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TRAINING ECOLOGICAL THINKING IN EARLY SCHOOL AGE STUDENTS THROUGH INTEGRATION OF CURRICULUM CONTENTS

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Abstract: *The article explores the formation of ecological thinking in young school-age students by integrating ecological education into the school curriculum. The need for individual and collective responsibility towards the environment and influence on student behavior is highlighted. The study promotes the use of STE(A)M methods to stimulate involvement in practical ecological projects, demonstrating that primary education can form responsible and empathetic citizens with nature.*

Key words: *ecological education, sustainable thinking, STE(A)M methodology, ecological responsibility.*

1. Introduction

In the current context of environmental degradation and accelerated climate change, environmental education is becoming a global priority. The training of ecological thinking from the first school years is essential for the development of a responsible generation capable of understanding and addressing environmental challenges. Young school-age students, at a crucial stage in their cognitive and moral development, are particularly receptive to notions of nature and protection. Therefore, the integration of ecological contents in the school curriculum is a valuable opportunity to influence positive behaviors and attitudes towards the environment.

As Cristea (2016) states, early education is the fundament on which the whole personality is built, including ecological consciousness. On the other hand, Munteanu (2017) emphasizes that the interdisciplinary approach, such as the integration of ecology in fields such as science, art, or technology, is an effective way to stimulate students' curiosity and involvement. In this sense, the use of innovative methods, such as the STE(A)M approach, not only facilitates active learning but also provides students with opportunities to apply knowledge in a real context.

This paper explores ways in which ecological education, integrated into the curriculum contents, can contribute to the formation of ecological thinking in

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students of small school age. The main goal is to analyze the impact of these strategies on the development of an early ecological consciousness and to demonstrate the importance of innovative approaches in shaping environmentally responsible behavior.

2. The Influence of Ecological Education on the Formation of Individual and Collective Responsibilities in Students at Early School Age

Individual responsibility is manifested through small but significant gestures, such as recycling, saving water, or rational use of resources. Munteanu (2017) shows that ecological education promotes a set of simple practices in children, such as reducing energy consumption or reusing materials, which help them become responsible citizens. In this context, students begin to perceive the impact of their daily actions on the environment, which contributes to the formation of long-lasting ecological habits.

On the other hand, ecological education is not only aimed at the formation of individual responsibility but also at the cultivation of a collective consciousness.

According to Albulescu (2014, p. 14), "group activities, which involve collaboration to solve environmental problems, contribute to strengthening the sense of belonging and responsibility towards the community". Team ecological projects teach students not only to be actively involved in environmental protection but also to understand that major changes can only be achieved through collective efforts.

The teaching methods used for environmental education are essential in shaping these types of responsibilities. Hands-on activities, educational games, and group projects are effective in stimulating critical thinking and making connections between theoretical knowledge and concrete actions. Dumitru and Bălan (2020) point out that through project-type activities, students become not only passive receivers of information but also active agents of change in their communities. Thus, ecological education at an early school age becomes a catalyst for the development of individual and collective responsibility, preparing students to become citizens aware of their impact on the environment.

Therefore, the formation of individual and collective responsibility through ecological education is an essential process in the development of sustainable behaviors in children. The Romanian authors emphasize the fundamental role of hands-on activities and collaboration among students to create a solid ecological awareness. By implementing such educational strategies, young school-age students can learn to take an active role in protecting the environment, both individually and within the communities they belong to.

3. The Benefits of Integrating Ecological Education into the Primary Curriculum through the STE(A)M Method

The integration of ecological education in the primary curriculum through the STE(A)M method brings multiple benefits, contributing to the formation of critical thinking and an early ecological responsibility. STE(A)M (Science, Technology, Engineering, Arts and

Mathematics) provides an interdisciplinary framework that allows students to explore ecological concepts through various perspectives, developing both theoretical knowledge and practical skills. According to Cristea (2016), ecological education cannot remain isolated from other educational fields but must become an integral part of the learning process, to ensure a holistic development of the child. Through the STE(A)M approach, students are challenged to find innovative solutions to environmental problems, connecting traditional disciplines in a practical and applied way.

A primary benefit of this approach is the development of critical thinking and problem-solving skills. Educators can use the ecological projects integrated in STE(A)M to stimulate students to look at environmental issues, such as climate change, pollution or biodiversity loss, from a scientific and technological perspective. The STE(A)M method allows students to develop research skills and learn to apply theoretical knowledge in real contexts, through projects that emphasize environmental protection. Thus, ecological education becomes not only theoretical but turns into an interactive process, in which children learn to be agents of change (Dumitru & Bălan, 2020).

