Neutral Schools

EDUCATION AND TEACHERS FACING THE CLIMATE CHANGE

Innovation and school action for a Carbon neutral future

PERMANENT TRAINING PLAN FOR TEACHERS (R3.1)

Neutral Schools

NEUTRAL SCHOOLS
Innovation and school action for a Carbon neutral future
ERASMUS+ Project: 2022-1-ES01-KA220-SCH-000088781

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Permanent Training Plan for Teachers "NEUTRAL SCHOOLS"

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Permanent Training Plan for Teachers "NEUTRAL SCHOOLS"

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1. INTRODUCTION

Climate change is one of the most pressing issues of our time, and it's essential for educators to play a crucial role in raising awareness and promoting action among their students. The eco-energy transition is a critical aspect of addressing climate change, as it involves transitioning to renewable energy sources and reducing carbon emissions.

This Result provides a framework for the educational authorities, training centers and institutions responsible for teachers' lifelong training in order to support them with resources, programs and tools useful in providing adequate teacher training and updating in the areas of the climate challenge, and thus facilitating the integration of climate change and eco-energy transition into their classes, along with suggested methodologies and implementation rules.

The continuous training of teachers through different training actions aimed at improving their scientific, technical, didactic and professional preparation is necessary in all areas, including, of course, all the new strategies for combating, adapting to and mitigating climate change, given the magnitude of the issue and the speed at which the technologies for responding to it are evolving.

This plan proposes the general framework for developing an appropriate continuous teacher training plan for an active contribution of the education system to the eco-energy transition needed for a carbon neutral future.

It is necessary to support permanent training of teachers in competencies to face the new approaches to the climate challenge which must be introduced in primary and secondary education at the European level, as a work area with the iSTEAM approach. That is why the methodological aspects, as vital for permanent teachers' training, have been also considered an important part of this plan.

This material complements the rest of the outputs of the project, all of them resulting from the transnational cooperation on the elaboration of the contents, which will facilitate its transferability at a European level and its applicability to the study of the climate challenge from multiple perspectives and with an innovative and collaborative approach.

2. OBJECTIVES OF THE PERMANENT TRAINING PLAN FOR TEACHERS

The general objective of this document is to provide a plan for continuous training of teachers, principals and educational staff in order to support their professional development, with the following specific objectives:

- Equip teachers with a comprehensive understanding of the science behind climate change, its impacts, and the latest principles and technologies to respond through the eco-energy transition, enabling them to accurately convey this information to their students and enhance awareness of the climate challenge.
- Provide teachers with practical strategies and skills in sustainable teaching practices to integrate sustainability and climate literacy into their curriculum, promoting an interdisciplinary approach that encompasses science, technology, engineering, arts, and mathematics (iSTEAM).
- Encourage teachers to develop and implement teaching methodologies that cultivate critical thinking, problem-solving, and innovative thinking in students, preparing them to address climate-related challenges and participate in the eco-energy transition.
- Provide a plan to train teachers to promote awareness and be advocates for climate action and eco-energy transition within their schools and communities, fostering a culture of environmental governance and proactive engagement among students and other stakeholders.
- Ensure teachers are proficient in using the latest educational technologies, digital tools, and resources to effectively teach climate change and eco-energy transition topics, making learning interactive and engaging.
- Create opportunities for continuous professional development and collaborative learning among teachers, enabling them to share best practices, resources, and innovative teaching strategies related to climate education.
- Develop and implement effective assessment and evaluation strategies to monitor and enhance the effectiveness of climate change and eco-energy transition education, ensuring that learning outcomes are met and continuously improved upon.

3. THEMATIC AREAS RECOMMENDED FOR THE PERMANENT TRAINING OF TEACHERS. GENERAL PROGRAM

This Result aims to provide a lifelong learning program that covers the different topics on which teachers need to keep up to date given the complexity and variety of aspects and issues that converge around the climate challenge and the rapidly evolving technological and policy responses to the ecological and environmental transition required.

Teacher training must be in line with the evolution of both science and didactics, so this document includes in the proposed content program both aspects for an adequate continuous teacher training in the area of the climate challenge and the didactic methodologies that are proposed from the NEUTRAL-SCHOOLS project as the most appropriate for tackling it in the classroom.

3.1. Scientific Update Content

Below is a list of scientific, technical and environmental topics and the reasons for the interest in each of them.

1. THE ENVIRONMENTAL AND CLIMATE CRISIS:

- *SUSTAINABLE DEVELOPMENT*
- *ENVIRONMENTAL AND CLIMATE CRISIS*
- *AGENDA 2030. THE UN SUSTAINABLE DEVELOPMENT GOALS (SDGS)*

More and more frequently, the concepts of environmental and climate crisis appear as a call for attention and awareness about the environmental situation of our planet and the consequences of climate change. Scientists indicate human activity as the most important cause for the worrying situation we are experiencing today. They reinforce the emergency of the fighting against global warming once climate change affects the environment, health, and the economy globally.

