The importance of environmental education in the 21st century: Literature review and case study

https://doi.org/10.56238/sevened2024.013-013

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ABSTRACT

Environmental education in secondary education is essential to train citizens who are aware of and committed to building a sustainable future. However, despite this awareness, in Brazil there are still many dilemmas around the incorporation of the subject in the BNCC. This study addresses the relevance of environmental education, highlighting the need for its integration into the school curriculum. To this end, a bibliographic review on the subject was carried out, as well as a case report of the practices carried out at the CETI Maria Adelaide Marinho Hortência, in the municipality of Careiro Castanho, Amazonas, Brazil. The educational practice revealed a significant commitment on the part of the students, who learned about sustainable practices and the importance of preserving the environment. This demonstrates the need to incorporate this type of practice into the day-to-day life of the school, as can be seen not only from our results, but also from the literature review carried out. The integration of this topic into the school curriculum, with the support of interdisciplinary approaches, is essential for the formation of responsible citizens committed to building a sustainable future.

Keywords: Environmental education, Fridays for Future, Sustainability.

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INTRODUCTION

According to the Brazilian dictionary, Education is understood as "the application of proper methods to ensure the formation and physical, intellectual and moral development of a human being" (Oxford Languages, c2024). Thus, the role of the school in always maintaining the good learning of the students becomes very important, regardless of the area in which it is spoken. Based on this principle, the 1988 Constitution guarantees that "education, a right of all and a duty of the State and of the family, will be promoted and encouraged with the collaboration of society, aiming at the full development of the person, his preparation for the exercise of citizenship and his qualification at work" (Brasil, 1988).

In a world facing growing socio-environmental challenges, Environmental Education in Brazilian High School emerges as an essential tool for building a sustainable future. By forming conscious and engaged citizens, this area of knowledge plays a crucial role in the transformation of society and the protection of the environment.

Environmental Education plays a crucial role in the education of high school students, being fundamental for the construction of a critical and responsible awareness in relation to the environment. In schools, it not only provides knowledge about ecology and sustainability, but also stimulates the development of practical skills and positive attitudes towards preserving the environment. In the face of global challenges such as climate change, biodiversity loss, and pollution, environmental education emerges as an essential tool to empower young people to become agents of change in their communities. In this sense, its teaching in high school not only broadens students' understanding of the interactions between humans and the environment, but also prepares them to face the environmental challenges of the 21st century in a conscious and sustainable way.

The *Fridays for Future* movement , started by young Swedish activist Greta Thunberg in 2018, quickly grew into a global mobilization for climate action. Thunberg began skipping school on Fridays to protest in front of the Swedish parliament, demanding stronger action against climate change. Their initiative has inspired millions of young people around the world to participate in school strikes and demonstrations, demanding that governments and global leaders take immediate and effective action to mitigate the effects of climate change. *Fridays for Future* highlights the urgency of the environmental crisis and the importance of engaging young people in the search for a sustainable future.

In this context, recognizing the great importance of Environmental Education for young people, this paper reviews the need and relevance of including environmental education classes in the school curriculum. In addition, it presents a case study on classes taught from the perspective of the *Fridays for Future* movement in a school in the interior of Amazonas, illustrating how this approach

can be implemented and its aspects of awareness and engagement of students in relation to environmental issues.

THEORETICAL BACKGROUND

There is a broad scientific consensus among scientists that climate change is real, caused by human activities, and poses a serious threat to the planet. The scientific consensus on climate change is based on a robust body of scientific evidence from diverse areas of knowledge, such as climatology, oceanography, glaciology, and paleontology.

The Intergovernmental Panel on Climate Change (IPCC), the main international scientific body for assessing climate change, warns in its reports of the urgency of ambitious actions to combat global warming. The IPCC states that greenhouse gas emissions need to be drastically reduced in the coming decades to avoid the worst impacts of climate change, such as extreme weather events, sea level rise, and biodiversity loss (IPCC, 2021).

The *Fridays For Future* (FFF) movement, also known as the Global Youth Climate Strike, emerges as a social and political phenomenon of great relevance in the current scenario, mobilizing millions of young people around the world in favor of urgent climate action. Through peaceful demonstrations and school strikes, FFF youth are pressuring governments and world leaders to take concrete action to combat global warming and build a sustainable future for the planet (FridaysForFuture.org).