Another advantage is increasing the level of motivation and involvement of students. Integrating art into environmental education through STE(A)M allows for a creative approach, stimulating children's imagination and sensitivity to the environment. Munteanu (2017, p.38) points out that "through artistic activities related to ecology, such as making posters, collages or visual projects about nature, students develop their empathy and ecological awareness in a natural and attractive way". Art, together with science and technology, facilitates a deep understanding of nature and helps children express their concerns for the environment in a creative form.

Also, the integration of STE(A)M in environmental education contributes to the formation of transversal skills essential for the 21st century. According to Albulescu (2014), project-based learning in STE(A)M encourages students to collaborate, communicate effectively and develop social and teamwork skills. Environmental projects often involve cooperation between students to find sustainable solutions, thus strengthening team spirit and the ability to work together for a common goal. In addition, through the use of technology, students develop the digital skills necessary to understand and address the environmental challenges of the contemporary world.

Bălan and Popescu (2018) claim that the interdisciplinary approach through STE(A)M offers students the chance to explore the connections between science, technology and the environment, developing the skills needed for the future. This integration not only prepares students for future academic challenges but also gives them the tools to become active citizens who understand the complexity of environmental problems and can contribute to their solutions.

Integrating environmental education into the primary school curriculum is essential to form environmentally responsible values and behaviors from an early age. According to UNESCO (2021), education for sustainable development not only raises awareness of environmental issues but also provides tools for students to actively contribute to a sustainable future.

Last but not least, ecological education through STE(A)M contributes to the development of a global consciousness. Students learn to look at environmental issues from a broad perspective, understanding the interconnections between local actions and global effects. Ecological education at early school age has the potential to form responsible citizens, aware of their role in protecting the environment globally (Cojocariu, 2016). Thus, students learn not only about conserving natural resources in their communities but also about the importance of collective action on a global scale to protect the planet.

Integrating environmental education into the primary curriculum through the STE(A)M method brings significant benefits, stimulating critical thinking, creativity, collaboration and environmental responsibility. Using this approach, students not only learn ecological concepts but are actively involved in finding innovative solutions to protect the environment, preparing to become responsible citizens in an increasingly complex world.

4. The Impact of Environmental Education on Students' Behavior and Values towards the Environment at the Earliest Ages

Early environmental education plays an essential role in shaping students' behavior and values towards the environment. Research has shown that core values are formed from childhood, and environmental education at an early age contributes to the development of an environmental consciousness that influences choices and behaviors throughout life. As Cristea (2016, p. 146) points out, “early environmental education is not only about imparting knowledge but also about creating an attitude of respect and care towards nature, which shapes responsible citizens”. Thus, educational interventions in the first school years have a profound impact on children's perceptions and future behavior towards the environment.

An important aspect of environmental education at an early school age is the formation of healthy habits and practical environmental behaviors. Through activities such as recycling, saving resources, or caring for plants and animals, students learn to take responsibility for the environment. Munteanu (2017) points out that the development of ecological habits begins with small, daily gestures, which, once learned from an early age, become an integral part of everyday life. Thus, children learn habits that will also accompany them in adulthood, such as reducing energy consumption, recycling, or rational use of resources.

In addition, environmental education helps develop empathy and emotional connection with nature. Albulescu (2014) points out that children who learn about protecting the environment through practical activities become more sensitive to the impact of their actions on nature, which leads to the development of deep ecological values. Through activities such as planting trees, observing plant and animal life, or participating in community clean-up projects, students develop a greater appreciation for nature and an understanding of the interconnectedness of ecosystems. This strong emotional connection to nature forms the basis for long-term environmentally responsible behaviors.

As students grow, early environmental education helps develop a global awareness of environmental issues. Students who have been exposed to ecological concepts from an early age tend to become adults more aware of the importance of protecting the environment and are more likely to be actively involved in solving environmental problems environment. Thus, children who learn about protecting nature from an early age develop values of sustainability and understand that individual and collective actions have an impact on the health of the planet (Dumitru & Bălan, 2020).

Bălan and Popescu (2018) emphasize that early environmental education not only develops responsible ecological behaviors but also promotes the values of cooperation and solidarity in communities. Through joint projects to protect the environment, children learn to collaborate for a common goal, which strengthens the sense of belonging to the community and the desire to protect the environment together with others. Thus, environmental education not only influences individual behaviors but also promotes cooperation at the community level.