In response to this awareness of the urgency in resolving this crisis, there are different initiatives. One of the most relevant ones is the 2030 Agenda and the SDGs of the UN, proposing urgent measures that involve education and the need for measures at a political level. Each of the 17 SDGs focuses on a theme and can be divided into four main areas: social, environmental, economic and institutional, relating to global actions that can somehow implement the SDGs.

Teacher training aimed at improving their scientific preparation and their knowledge of the evolution of new global strategies to combat, adapt to and mitigate this situation is important, in order to be able to reflect and understand the global framework of social, political, economic, environmental and institutional interrelationships.

2. CLIMATE CHANGE: ORIGIN, CONSEQUENCES AND SOLUTIONS:

- *CAUSES OF CLIMATE CHANGE AND GLOBAL WARMING*
- *GREENHOUSE EFFECT*
- *SOURCES OF GREENHOUSE GAS EMISSIONS*
- *ENVIRONMENTAL, SOCIAL AND ECONOMIC CONSEQUENCES OF THE CLIMATE CRISIS*
- *THE ENERGY CRISIS. ENERGY SECURITY AND POVERTY*
- *INSTITUTIONAL CONTEXT OF THE FIGHT AGAINST CLIMATE CHANGE AT INTERNATIONAL AND EUROPEAN LEVELS*
- *7TH SDG (CLEAN ENERGY) AND 13TH SDG (CLIMATE ACTION)*
- *CLIMATE CHANGE MITIGATION AND ADAPTATION STRATEGIES*
- *CARBON SINKS AND CARBON CAPTURE AND STORAGE TECHNOLOGIES*

Climate change is undoubtedly one of the greatest challenges that humanity will face during this century. The obvious difficulties in achieving a global and effective policy response derive from the multi-causality of the problem and the importance of aspects related to the dominant system of production and consumption, especially from the most advanced societies.

It is vital to educate to face, from an eco-social and global approach, the challenge that the climatic and energy crisis represents for today's societies and to raise awareness of the repercussions it will have for future generations.

Teachers should know the institutional context of the fight against climate change at international and European levels, and keep up to date with new climate action, mitigation and adaptation strategies and technological solutions such as the Carbon sinks and carbon capture and storage technologies, among others.

3. THE ECOLOGICAL & ENERGY TRANSITION. TOWARDS THE CLIMATE NEUTRALITY:

- *CLIMATE SUMMITS*
- *The Kyoto Agreement as a predecessor to the Paris Agreement*
- *The Paris Agreement and its main objective*
- *Chronology of the Paris Agreement and COPs*
- *EUROPEAN POLITICS, STRATEGIES AND REGULATIONS*

-THE EUROPEAN GREEN DEAL

- *Objectives and benefits*

- *The main measures of the European Green Deal:*
  - *Construction of a new economic model*
  - *Transition to more ecological mobility based on clean, accessible, and affordable transport*
  - *European industry based on non-polluting technologies and products*
  - *Increasing the shares of energy use from non-polluting sources and improve energy efficiency*
  - *Renovation of homes and buildings, allowing to energy saving and guaranteeing protection against extreme temperatures and fighting energy poverty*
  - *Using natural resources sustainably*
  - *Boosting climate action globally*
- *The European Ecological Pact: a fundamental instrument for carbon neutrality*
- *The Directorate-General for Climate Action: mission and responsibility*
- *CLIMATE NEUTRALITY. EU CLIMATE CHANGE CHALLENGE 2050*
- *What is climate neutrality?*
- *What Carbon neutrality 2050 consists of?*
- *How to achieve carbon neutrality*
- *CLIMATE DENIALISM (denial of the phenomenon of human responsibility, of the risks involved, of the need to act)*

The European Union has always been at the forefront in implementing measures to fight against global warming, either through a set of actions translated into the European Green Deal, a roadmap to achieve carbon neutrality in 2050, or through financing for non-EU countries with lower economic development allowing them to implement climate action measures and the implementation of the Paris Agreement.

It is interesting for teachers to know the general framework of ecological and energy transition and climate neutrality so that they can train and encourage responsible behavior in pupils to prevent climate change as well as the action of pupils within their family or community as real agents promoting climate change through active citizenship.

4. RENEWABLE ENERGIES AND CLEAN ENERGIES

- *CONCEPTS. DIFFERENCE BETWEEN RENEWABLE ENERGIES AND CLEAN ENERGIES*
- *ANALYSIS OF RENEWABLE AND CLEAN ENERGIES*
  - *Solar energy: photovoltaic and thermal*
  - *Wind energy*
  - *Bioenergy (biomass, biogas, biofuels)*
  - *Hydroelectric energy*
  - *Geothermal energy*
  - *Sea energies (tides, waves, currents, ocean thermal gradient)*
  - *Hydrogen energy*
- *COMPARATIVE ANALYSIS WITH OTHER ENERGIES*
  - *Nuclear: fission and fusion*
  - *Cogeneration*
  - *Gas*
  - *Coal*

The field of new, cleaner and renewable energy sources is constantly evolving, which is why it is important to update and train teachers in these areas, which are so essential for the fight against climate change.

