements: In the twentieth century, as the impact of human activities on the environment became more apparent, environmental movements emerged. Concerns about pollution, habitat destruction, and species extinction have led to the formation of organizations and initiatives dedicated to conservation and sustainability. This era saw the birth of the modern environmental movement and the recognition of the need for responsible interactions with the natural environment.

Contemporary Challenges: In recent times, interactions between human civilization and the natural environment have become an urgent global problem. Climate change, deforestation, biodiversity loss and pollution pose significant challenges that require collective action. Efforts are being made to promote sustainable practices, protect ecosystems, and mitigate the impacts of human activities on the environment.

The interactions between human civilization and the natural environment have had profound environmental consequences. While humans have benefited numerous from the natural

world, such as resources for sustenance and shelter, our activities have also caused significant environmental degradation.

Some of the main **environmental consequences** of human civilization's interactions with the natural environment are:

1. **Habitat destruction and biodiversity loss:** As human populations expand, natural habitats have been deforested, fragmented, and converted for agriculture, urbanization, and infrastructure development. This process, known as habitat destruction, has resulted in the loss of countless species and a decline in global biodiversity. The destruction of forests, wetlands, and coral reefs, among other ecosystems, has disrupted intricate ecological relationships and threatened the survival of numerous plant and animal species.
2. **Deforestation:** The clearing of forests for timber, agriculture, and urban sprawl has been a significant environmental consequence of human civilization. Deforestation contributes to habitat loss, reduces carbon sequestration, increases greenhouse gas emissions, and disrupts water cycles. It also exacerbates soil erosion, alters local climates, and threatens the livelihoods of indigenous communities that depend on forest resources.
3. **Pollution:** Human activities have introduced various pollutants into the environment, resulting in water, air, and soil pollution. Industrial processes, agricultural practices, and improper waste management have released toxic substances, chemicals, and heavy metals into ecosystems, leading to contamination of water bodies and soil degradation. Air pollution from burning fossil fuels and industrial emissions has contributed to climate change, respiratory diseases, and damage to the ozone layer.
4. **Climate change:** The burning of fossil fuels, deforestation, and industrial

processes have significantly increased concentrations of greenhouse gases in the atmosphere, leading to global climate change. Rising temperatures, changing rainfall patterns, and more frequent extreme weather events are some of the consequences of human-induced climate change. These changes have serious implications for ecosystems, agriculture, water resources, and human settlements, posing risks to human well-being and biodiversity.

5. Resource depletion: Human civilization's increasing demand for natural resources, such as minerals, water, and energy, has led to resource depletion and overexploitation. Unsustainable extraction practices, such as overfishing and overgrazing, have disrupted ecosystems and depleted fish stocks and pastures. The depletion of non-renewable resources, such as fossil fuels, poses challenges for future generations and requires a transition to sustainable alternatives.
6. Loss of ecosystem services: Ecosystems provide essential services that support human well-being, including clean water supply, air purification, soil fertility, pollination, and climate regulation. Human activities have disrupted these services, leading to a decline in the availability and quality of resources needed for human survival. The loss of these ecosystem services has far-reaching implications for human health, food security, and overall ecosystem resilience.
7. Water scarcity and pollution: Increased demand for freshwater resources, along with pollution and inefficient water management practices, has led to water scarcity in many regions. Pollution from industrial and agricultural runoff, improper waste disposal, and urbanization have contaminated water bodies, making them unfit for human consumption and threatening aquatic ecosystems.

These environmental consequences highlight the urgent need for sustainable practices, conservation efforts, and environmental management. Acknowledging the interdependence between human civilization and the natural environment is critical to mitigating these impacts and preserving a healthy and sustainable planet for future generations.		
<u>Summary and Conclusion:</u> Overall, historical interactions between human civilization and the natural environment have evolved from a simple hunter-gatherer reliance to complex and often unsustainable exploitation. However, there is a growing recognition of the need to establish a more harmonious and sustainable relationship with nature to ensure the well-being of both humans and the environment.		Class Discussion