This movement began in 2018, when young Greta Thunberg, just 15 years old, made the decision to skip school every Friday to protest in front of the Swedish parliament, seeking more ambitious political action to combat climate change. As a result, the movement quickly gained strength around the world and spread to several countries. Mobilizing millions of young people in peaceful demonstrations and school strikes. It was from this global expansion that FFF was consolidated as a youth-led global movement for climate action, demanding urgent action to address the climate crisis (FridaysForFuture.org).

In this way, the demands of the FFF reinforce the importance of incorporating Environmental Education in High School as a crucial tool for the formation of conscious citizens engaged in the construction of a sustainable future. Environmental education provides young people with the knowledge, skills, and values they need to understand the climate crisis, make informed decisions, and act proactively to address it (FridaysForFuture.org). In addition, the FFF movement highlights the need for quality education that prepares young people for the challenges of the 21st century, including climate change. Environmental education should be integrated into the high school curriculum in a transversal and contextualized way, using active and participatory methodologies that promote critical and reflective learning.

Understanding the importance of Environmental Education in the country's educational scenario, according to the National Common Curriculum Base (BNCC), Menezes and Miranda (2021) highlight what environmental education is in the country as:

> It is simply education resignified, bathed in concerns with the conservation of life, an education for the understanding of life in its range of complexity. This implies the revision of concepts and attitudes, it means overcoming apathy in the face of problems and being responsible for their possible solutions, in a solidarity movement in relation to the possibilities of the future (Brasil, 2017).

Menezes and Miranda (2021) also point out that, in their view:

> EE (Environmental Education), however, is materialized as a public policy in formal education resulting from the demand and mobilization of society. In view of all the historical references, actions and policies arising from the history of national education, EE consolidates the principles and objectives outlined by the PNEA and international documents, disseminating the experiences, methods, didactics and critical instruments already accumulated by EE, supporting the process of institutionalization and rooting of this theme in Brazilian education (Menezes and Miranda, 2021).

Despite highlighting the importance of Environmental Education, it has not yet been incorporated as a specific curricular component in the High School curriculum by the BNCC. However, this was defined as a cross-cutting theme that should be integrated into all areas of knowledge. This means that Environmental Education must be approached in an interdisciplinary and contextualized way in all subjects of High School, from the Human Sciences to the Exact Sciences (Colacios and Locastre, 2020; Brazil, 2022).

Colacios and Locastre (2020) also highlight in their work the concern for the absence of Environmental Education in the High School Curriculum:

> The theme of Environmental Education in the NLEM and the BNCC, documents that contain the curricular content, is basically null. It can be considered much more an absence than anything else. Because they are two instruments for organizing, regularizing and directing national education, it is understood that the absence of Environmental Education is significant. Its symbolism occurs in the clarity of the choices of the group that formulated the document for specific educational guidelines, in which the environment, the value of the natural world, and the emancipatory potential of Environmental Education are marginalized (Calacios and Locastre 2022, p. 5).

The insertion of Environmental Education in the school context is supported by a robust set of legislation and curricular guidelines, seeking to build a solid foundation for the implementation of this area of knowledge in a comprehensive and effective way. At the top of this structure, Law No. 9,795, of April 27, 1999, which instituted the National Policy for Environmental Education (PNEA), stands out. This law defines Environmental Education as a continuous and permanent process, with the objective of forming conscious and responsible citizens in the defense of the environment (Brasil, 2022).

In addition to the PNEA, CNE/CEB Opinion No. 11/2010 and CNE/CEB Resolution No. 7/2010 established the National Curriculum Guidelines for 9 (nine) year Elementary Education. These documents guide the integration of Environmental Education into the curriculum of this stage of basic education, ensuring that students develop the knowledge, skills, and values necessary to understand the importance of environmental preservation and act responsibly in building a more sustainable future (Brasil, 2017; Brazil, 2022).

Article 2 of the PNEA highlights that:

> Art. 2 Environmental education is an essential and permanent component of national education, and must be present, in an articulated way, at all levels and modalities of the educational process, in a formal and non-formal character (Brasil, 2022, p. 24).