Integrating renewable and clean energy topics into teachers' training is crucial for equipping them with the knowledge and skills needed for promoting environmental responsibility, interdisciplinary learning and incorporating these topics into primary and secondary school curricula, which is essential to prepare students for the eco-energy transitions to achieve a climate-neutral and more sustainable future.

Additionally, the inclusion of renewable energy education supports interdisciplinary learning, provides a holistic understanding of the global energy landscape, enhances critical thinking, problem-solving, and analytical skills, equipping with the tools to address complex global challenges, and developing a foundational knowledge that can inspire interest in careers in science, technology, engineering, and mathematics (STEM), which are vital for advancing clean energy innovations.

5. ENERGY SAVINGS AND ENERGY EFFICIENCY

- *CONCEPTS AND CO2 EMISSIONS SAVING*
- *ENERGY SAVINGS, ITS BENEFITS FOR SOCIETY AND INDIVIDUAL*
- *ENERGY EFFICIENCY, ITS IMPORTANCE FOR A BETTER SOCIETY AND FUTURE:*
  - *Methods and Tools*
  - *Economic and environmental benefits*
- *ENERGY LABELS, HOW IT WORKS AND HOW THEY HELP IMPROVE ENERGY SAVINGS AND ENERGY EFFICIENCY MEASUREMENT*
  - *Energy audits*
  - *Home appliances*
  - *Home automation*
- *ENERGY MARKETS*
  - *Taxes: free market. Regulated market*
  - *European market*
  - *Production and control of energy*
- *IMPACT IN CLIMATE CHANGE*
  - *Future policies*

Continuous learning about the latest developments in energy efficiency technologies will foster adaptability to new innovations and emerging trends in the field.

Understanding the technical aspects of energy saving devices, energy efficiency systems and energy conservation technologies will help teachers develop the ability to identify energy-related problems, think critically and devise effective strategies to address energy inefficiencies.

In addition, teachers should be familiar with policies, regulations and incentives related to energy efficiency and energy conservation.

6. ENERGY EFFICIENT BUILDINGS

- *ENERGY EFFICIENCY IN BUILDING DESIGN AND CONSTRUCTION, ITS IMPORTANCE FOR A BETTER SOCIETY AND FUTURE AND THEIR ECONOMIC AND ENVIRONMENTAL BENEFITS*
  - *Energy efficiency buildings concept*
  - *Importance of energy efficiency for sustainable and environmentally friendly buildings*
- *IMPORTANCE OF THE BUILDING ENVELOPE OPTIMIZATION:*
  - *Strategies for optimizing the building envelope to minimize heat transfer and improve insulation*
  - *Introduction to the materials and technologies that enhance the thermal performance of walls, roofs, and windows*
- *ADVANTAGES OF THE INTEGRATION OF RENEWABLE ENERGY SOURCES*
- *ROLE OF SMART BUILDING TECHNOLOGIES IN ENHANCING ENERGY EFFICIENCY (smart thermostats, energy-efficient lighting systems, and automated energy management)*
- *ENERGY-EFFICIENT HVAC SYSTEMS*

Energy-efficient heating, ventilation, and air conditioning (HVAC) systems

- *LIFE CYCLE ANALYSIS AS A TOOL TO ASSESS THE ENVIRONMENTAL IMPACT OF BUILDING MATERIALS, CONSTRUCTION METHODS, AND ENERGY SYSTEMS*
- *ENERGY AUDITING AND BENCHMARKING:*

Methods for conducting energy audits to identify areas for improvement in existing buildings

- *ENERGY DISTRICTS*

Definition and basics. How energy districts are beneficial for energy saving and efficiency.

For trainers, it is important to understand energy efficiency concepts in the context of building design and construction and the importance of introducing materials and technologies that enhance the thermal performance of walls, roofs, and windows. Knowing the existing technologies of energy efficiency for sustainable and environmentally friendly buildings makes teachers to be able to develop awareness related to the importance of the efficient building, the envelope optimization and the benefits and challenges associated with integrating renewable energy into building infrastructure.

It is also important being informed about the smart building technologies (smart thermostats, energy-efficient lighting systems, and automated energy management), let know the Energy-Efficient HVAC Systems (energy-efficient heating, ventilation, and air conditioning) and the Energy Districts and how they are beneficial for energy saving and efficiency.