Activity	Methodology
<u>Activity:</u> Debate on environmental impact <u>Objective:</u> To engage students in a structured debate that explores the various perspectives and topics surrounding the interactions between human civilization and the natural environment. <u>Arrangement:</u> ● Divide the class into small groups of 4-5 students each. ● Assign each group a specific topic related to the theme "Interactions between Human Civilization and the Natural Environment." Some suggested topics might include deforestation, climate change, pollution, biodiversity loss, or sustainable development. ● Have each group research and prepare topics for both sides of the assigned topic. For example, if the topic is deforestation, one group might advocate for the economic benefits of deforestation, while another group might advocate for forest conservation for ecological reasons. ● Give groups enough time to conduct research, gather evidence, and prepare their arguments.	Problem-based learning Collaborative learning Cooperative Learning

• Once the research and preparation phase is complete, organize a class discussion. Assign each group a party to discuss (e.g., pros or cons), or you can allow groups to choose their preferred location. • Conduct the debate in a structured format. Each group will take turns presenting their own arguments and counter-arguments, providing supporting evidence and addressing the opposing group's points. • Encourage students to engage in respectful and constructive dialogue, listening to opposing points of view, and responding with well-reasoned arguments. • After the discussion, facilitate a class discussion to reflect on the activity. Ask students to share their thoughts on the topics presented, the effectiveness of the debate format, and any insights or new perspectives they have gained. • Conclude the activity by encouraging students to think critically about the complexity of the interactions between human civilization and the natural environment. Discuss the importance of considering multiple perspectives and the need for sustainable practices that balance human needs with environmental conservation.	

Checks	Typology
Question 1: Human civilization has had minimal impact on the natural environment throughout history. Answer: False Question 2: Deforestation is an example of human activity that can have long-term environmental consequences. Answer: True Question 3: The Industrial Revolution had no significant environmental consequences. Answer: False Question 4: Human interactions with the natural environment have had only immediate and short-term consequences. Answer: False Question 5: Climate change is a long-term environmental consequence of human actions. Answer: True Question 6: Ancient civilizations had no impact on the ecosystems and landscapes in which they lived. Answer: False	True or False Questions

Question 7: Soil erosion can lead to the collapse of agricultural societies.

Answer: True

Question 8: Urbanization has no negative environmental impacts.

Answer: False

Question 9: Human actions can lead to the extinction of plant and animal species.

Answer: True

Question 10: Human-nature interactions have remained constant and unchanged throughout history.

Answer: False

Skills acquired

1. **Critical Thinking:** Through discussions, debates, and analysis of complex environmental issues, students will improve their critical thinking skills. They will learn to evaluate different perspectives, weigh evidence, identify logical fallacies, and develop well-reasoned arguments. This expertise is key to assessing environmental challenges and proposing sustainable solutions.
2. **Communication and presentation:** Engaging in classroom debates, discussions, and presentations will help students develop effective communication skills. They will learn to articulate their thoughts, express their ideas clearly, and present their arguments persuasively. This skill is essential for expressing one's views and engaging in constructive dialogue.
3. **Environmental Literacy:** The class will promote environmental literacy by providing students with the knowledge and understanding of the interactions between human civilization and the natural environment. They will gain awareness of key concepts, historical perspectives, and current environmental challenges, enabling them to make informed decisions and take responsible action.
4. **Analytical skills:** Students will improve their analytical skills while examining the environmental consequences of human activities. They will learn to identify cause-and-effect relationships, assess the impacts of human actions on ecosystems, and analyze the interconnections between human civilization and the natural environment. This skill is critical to understanding the complexity of environmental issues.
5. **Problem-Solving:** The class will encourage students to develop problem-solving skills related to environmental challenges. They will explore sustainable solutions, assess trade-offs, and propose actions to mitigate the negative impacts of human activities on the natural environment. This expertise is essential for finding innovative and sustainable approaches to environmental issues.
6. **Empathy and perspective-taking:** Through exploring different points of view and understanding the impacts of human actions on the natural environment, students will develop empathy and perspective skills. They will learn to consider the needs and perspectives of various stakeholders, including future generations and non-human species, fostering a sense of environmental stewardship.