The BNCC presents several guidelines for the implementation of Environmental Education in High School, such as:

- Addressing socio-environmental issues: The BNCC encourages the approach of socio-environmental issues relevant to the students' reality, such as the climate crisis, pollution, biodiversity loss and the challenges of sustainable development.
- Skills development: The BNCC proposes the development of socio-environmental skills in students, such as critical analysis of information, effective communication, problem solving and participation in decision-making processes.
- Promotion of values: The BNCC seeks to promote the development of socio-environmental values in students, such as environmental responsibility, respect for biodiversity and social justice (Leff, 2001; Sachs, 2004; Brazil, 2017; Brazil, 2022).

Although climate change is an emerging concern, it has a spotlight on the teaching of the environment and leads to several initiatives, the lessons sought for Environmental Education are not limited to this. Lustosa et al. (2023) highlight that:

> Routine situations, which guide our day-to-day lives, such as irregular waste disposal, contamination of rivers, fires, deforestation, are situations that students can be influenced to analyze and propose possible solutions according to the reality of the region, it is important to emphasize the importance of proposing solutions such as the application of didactic and pedagogical exercises (Lustosa et al. 2023, p. 4).

In summary, Environmental Education in High School is fundamental for the formation of conscious citizens engaged in the construction of a sustainable future. Through it, students can develop the knowledge, skills, and values necessary to understand today's socio-environmental challenges and act proactively to address them.

METHOD

Initially, a literature review on Environmental Education was carried out, highlighting its importance and the feasibility of its implementation in the school curriculum. For this, the Google Scholar database was used, with the search for the theme "The importance of Environmental Education in High School". Articles that address the subject from both theoretical and practical perspectives were selected, including case studies on the implementation of Environmental Education in schools in different regions of the country.

Another methodology involved the presentation of the *Fridays for Future initiative* to students in the 1st, 2nd and 3rd grades of Technical High School at the Maria Adelaide Marinho Hortência Full-Time Education Center, located in the municipality of Careiro Castanho, Amazonas, Brazil. First, the students were shown a video that explained the origin and main objectives of the initiative. The main objective of the practical class was to expand the students' knowledge about the environment, teaching them, mainly, to take care of the plants around the school and to understand the importance of environmental preservation.

In addition, the practical classes included teachings on plant biology, covering topics such as photosynthesis and the functioning of the ecosystem. Students also learned about the differences between wooded and non-wooded environments, highlighting the importance of green areas for the sustainability and health of the school ecosystem.

RESULTS

In view of the widely discussed need for interdisciplinarity in Environmental Education, 10 articles were selected to compose the discussion of this work. These articles deal mainly with the ways to insert Environmental Education in various areas of knowledge in High School. Table 1 presents the selected articles according to title, authors, and objectives.

Code	Authors	Title	Objectives
01	Braz, Duarte and Bottino 2022	Urban Rivers: 'Realizing the importance through Environmental Education	An educational action was implemented for elementary and high school students in Passos (MG), which consists of the presentation of concepts based on local problems and the application of questionnaires.
02	Cocato 2021	Critique of environmental education in the teaching of geography: discussion and pedagogical proposals	The objective is to discuss such activities that question environmental problems. An extensive bibliographic review is carried out and pedagogical activities are proposed according to the critical and applicable geographical teaching.
03	Dias e Silveira 2020	Environmental Education and the Construction of Dialogic Didactic Paths in High School	The objective of the work is to develop a space for dialogue and reflection on contemporary environmental problems, focusing on the search for alternatives and change in individual and collective behavior.
04	Ferreira and Diniz 2021	The importance of environmental education for Campo Grande (MS): P.A.I.S project in the agricultural school	The general objective was to identify the potential of the Integrated and Sustainable Agricultural Production Project (P.A.I.S.), and the mechanisms used for the development of