7. ENERGY EFFICIENT CITIES AND TRANSPORT

- *SUSTAINABLE MOBILITY:*
  - *Basic concepts of sustainable mobility in the context of cities*
- *SMART CITIES:*
  - *Concept and examples*
  - *Tools and services needed in a Smart City*
- *ELECTRIC VEHICLES:*
  - *Basic of how electric vehicles work*
  - *Future, present and past*
  - *Analyze the benefits and challenges associated with electrical vehicles in our society*
  - *Contamination reduction and carbon footprint*
- *COLLECTIVE TRANSPORT*
  - *Tools for daily contribution to reduce CO2*
  - *Importance of bikeways*
  - *Improvement of live quality*
- *BIKEWAY DESIGN AND PEDESTRIAN-FRIENDLY INFRASTRUCTURE*
  - *Benefit and importance*
  - *Urban design and planning*
- *DIRECT IMPACT OF ENERGY EFFICIENCY AND SUSTAINABLE MOBILITY ON CO2 REDUCTION AND FIGHT AGAINST CLIMATE CHANGE*

It is important to understand the principles of sustainable mobility and explore how intelligent technologies can enhance transportation efficiency while minimizing environmental impact. Explore real-world examples and the potential impact on urban living, explore the shift towards electric vehicles (EVs) and other sustainable transportation modes. Learn about the benefits, challenges, and innovations in electric mobility, examine urban planning strategies that prioritize efficiency, sustainability, and the well-being of residents. Discover how thoughtful design can address issues such as traffic congestion, pollution, and resource consumption, investigate the role of collective transport systems, including buses, subways, and shared mobility services. Understand how these systems contribute to reducing individual car usage and improving overall urban mobility and explore the importance of bikeways and pedestrian-friendly infrastructure in creating accessible, healthy, and environmentally friendly urban spaces. Learn about design principles that prioritize non-motorized modes of transportation.

8. CIRCULAR ECONOMY

- *CIRCULAR ECONOMY PRINCIPLES AND THEIR SIGNIFICANCE*
- *TYPES OF WASTE AND THEIR POTENTIAL FOR REINTRODUCTION INTO THE ECONOMIC CIRCUIT*
- *THE 5 R'S OF CIRCULAR ECONOMY: WASTES BECOME RESOURCES:*
  - *Reintroduction into the economic circuit*
  - *Re-use*
  - *Repair: second life for damaged products*
  - *Recycling*
  - *Revalorization: energetic use of wastes*
  - *Reduction*
- *ECONOMY OF FUNCTIONALITY*
- *ECO-DESIGN. Integration into the design of environmental impacts throughout the life cycle of a product*
- *THE IMPACT OF RAW MATERIALS*

Incorporating circular economy concepts into the continuous training of teachers of primary and secondary school is crucial for several compelling educational reasons. Firstly, a deeply understanding of the principles of a circular economy helps them to foster environmental stewardship and social responsibility, to empower students to adopt sustainable behaviors in their daily lives and to advocate for more sustainable practices within their communities, contributing to a climate-neutral and more sustainable future.

Additionally, the circular economy aligns with contemporary educational goals of fostering innovation and entrepreneurship. By learning about sustainable business models and the circular design principles, teachers can make it easier for students to understand and develop innovative solutions to real-world problems, potentially leading to new economic opportunities and careers in green industries.

In conclusion, including circular economy topics in primary and secondary education is essential for preparing future generations to lead in a climate-neutral and sustainable world.

9. BIOECONOMY AND GREEN ECONOMY

- *SUSTAINABLE USE OF NATURAL RESOURCES*
- *IMPORTANCE OF THE CONSERVATION OF FORESTS AND BIODIVERSITY. - 14TH AND 15TH SDGS (CONSERVATION OF UNDERWATER LIFE AND TERRESTRIAL ECOSYSTEMS)*
- *AGRICULTURE AND HEALTHY FOOD SYSTEM FOR PEOPLE AND PLANET ("FARM TO FORK" STRATEGY)*

As we strive towards a climate-neutral and more sustainable future, understanding the principles of a green economy and sustainable resource management is crucial. Additionally, bioeconomy topics, which focus on the use of renewable biological resources and sustainable agricultural practices, are integral to developing solutions for food security, health, and environmental sustainability.

Integrating green economy and bioeconomy topics into the teachers' training will allow them to support interdisciplinary learning, since these subjects intersect with various academic disciplines such as biology, chemistry, economics, and social studies. This awareness is critical for cultivating a generation that values and actively participates in creating a sustainable future.

10. THE CARBON FOOTPRINT

- *CONCEPTS AND TYPES (ECOLOGICAL, WATER & CARBON FOOTPRINTS)*
- *CARBON FOOTPRINT AS A TOOL TO SUPPORT SUSTAINABILITY IN THE FACE OF CLIMATE CHANGE*
- *EMISSIONS RELATED TO OUR ONLINE ACTIVITY AND USE OF THE INTERNET. THEIR CARBON FOOTPRINT*
- *CALCULATION OF THE CARBON FOOTPRINT*
- *GOOD PRACTICES TO REDUCE OUR FOOTPRINTS*

In order for teachers to fulfil the dual mission of achieving carbon neutrality in European schools and leading collective efforts to reduce greenhouse gas emissions, they need to be adequately trained in the concept of the Carbon Footprint, the complexity of its calculation in the different possible settings, and the areas of human activity, including our online activity, that contribute most to our Carbon Footprint as a step towards correcting it.