Lesson No. 10 – Environmental Laws and Regulations to Mitigate Climate Change

Lesson plan

Keywords: carbon pricing, renewable energy standards, emissions trading schemes, energy efficiency regulations, climate change adaptation measures

Timetable: 45 minutes lesson , 30 minutes activity, 10 minute test.

School: Two-year middle school

Objectives
● Knowledge Acquisition: Provide students with a solid understanding of the major environmental laws and regulations implemented to address climate change. This includes the introduction of concepts such as carbon pricing, renewable energy standards, emissions trading, and energy efficiency regulations. ● Global Climate Action Awareness: Familiarize students with international efforts to mitigate climate change, including major agreements such as the Paris Agreement. Help them understand the importance of these agreements in setting global climate goals and promoting international cooperation. ● Understanding policy tools: Explore the different policy tools used to mitigate climate change and their goals. Enable students to understand the mechanisms and effectiveness of various policies, such as cap-and-trade systems, carbon taxes, and renewable energy incentives. ● Socio-economic considerations: exploring the socio-economic implications of climate change policies. Discuss how these policies can affect various stakeholders, industries, and communities, and consider the opportunities and challenges of transitioning to a low-carbon economy. ● Environmental Justice Assessment: Examine the equity and justice aspects of climate change policies. Discuss how these policies can address or exacerbate existing social and economic inequalities, and encourage students to reflect on the importance of ensuring equitable and inclusive outcomes in climate mitigation efforts. ● Empowerment for Active Citizenship: Inspiring students to become informed citizens committed to climate change mitigation. Encourage them to explore ways to participate in local initiatives, advocate for effective policies, and make sustainable choices in their daily lives.

Contents	References	Methodology
<u>Introduction:</u> The implementation of environmental laws and regulations plays a crucial role in addressing the urgent challenge of climate change. As the impacts of global warming become increasingly apparent, governments around the world have recognized the need for concerted action to reduce greenhouse gas emissions, promote sustainable practices, and adapt	<u>Video:</u> Laws on climate change in the world":Link: https://www.youtube.com/watch?v=1rkNQhHpgNY "The Paris Agreement Explained": Link: https://www.youtube.com/watch?v=DA5DsxEALYE	Class Discussion Student Presentations Problem-Based Learning (PBL)

to climate change. These laws and regulations form the legal framework that guides countries, regions, and communities in their efforts to mitigate the effects of climate change. With the goal of stabilizing and ultimately reducing greenhouse gas concentrations in the atmosphere, environmental laws and regulations are designed to drive transformative change in various industries. They provide guidelines, incentives, and enforcement mechanisms to foster the transition to a low-carbon economy, reduce dependence on fossil fuels, and promote the sustainable use of resources.	"How the carbon price works":Link: https://www.youtube.com/watch?v=VbAdul2RLdo "Renewable energy explained":Link: https://www.youtube.com/watch?v=9q9a8Sz4HUw "Energy Efficiency: Policies and Practices":Link: https://www.youtube.com/watch?v=NDYrP5c74Rw	
<u>Summary of prior knowledge</u>	--	-
<u>Introducing new content</u> The environmental laws and regulations implemented to mitigate climate change can vary depending on the country and region. Some examples of commonly implemented measures are: • Renewable Portfolio Standards (RPS) or Renewable Energy Standards (RES): These policies mandate that a certain percentage of electricity production come from renewable energy sources. They incentivize the development and use of renewable energy technologies, such as solar, wind, hydropower, and geothermal. • Cap-and-trade systems: Cap-and-trade systems set a cap on greenhouse gas emissions and allocate or auction emission allowances to companies. Companies can trade these allowances, creating a market-based approach to reducing emissions. Notable examples include the European Union Emissions Trading System (EU ETS) and the Regional Greenhouse Gas Initiative (RGGI) in the northeastern United States. • Carbon pricing: Carbon pricing mechanisms involve imposing a price or tax on carbon emissions to internalise	<u>Sources:</u> United Nations Framework Convention on Climate Change (UNFCCC): Link: https://unfccc.int/ Environmental Protection Agency (EPA) - Climate Change Laws and Regulations: Link: https://www.epa.gov/climatechange/climate-change-laws-and-regulations Monitoring Climate Action: Connection: https://climateactiontracker.org/ International Energy Agency (IEA) - Policy and Measures Database: Link: https://www.iea.org/topics/climate-change-policy-measures World Resources Institute (WRI) - Climate Watch: Link: https://www.climatewatchdata.org/ International Partnership for Carbon Action (ICAP): Link: https://icapcarbonaction.com/	Class Discussion Student Presentations Problem-Based Learning (PBL)

the social cost of greenhouse gas pollution. It creates an economic incentive for companies and individuals to reduce emissions. Examples include carbon taxes, such as in Sweden and Finland, and carbon markets, such as the California Cap-and-Trade Program.