Another important impact of early environmental education is the development of responsibility and a sense of empowerment. Students learn that their actions matter and that they can bring positive change to the environment in which they live. Children who are taught from an early age that they can positively influence the environment to become more confident and responsible in everyday life. This awareness of their power in making environmental decisions contributes to the development of active citizens involved in protecting nature.

The impact of environmental education on the behavior and values of young school-age students is profound and lasting. By forming healthy ecological habits, developing empathy towards nature and cultivating a global consciousness, children learn to become responsible and active citizens in protecting the environment. The Romanian and Moldovan authors highlight the importance of early ecological education as a foundation for the development of sustainable values and behaviors, essential for creating a sustainable future.

5. Practical Activities and Eco Projects that Can Stimulate Students' Curiosity and Involvement in Environmental Protection

The integration of STE(A)M (Science, Technology, Engineering, Art and Mathematics) in the teaching of ecology is an innovative method that stimulates interdisciplinary thinking. Students can be involved in projects that combine scientific knowledge of nature with art or technology, such as building models of ecosystems or solar panels. According to Anderson and Mundry (2020), the STE(A)M approach in primary education promotes connections between disciplines, giving students the tools to find innovative solutions to environmental problems and develop critical skills for the 21st century.

Practical activities and ecological projects are an effective way to stimulate students' curiosity and involvement in environmental protection. Through these activities, students not only learn ecological concepts but also develop an emotional and practical connection with nature, transforming environmental education from a theoretical

process to a life experience. As Sorin Cristea (2016) states, ecological education allows students to directly experience the relationship with the environment and understand the importance of protecting it. Hands-on activities allow students to explore the environment, ask questions, and find solutions, thus contributing to the formation of responsible citizens.

An effective example of an activity is planting trees or school gardens, which help students understand the life cycle of plants and the importance of conserving natural resources. According to Munteanu (2017), planting activities develop children's empathy towards nature and teach them about the essential role of plants in combating climate change. By participating in such projects, students become aware of their role in protecting biodiversity and the natural environment, while reinforcing the values of responsibility and care for nature.

Another effective activity is the creative waste recycling and reuse project, which involves collecting recyclable materials and transforming them into useful or artistic objects. This type of activity not only develops students' creativity but also teaches them about the impact of waste on the environment. As Albulescu (2014, p. 64) points out, "through recycling, students become aware of pollution problems and learn that small everyday gestures can have a significant impact on environmental protection". It stimulates critical thinking and curiosity, allowing students to see how their actions can help reduce pollution.

Projects to clean up local green spaces or parks are another way to engage students in hands-on environmental activities. By participating in greening actions, students learn about collective responsibility and the impact of pollution on nature. Bălan and Popescu (2018) claim that collective actions to clean the environment teach children to collaborate and be responsible towards the community, strengthening the sense of belonging. Thus, these activities develop team spirit and teach students that protecting the environment is a shared responsibility that requires cooperation.

Green-themed STE(A)M projects, such as building green model homes or simple solar panels, can spark students' interest in science and technology while learning about sustainability. Dumitru and Bălan (2020) show that the STE(A)M method helps students understand the complex interactions between science, technology, and nature, developing innovative solutions to protect the environment. Such projects not only increase students' involvement in environmental protection but also provide them with essential skills for the 21st century.

Hands-on activities and ecological projects play a key role in stimulating students' curiosity and involvement in environmental protection. These activities provide students with experiential learning opportunities, developing empathy, responsibility, and environmental awareness. Through direct involvement in eco-projects, students not only learn about the importance of protecting the environment but also become active agents of change in their communities.

As I emphasized in the article, in the context of contemporary education, the formation of ecological thinking in primary school students is essential for the development of a generation responsible for the environment. We propose a series of STE(A)M projects that combine elements of science, technology, engineering, arts and

mathematics, all centered on the ecological theme, being designed and carried out with my students in the 1st and 2nd grades. Within STE(A)M, ecological projects “The curious hedgehog – a journey through his world” (Figure 1), “Adventures in nature - we discover living environments” (Figure 2), “Be the superhero of the blue planet” (Figure 3), and “Let's save bees!” (Figure 4), we carried out activities, such as walking under Mount Tâmpa in the park - we collected information about the necessary elements of survival for hedgehogs, bears, bees and plants (water, food, light, shelter). In the Little Ecologist's Journal, the students drew the hedgehog, the bear, the bee and their habitat. For the creative workshop, we created models of hedgehogs, bears, bees, etc. from recyclable materials, leftover pencil sharpeners, blankets, caps, paper and other materials. Through such activities, we emphasized the importance of recycling.