The same applies to ecological or water footprints and awareness of the serious ecological and environmental consequences of all our activities and the need for individual and collective contributions to reduce our footprint.

An important part of our daily activities is digital. We spend more and more time connected to the internet through different applications. Although digitalization means a reduction in pollutant emissions, digital consumption also has a significant ecological impact. Internet use and all the data we generate as we move online are stored in a physical place: data centers, which need enormous amounts of energy to function and not become overloaded. The digital servers and supercomputers that allow us to be constantly connected, run non-stop. There are many small habits we can change or be aware of to reduce our digital carbon footprint and this is a new area in which teachers are often not trained.

11. SUSTAINABLE, FAIR AND RESPONSIBLE CONSUMPTION AND LIFESTYLE

- *EFFICIENT USE OF WATER AND ENERGY*
- *PREVENTION OF WASTE PRODUCTION. CONTRIBUTION TO THE WASTE REUSING AND RECYCLING*
- *RESPONSIBLE PURCHASING AND VALUING SUSTAINABLE PRODUCTION*
- *SAFE, HEALTHY AND SUSTAINABLE MOBILITY*

The importance of educating in sustainable lifestyles and consumption, and also fair consumption models (taking into account the environmental consequences and ensuring the integral development of all peoples, with economic, social and environmental sustainability) makes it necessary to keep teacher training up to date in these areas as well.

The solutions to mitigate climate change do not depend only on decisions and plans made by governments and institutions or on technological advances, but also fundamentally depend on changing the modes of production, consumption habits and lifestyles that dominate the most advanced societies. A forceful and effective response to the challenge of climate change requires a social change that reduces dependence on fossil fuels and questions the consumerist and development models that advocate unlimited growth.

12. RESPONSIBLE LEISURE AND SUSTAINABLE TOURISM

- *RESPONSIBLE LEISURE*
- *SUSTAINABLE TOURISM ACTIVITIES AND FACILITIES*

This project also recommends training to familiarize teachers with the concept of sustainable tourism and the reflexive analysis of the carbon footprint of tourism, sports, cultural, entertainment and leisure activities and the choice and implementation of habits that contribute to preventing, correcting, mitigating and adapting to climate change.

It is possible to contribute to the mitigation of climate change and the achievement of a more sustainable, just and peaceful world through our habits during leisure and tourism activities.

13. BALANCED AND SUSTAINABLE FOOD

- *LABELLING OF FOOD PRODUCTS*
- *FOOD MENUS WITH A LOW ENVIRONMENTAL AND CARBON FOOTPRINT*
- *IMPORTANCE OF PROXIMITY AND BULK FOODSTUFFS*
- *CONCEPTS OF "FARM-TO-FORK", "ZERO-KILOMETER FOODS", AND LOCALLY SOURCED FOODS*
- *NOVA CLASSIFICATION OF FOODSTUFFS AND PROCESSING LEVELS*

Environmental awareness and informed decision-making should be encouraged in relation to the following key aspects:

- Food labeling, which enables an understanding of the environmental and nutritional impact.
- Diets with low Environmental and Carbon Footprint: Certain dietary patterns can be more sustainable; it's important to incorporate more plant-based foods and reduce the consumption of animal products.
- Importance of local and bulk foods: Understanding the origin of foods and choosing local and bulk products not only supports the local economy but also reduces the environmental footprint associated with the transportation of foods over long distances.
- NOVA Classification of Food Products and Processing Levels: degree of processing in consumed foods, understanding the direct impact on sustainability and health.

3.2. Didactic Update Content

Below is a list of USEFUL EDUCATIONAL APROACHES & METHODOLOGIES we recommend for or the updating and training of teachers and the reasons for the interest in each of them.

1. **SCHOOLS IN ACTION:** Context and importance of the action. It is important for schools to address the climate crisis for several key reasons:

   Education and Awareness: Schools play a vital role in educating young people about the causes, effects, and solutions to the climate crisis. By integrating climate education into the curriculum, students become more informed and aware of the environmental challenges we face.

   Empowering Future Leaders: Educating students about the climate crisis empowers them to become informed citizens and future leaders who can advocate for and implement sustainable practices. This prepares them to take active roles in addressing environmental issues in their communities and beyond.

Developing Critical Skills: Understanding the climate crisis involves critical thinking, problem-solving, and scientific literacy. These skills are essential for students to navigate the complexities of the modern world and to contribute meaningfully to solving global problems.

Promoting Sustainable Practices: Schools can model and teach sustainable practices, such as energy conservation, waste reduction, and sustainable transportation. By implementing these practices, schools not only reduce their own environmental impact but also teach students how to live sustainably.

Community Engagement: Schools are central to communities and can influence local attitudes and behaviors toward the environment. Engaging students in climate action projects can extend these efforts to their families and the broader community, creating a ripple effect of positive change.

Addressing Equity: The climate crisis disproportionately affects marginalized communities. Educating students about environmental justice helps them understand the social dimensions of climate change and prepares them to advocate for equitable solutions.