- Energy efficiency standards and building codes: Governments set energy efficiency standards for appliances, vehicles, and buildings to reduce energy consumption and associated emissions. Building codes often require the implementation of energy-efficient design and technologies in new construction or renovations.
- International agreements: Governments participate in international agreements to address climate change, such as the Paris Agreement. These agreements outline commitments to reduce greenhouse gas emissions, adapt to climate impacts, and provide financial support to developing countries.

Keep in mind that specific laws and regulations can vary significantly from one country to another and from one region to another. The examples provided are intended to illustrate common measures, but it is important to refer to each jurisdiction's specific legislation and policies for a comprehensive understanding of their efforts to mitigate climate change.

Environmental laws and regulations implemented to mitigate climate change refer to the specific legal measures and policies put in place by governments to address the challenges posed by climate change. These laws and regulations are designed to reduce greenhouse gas emissions, promote sustainable practices, and adapt to the impacts of climate change. The **main meanings and objectives** of these measures are:

Reducing greenhouse gas emissions: The main goal of these laws and regulations

is to reduce greenhouse gas emissions, such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). This is achieved through measures such as setting emission reduction targets, implementing policies to promote renewable energy sources, and regulating industrial processes and transport.

Promotion of renewable energy: Many environmental laws encourage the development and use of renewable energy sources such as solar, wind, hydroelectric, and geothermal energy. This includes providing incentives and grants for renewable energy projects, setting standards for renewables, and establishing feed-in tariffs to support the integration of renewables into the grid.

Adoption of energy efficiency measures: Governments implement regulations to improve energy efficiency in various industries, including buildings, appliances, vehicles, and industrial processes. These measures aim to reduce energy consumption and associated greenhouse gas emissions by setting efficiency standards, promoting energy-efficient technologies and encouraging energy-saving practices.

Carbon pricing and market-based mechanisms: Carbon pricing mechanisms, such as carbon taxes or cap-and-trade systems, are implemented to internalise the costs of greenhouse gas emissions. By assigning a monetary value to carbon pollution, these measures create economic incentives for companies and individuals to reduce emissions and invest in low-carbon alternatives.

Climate change adaptation: In addition to efforts to reduce emissions, environmental laws and regulations also address the need to adapt to the

impacts of climate change. These measures involve strategies to build resilience, protect vulnerable communities and ecosystems, and develop adaptation plans to cope with climate change and associated risks such as sea level rise, extreme weather events, and changes in precipitation patterns.		
<u>Summary and Conclusion:</u> The laws and regulations implemented are crucial tools in the fight against climate change, providing a legal framework and incentives for the transition to a sustainable, low-carbon future and to mitigate the environmental and socioeconomic impacts of global warming.		Class Discussion

Activity	Methodology
<u>Activity:</u> Climate Policy Simulation Game <u>Objective:</u> The goal of this activity is to engage high school students in a hands-on simulation game that allows them to understand and experience the complexities and challenges of implementing environmental laws and regulations to mitigate climate change. Through this activity, students will develop critical thinking, decision-making, and teamwork skills, exploring the trade-offs and considerations involved in climate decision-making. <u>Arrangement:</u> 1. Divide the class into small groups and assign each group a role or stakeholder in the climate policymaking process. Examples of roles might include government representatives, environmental activists, industry representatives, scientists, and community leaders. Make sure each group has a diverse mix of roles to encourage different perspectives. 2. Explain to students that they will participate in a simulation game where they will act as stakeholders involved in the creation and implementation of climate policies. Provide an overview of the game's rules and objectives. 3. Assign each group a specific climate policy or regulation to focus on. This may include policies related to carbon pricing, renewable energy, emission reduction targets, energy efficiency, or adaptation measures. Ask each group to research their assigned policy, including objectives, key provisions, potential impacts, and challenges. 4. Instruct each group to develop a strategy and action plan based on their assigned role. They should consider the interests, values, and goals of their stakeholders when crafting their positions and policy proposals.	Workshop Problem-based learning Collaborative learning Cooperative Learning