			sustainable agriculture in the agricultural school in Campo Grande-MS.
05	Brito et al. 2020	Environmental Education in the school environment	The purpose was to analyze how themes related to the environment can awaken, in students, the perception of environmental sustainability and the permanence of humanity on the planet, having as main guiding questions: citizenship, environmental perception, environmental practices and sustainability.
06	Lobato et al. 2020	The Importance of Environmental Education for the Teaching of Natural Sciences: A Look at Community Time	This study aimed to evaluate the importance of Environmental Education (EE) for the Teaching of NC at EDUCampo/UFCAT.
07	Pinheiro et al. 2021	The importance of environmental education for professional, teaching and human improvement	The research aims to: analyze how this subject is being worked on in school and the appreciation of the environment for living beings.
08	Silva e Silva 2020	An approach to the importance of interdisciplinarity in the teaching of Environmental Education in schools	The present work aims to present the importance of interdisciplinarity to the teaching of Environmental Education applied in school, seeking to raise some practices that can be applied during classes.
09	Silva et al. 2022	Environmental Education in the teaching of Chemistry: review of didactic-pedagogical practices about batteries in High School	The present work proposes to analyze classroom practices in the area of Chemistry, especially about batteries and drums, in order to point out ways for the inclusion of Environmental Education, aiming to promote reflections on the relationships of the human being with the environment.
10	Souza et al. 2022	Environmental education as a pedagogical tool in high school in the municipality of Itacoatiara-AM	The objective was to verify how this theme has been worked on in public schools in high school, to give focus and relevance to students, to consult the point of view of teachers, students and the interest of both in the subject.

The practical class taught to the students of the 1st, 2nd and 3rd grades of High School took place over two days, as they depended on the weather to plant the seedlings. Coconut seedlings (in the area at the front of the school) and mango seedlings (in the area behind the school) were planted around the school. Also, several ornamental plants were planted in the ornamental pots. The material for this practical class had the direct participation of the students, who donated the seedlings to be planted, since most of the students in these classes live and plant in rural communities and attend school. Therefore, most of them have already shown some experience in the practice of cultivation.

With the activity, students were able to learn more about the process of planting and growing plants, photosynthesis, and the entire ecosystem, including the difference between a wooded and non-wooded environment. The results of the practice were effective throughout the process, as the students dialogued among the classes involved, exchanged experiences of how their parents plant on their land and how this can improve life, food and also family income.

As one of the objectives of the practice was to change the students' view of environmental education and its importance as a source of training and awareness among young people, some reports about the success of the practice were made by the students. One of the students interviewed commented that: "We learned that the climate and the type of soil directly influence the development of the plant. The soil must be examined so that it is supplemented with the correct fertilizer. Despite the importance of manure, organic fertilizer is more easily acquired." Another student reported that:

"We learned how to make use of organic materials as fertilizer for plants, as they are less aggressive to the environment compared to manipulated fertilizers. In addition, it is easier for families who plant to use organic fertilizer. The practical class was very successful." Regarding the importance of the class for young people, another student reported that: "The class helped in the development of environmental awareness and the knowledge acquired can be passed on to the next generations, cultivate the integrating spirit of human and environment. Also, to be more aware of sustainable practices on a daily basis, such as saving water, energy, among others".

In summary, the teachers responsible for the class reported the strong participation of the students throughout the class, exchanging family experiences about the plants and the correct way to plant each one. The importance of the practical class for future generations was also discussed, who will be able to directly enjoy the planted trees when they grow and develop fruit. Therefore, the seed of awareness was planted that not only the present matters, but also future generations who are more likely to feel the result of today's environmental negligence.

DISCUSSION

According to the Ministry of Education, in the Environment Notebook (Brazil, 2022):

> Educating and learning are phenomena that involve all dimensions of the human being and, when this ceases to happen, it produces alienation and loss of social and individual meaning in living. It is necessary to overcome the forms of fragmentation of the pedagogical process in which the contents are not related, integrated and do not interact.

In short, this passage invites us to rethink education as an integral process that transcends the mere transmission of knowledge. An education integrates knowledge, promotes human development in its multiple dimensions and restores meaning to life, becoming the key to overcoming alienation and building a promising future for all. Of all the areas that can be highlighted in this sense, here we will highlight Environmental Education and the interdisciplinarity that promises to encompass it in all areas, especially in High School.

To this end, we can highlight the Fridays For Future movement, led by young people from all over the world, which is emerging as a social and political phenomenon of great relevance in the fight against climate change. Through peaceful demonstrations and school strikes, the FFF pressures governments and world leaders to take urgent action to combat global warming and build a sustainable future for the planet. Given the importance of FFF for younger generations, there is a broad connection between the movement and Environmental Education embedded in High School.

The FFF movement contributes to raising awareness among young people about the urgency of climate action, mobilizing them for collective action for environmental protection. The movement demonstrates the power of youth mobilization to promote positive social and environmental change.