Innovation and Solutions: Schools are incubators for innovation. By encouraging students to think creatively about climate solutions, schools can contribute to the development of new technologies, policies, and practices that mitigate climate change.

Meeting Global Goals: Education is critical to achieving global sustainability goals, such as the United Nations' Sustainable Development Goals (SDGs). Specifically, Goal 13 focuses on taking urgent action to combat climate change and its impacts. Schools play a key role in achieving this goal through education and action.

By addressing the climate crisis, schools help create a generation of informed, responsible, and proactive individuals who are equipped to tackle one of the most pressing issues of our time.

2. **SERVICE-LEARNING METHOD (SLM):** with project-based learning. The goal is to develop students' critical thinking, problem-solving, and leadership skills while making a positive impact on the community. SLM involves identifying a community need, designing a project to address that need, and implementing the project while reflecting on the learning process.

3. **THE INTEGRATED I-STEAM APPROACH:** that combines traditional STEAM subjects (Science, Technology, Engineering, Arts, and Math) with digital tools and online learning. A teaching approach that integrates technology and digital tools into traditional STEAM subjects to create a more engaging and interactive learning experience.

4. **FLIPPED CLASSROOM APPROACH:** Start by introducing the concept of climate change and eco-energy transition through online resources, videos, or interactive simulations. This will help students gain a basic understanding of the topic before in-class discussions.

5. **CASE STUDIES:** Use real-life case studies to illustrate the impact of climate change and the benefits of eco-energy transition. For example, you can discuss the effects of rising sea levels on coastal communities or the success stories of renewable energy projects.

6. **ROLE-PLAYING:** Assign students different roles (e.g., policymakers, business leaders, or community members) and have them debate and discuss the pros and cons of different energy sources.

7. **HANDS-ON ACTIVITIES:** Conduct hands-on activities such as building model wind turbines, designing energy-efficient homes, or creating posters promoting eco-friendly behaviors.

8. **STUDY VISITS – FIELD TRIPS** – Organize study visits or field trips to see *in loco* the situations/problems/crisis/organizations that are dealt with in class and that through observation may lead to action, being it at problem solving or decision-making level.

9. **GUEST SPEAKERS:** Invite guest speakers from local organizations or businesses that specialize in renewable energy or sustainability to share their experiences and insights.

4. RECOMMENDED TRAINING MODALITIES AND DURATION OF TEACHER TRAINING ACTIVITIES

There are many different formats of training activities that can be developed, among which we can highlight the following:

- **Courses**: programmed to contribute to the updating of teachers' knowledge. They must be taught by specialists.
- **Seminars**: these may be proposed by the teachers themselves in order to study in depth educational issues of a specific discipline or its didactics
- **Working groups**: these arise from the initiative of teachers to develop curricular materials. They must be coordinated by one of their members and must present a report reflecting the work carried out.
- **In-school training projects**: training activities focused on the school itself and its context in order to promote educational innovation and the improvement of the school itself. They must be evaluated, for example by means of a report drawn up by the person who coordinates and dynamizes the group.
- **Educational innovation and research projects** focused on the enhancement of digital and other competences
- **Conferences and meetings**
- **Workshops**
- **Training stays**

The training activities can be delivered face-to-face, online or blended.

Their duration should be according to each institution or kind of action and must be justified with a report or other type of individual or group work.

5. CHARACTERISTICS AND PRINCIPLES OF THE TRAINING PLAN

- **Enhance accurate knowledge of Climate Science and Eco-Energy transition technologies, innovations, politics and regulations** in order to equip teachers with a comprehensive understanding of the background behind climate change, its impacts, and the principles of eco-energy transition, enabling them to accurately convey this information to their students.
- **Develop skills in sustainable teaching practices**: Provide teachers with practical strategies for integrating sustainability and climate literacy into their curriculum, promoting an interdisciplinary approach that encompasses science, technology, engineering, arts, and mathematics (iSTEAM).
- **Foster critical thinking and problem-solving**: Encourage teachers to develop and implement teaching methodologies that cultivate critical thinking, problem-solving, and innovative thinking in students, preparing them to address climate-related challenges and participate in the eco-energy transition.
- **Promote awareness and advocacy for climate action** and eco-energy transition within their schools and communities, fostering a culture of environmental governance and proactive engagement among students and other stakeholders.
- **Utilize innovative and active educational methodologies** to effectively teach climate change and eco-energy transition topics, making learning interactive and engaging.
- **Integrate the use of modern educational resources and tools**: Ensure teachers are proficient in using the latest educational technologies, digital tools, and resources.
- **Support professional development and collaboration**: Create opportunities for continuous professional development and collaborative learning among teachers, enabling them to share best practices, resources, and innovative teaching strategies related to climate education.
- **Integrate the implementation of effective innovative assessment and evaluation strategies** to monitor and enhance the effectiveness of climate change and eco-energy transition education, ensuring that learning outcomes are met and continuously improved upon.