5. Conduct a mock negotiation session in which groups present their proposed policies and engage in discussions and negotiations with other groups. Encourage students to actively participate, express their points of view, and consider different perspectives. 6. Facilitate the negotiation process by ensuring that each group has the opportunity to present its policy and respond to the questions and concerns of the other groups. It encourages students to seek common ground, collaborate, and find solutions that balance various interests. 7. After the negotiation session, conduct a debriefing session where students reflect on the challenges, trade-offs, and compromises they encountered during the game. Discuss the real-world implications of proposed policies and the complexities of implementing climate policies in a diverse and interconnected world. 8. Encourage students to reflect on the lessons learned from the activity. Ask them to consider the importance of collaboration, communication, and understanding different perspectives in addressing climate change. 9. Conclude the activity with a classroom discussion about the role of young people in climate action and the potential for implementing effective environmental laws and regulations. Encourage students to think about how they can contribute to climate mitigation efforts in their lives and communities.	

Verification (one or more)	Typology
True or False Questions: Question 1: The Paris Agreement is a legally binding international treaty that aims to limit global warming to well below 2 degrees Celsius above pre-industrial levels. Answer: True Question 2: Carbon pricing mechanisms, such as carbon taxes and emissions trading schemes, create economic incentives to reduce greenhouse gas emissions. Answer: True Question 3: Renewable energy rules require a certain percentage of electricity production to come from non-renewable sources. Answer: False Question 4: Environmental laws and regulations focus solely on climate change mitigation and do not address other environmental issues. Answer: False Question 5: Adaptation measures in climate policies aim to strengthen resilience and reduce vulnerability to the impacts of climate change. Answer: True	True or False Questions

Question 6: Energy efficiency standards only apply to industrial sectors and do not affect households or individuals.

Answer: False

Question 7: Environmental laws and regulations are static and do not evolve or change over time.

Answer: False

Question 8: Cap-and-trade systems set a limit on greenhouse gas emissions and allow emissions trading between industries.

Answer: True

Question 9: Climate policies involve collaboration between governments, businesses, communities, and individuals to achieve effective and sustainable outcomes.

Answer: True

Question 10: Environmental laws and regulations to mitigate climate change do not take into account social equity and justice.

Answer: False

Skills acquired

1. **Critical Thinking:** Students will develop critical thinking skills by analyzing and evaluating the effectiveness, strengths, and weaknesses of environmental laws and regulations in addressing climate change. They will be able to assess the impact of different policy approaches and consider the complexities and trade-offs involved.
2. **Research and Analysis:** Through research and analysis of climate policies, students will improve their ability to collect and evaluate information from various sources. They will learn to assess the credibility and reliability of information, analyze data, and draw evidence-based conclusions.
3. **Communication and Presentation:** Students will develop effective communication skills by presenting their research findings, policy proposals, and arguments to their peers. They will learn to articulate complex ideas, engage in respectful discussions, and present their points of view in a coherent manner.
4. **Problem Solving and Decision Making:** Students will improve their problem-solving and decision-making skills by evaluating policy options, considering their implications, and making informed choices. They will learn to weigh different factors, weigh risks and benefits, and think critically about the potential outcomes of policy decisions.
5. **Ethical and Moral Reasoning:** Discussion of climate policies will encourage students to consider the ethical and moral dimensions of environmental laws and regulations. They will reflect on the themes of social equity, intergenerational justice and environmental responsibility, developing a deeper understanding of the ethical implications of climate change mitigation.
6. **Global Awareness and Citizenship:** Engaging with climate policies will broaden students' global awareness and understanding of international cooperation. They will recognize the interconnectedness of environmental issues, develop empathy for affected communities around the world, and understand their role as global citizens in addressing climate change.