With regard to the incorporation between the FFF movement and Environmental Education, we can highlight that the demands of the FFF reinforce the importance of Environmental Education in High School as a crucial tool for the formation of conscious citizens engaged in the construction of a sustainable future. And, Environmental Education provides young people with the knowledge, skills, and values they need to understand the climate crisis, make informed decisions, and act proactively to address it. In addition, the FFF movement highlights the need for quality education that prepares young people for the challenges of the 21st century, including climate change. In the search for the insertion of environmental knowledge into the country's education, environmental education was integrated into high school in a transversal and contextualized way, using active and participatory methodologies that promote critical and reflective learning.

According to the Brazilian Ministry of Education:

> The themes of the Environment are responsible for giving students, individuals and the community, through environmental education and its processes, social values, knowledge, skills, attitudes and competencies aimed at the conservation of the environment, a good for the common use of the people, essential to the quality of life and its sustainability (Brasil, 2022, p. 24).

Environmental Education can be an active response to the demands of the FFF movement, when the goal of the movement is added to the classroom. The following can be highlighted:

- Knowledge development: Environmental education in high school should provide students with the scientific knowledge necessary to understand the causes and impacts of climate change. This includes the study of climate systems, human action on climate, and the potential consequences of climate change for the planet and society.
- Skills for action: environmental education should develop in students skills for climate action, such as critical analysis of information, effective communication, problem-solving, and participation in decision-making processes. This will enable young people to become agents of social transformation, advocating for ambitious public policies and implementing actions in their communities.
- Values for sustainability: environmental education should promote the development of values for sustainability, such as environmental responsibility, respect for biodiversity, and social justice. This will allow young people to make informed decisions in their daily lives and contribute to building a more sustainable future for all.

In this way, presenting the FFF initiative to students is of paramount importance, as they perceive in a practical way the importance, mainly, of taking a stand on the changes they want to see. They also realize that actions involving the environment today can directly affect future generations. In the practical class taught to the 1st, 2nd and 3rd grade students of CETI Maria Adelaide Marinho Hortência High School, it can be seen that the students already had this awareness and were very

engaged in passing on these teachings to family members and the community. Thus, we believe that the main objective of making generations aware of the importance of Environmental Education has been completed.

There are several approaches to the application of Environmental Education in the classroom. One of them integrates the theme directly into disciplines such as Geography, Chemistry, Physics and Biology, which are directly related to the subject. Another approach consists of isolated practical classes, focused on current and local issues, aiming to make students aware of problems specific to the region where they live.

Interdisciplinarity in the teaching of Environmental Education at school is extremely important, as it promotes the integration of knowledge from various areas, providing a broader and more complete understanding of environmental issues. With an interdisciplinary approach, students can understand the complexity of environmental problems and their interrelationships with different disciplines, such as Science, Geography, Mathematics, among others (Silva and Silva 2020).

In addition, interdisciplinarity encourages critical reflection, teamwork, and the search for creative and innovative solutions to environmental challenges. By integrating different disciplines in the teaching of Environmental Education, students are encouraged to develop a holistic view of the environment, understanding the interdependence between human beings, nature, and society. Thus, interdisciplinarity in the teaching of Environmental Education at school contributes to the formation of citizens who are more conscious, responsible and engaged in the promotion of sustainability and environmental conservation (Silva and Silva 2020).

Braz, Duarte, and Bottino (2022), in a study carried out in Passos (MG), aimed to promote a school intervention with Environmental Education practices, aiming to sensitize young people at different school levels (1st and 2nd grades) about urban water resources. An educational action was implemented, through the presentation of concepts related to local problems. The author points out that the work resulted in a significant change in the students' perception of the importance of urban streams. Before the intervention, the students had a negative view of urban water resources, but after the educational activities, they began to better understand the importance of ecosystems, valuing them as much as the streams of preserved environments.

Addressing the theme of Environmental Education in the teaching of Geography, Cocato (2021) sought to criticize and discuss how the pedagogical activities of environmental education are presented in the current context of a globalized economy, especially in the teaching of Geography, and how these contents are addressed in the classroom. The work brings the presentation of pedagogical proposals that instigate students to participate in classes and shows the need for a critical and questioning view of current environmental problems. In addition, they emphasize the importance

of the active involvement of teachers and students and the search for more meaningful and transformative educational practices.