6. IDEAS TO MOTIVATE CONTINUOUS TRAINING OF TEACHERS

- Emphasize the importance of self-improvement
- Be updated with new techniques and research
- Engage in eTwinning and Erasmus+ projects
- Arrange meetings and conferences to share experiences
- Allow collaborative projects
- Raise awareness for the continuous change of the world of education
- Commit to a permanent growth mindset
- Be exposed to new challenges
- Nurture passions and curiosity

7. USEFUL EDUCATIONAL RESOURCES

- Curriculum
- Methodological guide
- Books
- Internet
- Games
- Platforms (ONLINE COURSES)- (Teacher communities – forums)
- Apps (iNaturalist)
- AI
- Collaboration with a University

Here are some useful educational resources specifically designed for teachers to work with children on climate change topics:

- NASA Climate Kids Website: NASA Climate Kids Offers interactive games, activities, articles, and videos aimed at younger students to make learning about climate science fun and engaging.
- National Geographic Kids: Website: National Geographic Kids Climate Features articles, videos, and activities designed to teach children about climate change and the environment in an accessible way.
- SciShow Kids: YouTube Channel: SciShow Kids. Provides educational videos on a wide range of science topics, including climate change, presented in an engaging and kid-friendly manner.

- The Kid Should See This: Website: The Kid Should See This Curates a collection of educational videos on climate change and environmental topics suitable for children.
- PBS KIDS: Website: PBS KIDS Climate Change. Offers games, videos, and activities featuring popular PBS KIDS characters that teach children about the environment and climate change.
- WWF Wild Classroom: Website: WWF Wild Classroom. Provides curriculum materials, activity guides, and videos focused on wildlife conservation and climate change, tailored for young learners.
- Eco-Schools USA: Website: Eco-Schools USA. Offers a range of resources and programs to help schools implement environmental education and sustainability projects, including lesson plans and activities for children.
- Earth Rangers: Website: Earth Rangers. An engaging platform with activities, missions, and educational content aimed at children to teach them about wildlife conservation and climate action.
- Children's Environmental Literacy Foundation (CELF): Website: CELF Resources. Provides lesson plans, workshops, and tools for teachers to integrate environmental literacy into the classroom.
- Project Learning Tree (PLT): Website: PLT Green Schools. Offers hands-on activities and lesson plans focused on trees, forests, and the environment, with specific materials for younger students.
- These resources are designed to make learning about climate change and the environment accessible and engaging for children, helping teachers to foster an early appreciation for sustainability and environmental stewardship

8. INCORPORATING CLIMATE CHANGE AND ECO-ENERGY TRANSITION INTO CLASSES. SOME METHODOLOGIES AND IMPLEMENTATION RULES

Learning objectives

- Understand the causes and impacts of climate change
- Identify the role of human activities in contributing to climate change
- Recognize the importance of eco-energy transition in mitigating climate change
- Develop critical thinking skills to evaluate energy sources and their environmental impact
- Create a plan to reduce personal carbon footprint

Implementation Rules

1. Create a Collaborative Learning Environment: Encourage students to work together to share knowledge, ideas, and perspectives.
2. Use Authentic Materials: Utilize real-world data, news articles, and primary sources to make the learning experience more authentic.
3. Emphasize Critical Thinking: Encourage students to think critically about the information they gather and evaluate the pros and cons of different energy sources.
4. Make it Relevant: Connect the learning experience to students' daily lives and personal experiences.
5. Incorporate Technology: Utilize digital tools, apps, and games to engage students and make learning fun.

Activities

Here are some sample topics - activities that incorporate the methodologies and implementation rules:

Topic 1: Introduction to Climate Change

Flipped classroom approach: (have an intention) Show a video on climate change causes and impacts

Case study: Discuss the effects of rising sea levels on coastal communities

Hands-on activity: Have students create a timeline of major climate-related events

Topic 2: Energy Sources

Role-playing: Assign students different roles and have them debate the pros and cons of different energy sources

Guest speaker: Invite a representative from a local renewable energy company to share their experiences

Hands-on activity: Have students design an energy-efficient home

Topic 3: Eco-Energy Transition

Case study: Discuss successful eco-energy transition projects around the world

Flipped classroom approach: Show a video on renewable energy technologies

Hands-on activity: Have students build model wind turbines or solar panels

Topic 4: Carbon Footprint Reduction

Guest speaker: Invite a representative from a local organization that promotes sustainable living

Role-playing: Assign students different roles and have them discuss ways to reduce carbon footprint

Hands-on activity: Have students create a plan to reduce their own carbon footprint

Topic 5: The importance of the energy efficiency

Energy Detective: Have students become “energy detectives” by going on a scavenger hunt around the classroom or school to find items that use energy (lights, computers, etc.). They can list ways to use these items more efficiently.

Energy Savings Chart: Create a chart with pictures of everyday appliances. Students can estimate how much energy each appliance uses and discuss simple actions (like turning off lights) to save energy.

Story Time: Read a story or watch a video about a character who learns to save energy (like turning off the TV when not in use). Discuss the character’s actions and relate them to students’ own habits.