7. Empowerment and activism: By exploring climate policies, students will gain a sense of empowerment and an awareness that their actions can make a difference. They will be encouraged to take an active role in climate action, engage in sustainable behaviors, and advocate for effective policies in their communities and beyond.

Conclusions

In reading this textbook on climate education, we explored a comprehensive and engaging educational approach to addressing one of the most pressing challenges of our time: climate change. This journey has led us through a range of teaching methodologies, guiding principles, and innovative approaches that aim to prepare students not only to understand complex climate mechanisms, but also to become active and responsible actors in promoting sustainability and climate justice.

As a lecturer, it is crucial to recognise the crucial role we play in educating future generations about the climate issue. Climate change is not just a scientific issue, but an interdisciplinary phenomenon that requires a thorough understanding of environmental science, economics, politics, sociology, and environmental morality. Our responsibility as educators is to provide students with the conceptual tools, practical skills, and social awareness needed to address this global challenge.

A crucial aspect we looked at was the use of innovative teaching methodologies, such as problem-based learning, cooperative learning, inquiry-based learning, and technology integration. These approaches have proven to be effective in engaging students in active and meaningful learning, allowing them to explore climate in depth and develop creative solutions to address climate problems.

However, our commitment to climate education should not stop there. We must be ready to adapt to new scientific discoveries, emerging challenges and technological developments. Climate education is an ongoing process, requiring a constant effort to stay informed and up-to-date.

The future of climate education is promising. Today's students are increasingly aware of climate issues and eager to make a difference. As educators, we have the opportunity to inspire and lead this new generation of environmental activists and innovators. We can prepare them to become leaders in the field of sustainability, influence climate policies, and contribute to a greener and fairer future for all.

In conclusion, climate education is much more than just a school subject; It is a vehicle for social and environmental change. With a continued commitment to pedagogical innovation and a constant focus on outreach and action, we can play a critical role in creating a more sustainable world for future generations. Our job is to educate, inspire and give hope, and we can do it with the passion and dedication that characterize our role as teachers.

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Sitography

Links to links on specific topics of the lessons can be found within each tab of the respective lessons, below are some sites of worldwide interest that concern climatology and climate education.

Euro-Mediterranean Centre on Climate Change

<https://www.cmcc.it>

Climate Literacy and Energy Awareness Network (CLEAN) - Teaching Climate and Energy Science.
(<https://cleanet.org/index.html>)

European Commission

https://climate.ec.europa.eu/eu-action/european-climate-law_it

European Commission – Climate Committee

https://climate.ec.europa.eu/eu-action/climate-strategies-targets/2030-climate-targets_it

Ecosia

<https://www.youtube.com/watch?v=eweTbEP6AE0#:~:text=URL%3A%20https%3A%2F%2Fwww,100>

Environmental Protection Agency (EPA) - Climate Change Education Resources.
(<https://www.epa.gov/students/lesson-plans-teacher-guides-and-online-environmental-resources-educators>)

European Environment Agency

<https://www.eea.europa.eu/it/articles/l2019adattamento-ai-cambiamenti-climatici-e>

NASA Climate Kids. (<https://climatekids.nasa.gov/>)

National Oceanic and Atmospheric Administration (NOAA) Climate Education.
(<https://www.climate.gov/teaching>)

National Geographic Education - Climate Change Resources.
(<https://www.nationalgeographic.org/education/topics/climate-change/>)

National Center for Science Education (NCSE) - Climate Change Education.
(<https://ncse.ngo/climate-change-education>)

National Aeronautics and Space Administration (NASA) - Climate Resources for Educators.
(<https://www.nasa.gov/content/climate-resources-for-educators>)

Climate network

<https://www.reteclima.it/download-materiali-didattici/>

TeachClimateScience.org - Resources for Teaching Climate Science.
(<https://teachclimatescience.org/>)

United Nations Educational, Scientific and Cultural Organization (UNESCO) - Climate Change Education. (<https://en.unesco.org/themes/climate-change-education>)

Yale Program on Climate Change Communication - Climate Change Education.
(<https://climatecommunication.yale.edu/>)