Dias and Silveira (2020) sought, in their work, to find pedagogical tools and methods that would prove useful for teaching and environmental awareness in the classroom. To this end, resources such as documentary screening, conversation circles, poster making, practical activities and the use of audiovisual resources were used. As a result, the authors described the high effectiveness of these resources in teaching Environmental Education, always aiming to sensitize students and promote discussions about existing environmental problems. As in our work, the teachers were able to perceive that these resources were effective in terms of student engagement, mobilizing discussions about not only the problems, but also seeking solutions for the environment. Thus, the use of audiovisual pedagogical resources can help teachers to incorporate Environmental Education in the classroom.

Another strategy that can be mentioned for the incorporation of Environmental Education in the classroom is the creation of projects that aim to develop this knowledge, as already mentioned, through theoretical classes, which instigate discussion among students, and also through practical classes. Ferreira and Diniz (2021), in their work carried out at the Agricultural School and Campo Grande (MS), present the Integrated and Sustainable Agroecological Production Project (P.A.I.S.). The project aims to insert Environmental Education in the school environment. Among the various results described by the authors, such as the use of agroecological practices, integration of theory and practice, healthy eating and community strengthening, environmental awareness stands out. The project contributed to the environmental awareness of students, families and the school community, promoting the dissemination of knowledge and the practical application of what was taught, strengthening the concept of Environmental Education. The same could be observed in our work, since the students brought the knowledge from home about planting and passed on the knowledge acquired in the practical class to the community.

Studies such as that of Lobato, Adams and Nunes (2020), Pinheiro et al. (2021) and Silva, Royer and Zanatta (2022) also highlight, as already described, the importance of integrating theoretical and practical classes on Environmental Education, highlighting not only the students' learning about important environmental topics, but also the teachers involved in these projects. Therefore, the approaches to Environmental Education themes are not only important for students, but also for teachers and the community, forming an integrative unit capable of taking care of the environment.

In a study carried out in Itacoatiara-AM-Brazil, Souza et al. (2022) sought to investigate and evaluate the environmental perception of students and teachers in two state schools, as well as to

analyze how the topic of Environmental Education is addressed in high school in these schools. As results found in the study, the authors highlight:

- The highlight is the average frequency with which environmental issues are addressed in the classroom, attributed to the lack of preparatory courses in environmental education for teachers, emphasizing the need for actions and projects in this area in schools;
- The greater interest of students in subjects related to the environment compared to teachers, evidencing the importance of effective environmental awareness, beyond just showing interest;
- The realization of projects in the area of environmental education with infrequency, mainly through transversal themes, indicating the inclusion of this theme in schools, but emphasizing the need for greater attention and implementation of projects in this area;
- The teachers' perception that environmental education should be considered as a curricular subject, aligning with the possibilities of the BNCC in high school, which can contribute to a quality education with an environmental focus.

These results highlight the importance of environmental awareness, the implementation of sustainable practices, and the effective inclusion of environmental education in the school curriculum to promote the preservation of the environment and greater environmental awareness among students and teachers in schools in Amazonas (Souza et al. 2022).

The results found by the aforementioned works and by our work indicated that the application of environmental practices in the educational process contributes to the formation of critical individuals committed to environmental issues, enabling a positive change in the perception and attitudes of students in relation to the environment. The inclusion of Environmental Education in educational institutions was highlighted as a key tool in the formation of a sustainable society, promoting an education based on environmental problematization and perception.

CONCLUSION

Environmental Education in high school is essential to form conscious and responsible citizens, capable of facing current and future environmental challenges. The importance of interdisciplinarity in this area is evident, as it allows for the integration of knowledge from diverse disciplines, providing students with a holistic and in-depth understanding of environmental issues. By approaching environmental topics through multiple perspectives, such as Science, Geography, Mathematics and others, interdisciplinarity enriches learning by encouraging critical thinking and the ability to solve problems creatively and innovatively. This approach not only broadens students' understanding of the complexity and interconnectedness of environmental problems, but also fosters

collaboration between different areas of knowledge, which is essential for the search for sustainable solutions.

Therefore, the effective inclusion of Environmental Education in the school curriculum, supported by an interdisciplinary approach, is crucial for the development of a sound environmental awareness and for the promotion of sustainable attitudes and practices among young people. This will contribute significantly to the preservation of the environment and the construction of a more sustainable and balanced future.

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