Topic 6. Energy efficient buildings and cities

Dream Green City: Have students draw or build a model of their “dream green city,” incorporating energy-efficient buildings, parks, and transportation. They can present their creations and explain how their designs save energy.

Building Bingo: Create bingo cards with different features of energy-efficient buildings (like solar panels, green roofs, etc.). Students can go on a walk around the school or neighborhood to find these features.

Classroom Renovation: Discuss how the classroom could be made more energy efficient. Brainstorm ideas and create a poster showcasing their suggestions, like using natural light or recycling bins.

Topic 7: The sustainable mobility

Transport Show-and-Tell: Ask students to bring in toy cars, bikes, or pictures of various modes of transportation. Discuss which ones are eco-friendly and why.

Walk or Bike Day: Organize a “Walk or Bike to School” day and encourage students to share their experiences. Create a chart to track how many students participated.

Transportation Map: Have students draw a map of their neighborhood, marking safe walking or biking paths. Discuss the benefits of walking and biking for health and the environment.

Topic 8. Circular economy

Recycling Relay Race: Set up a relay race where students sort recyclable materials into the correct bins. Discuss the importance of recycling and how it helps the environment.

Crafts from Recyclables: Have students bring in recyclable materials (like bottles and cardboard) and create art projects, highlighting the concept of reusing items instead of throwing them away.

Story of Stuff: Read a simplified version of "The Story of Stuff," explaining how products are made and what happens to them after use. Discuss ways to reduce waste.

Topic 9. Sustainable, fair and responsible consumption and lifestyle for the Eco-Energy transition

Sustainable Choices Game: Create a board game where students must make choices about buying items, learning which choices are more sustainable (e.g., buying local produce vs. imported).

Fair Trade Treasure Hunt: Teach students about fair trade products and organize a treasure hunt where they find examples around the classroom or school (e.g., labels on snacks).

Healthy Lifestyle Pledge: Have students write a pledge about how they will live sustainably, such as using reusable bags or eating less meat. Display their pledges in the classroom.

These activities are designed to be engaging and age-appropriate, helping primary school students understand key concepts related to climate change and the eco-energy transition in a fun and interactive way.

Assessment

1. Quizzes: Use online quizzes or written assessments to evaluate students' understanding of climate change and eco-energy transition concepts.
2. Projects: Have students work on individual or group projects that demonstrate their understanding of the topic.
3. Reflective Journaling: Encourage students to reflect on their learning experience through journaling or self-assessment.
4. Direct observation on applying the results on student's daily lives.

Resources

Website: climatekids.nasa.gov

Engaging games, videos, and activities designed to teach children about climate change and its impact on the planet.

National Geographic Kids

Website: kids.nationalgeographic.com

Offers articles, videos, and educational games about the environment and conservation.

Eco-Schools Program

Website: eco-schools.org

Provides a framework for schools to engage students in sustainability practices, along with resources and project ideas.

The World Wildlife Fund (WWF) Education Resources

Website: worldwildlife.org

Offers lesson plans, activities, and multimedia resources focused on conservation and sustainability.

The United Nations Sustainable Development Goals (SDGs)

Website: sdgs.un.org

Provides educational resources related to climate action and sustainability, with activities linked to the SDGs.

Books and Literature

“The Lorax” by Dr. Seuss

A classic children’s book that introduces the concept of environmental stewardship and the importance of protecting nature.

“Why Should I Save Energy?” by Jen Green

A kid-friendly book explaining the importance of energy conservation with fun illustrations.

“The Earth Book” by Todd Parr

An accessible book that teaches kids simple ways to take care of the planet.

“This Is How We Do It: One Day in the Lives of Seven Kids from Around the World” by Matt Lamothe

Highlights the diverse lifestyles of children globally, including their environmental practices.

Educational Videos

PBS Learning Media

Website: PBS Learning Media

Search for videos on climate change, energy efficiency, and sustainability tailored for younger audiences.

TED-Ed

Website: ed.ted.com

Explore animated lessons that cover various topics related to climate change and renewable energy.

Interactive Tools and Games

Carbon Footprint Calculator for Kids

Website: earthday.org

A simple tool for kids to understand their carbon footprint and how to reduce it.

Energy Quest

Website: energyquest.ca.gov

Offers games and quizzes to teach children about energy, conservation, and renewable resources.

Climate Change Games and Simulations

Website: climateinteractive.org

Provides interactive simulations that can help students understand climate models and energy solutions.

Professional Development

National Science Teaching Association (NSTA)

Website: nsta.org

Offers professional development resources and lesson plans focused on science education, including climate change topics.

Eco Rise

Website: ecorise.org

Provides curriculum and resources for educators to incorporate sustainability into their teaching.

Local and Community Resources

Local Environmental Organizations

Reach out to local NGOs or community groups that focus on environmental education. They often provide workshops, materials, and guest speakers.

Public Libraries

Many libraries offer educational resources, books, and even programs related to climate change and sustainability.

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