For the arrangement of the ecological space, the students used natural materials and drawings with the habitat of the hedgehog, the bear to promote the protection of nature.

Interdisciplinary Learning for Eco-Reading I made my own stories with student-created content and images using the Storyjumpera app; “The Curious Hedgehog - Journey Through His World”, “The Adventures of the Water Drop: Journey from Clouds to Earth' 'Layla and Friends'” was read in class and subsequent discussions highlighted environmentally responsible behaviours.

Educational games like “Guess the Food” (which gives students cards of various foods and asks them to choose specific ones) helped to learn about his diet.

Active involvement in environmental protection with parents, grandparents, colleagues - students planted flowers in pots and trees in the yard of the house, in the school yard; also participating in various children's associations such as "Save a Bear", explaining how such actions can create friendly habitats for various animals.

On Recycling Day, the students met with the representatives of the company “Comprest” from Brașov, who taught us how we can contribute to the recycling process by sorting the garbage correctly, we brought to class the bins for sorting plastic, paper and bottles. Another activity through which students were encouraged to bring recyclable objects from home and transform them into creations related to the proposed theme.

The reflections and evaluation were done through the works in which they illustrated what they learned about the protection of the habitat of the hedgehog, the bear, the bees.

The products made by the students (models, drawings, agendas) were exhibited, where each child had the opportunity to present his contribution and exchange experience with his colleagues. Through the inter- and transdisciplinary approach, students are encouraged to explore and understand the relationships between various natural phenomena, develop critical and creative skills, and apply the acquired knowledge to real situations. Projects are created to stimulate the curiosity and active involvement of students, giving them the opportunity to become agents of change in their communities. These initiatives also contribute to the formation of essential skills for the future, in the spirit of sustainable development and respect for nature. Here are some examples (https://www.canva.com/design/DAGJcke_tpY/):

Fig. 1. *Ecological project „The curious hedgehog – a journey through his world"*

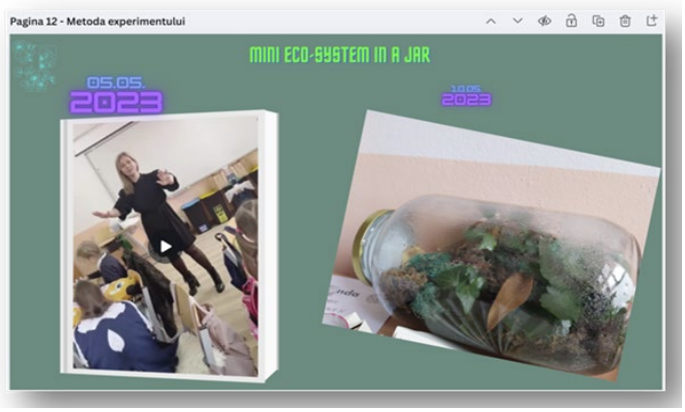

Fig. 2. *STE(A)M project „Adventures in Nature - we discover living environments"*
(Source: https://www.canva.com/design/)

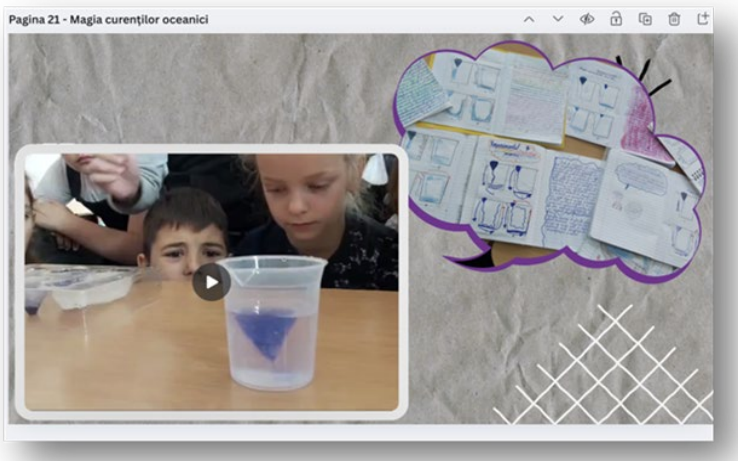

Fig. 3. *STE(A)M project „Be the superhero of the Blue Planet"*
(*Source:* https://www.canva.com/design/DAF7i4M5Y5U/)

Fig. 4. *STE(A)M project „Let's save the bees!"*
(Source: https://www.canva.com/design/DAF9OBcHFAg/)

6. Conclusions

In conclusion, the formation of ecological thinking in students of small school age, through the integration of curricular contents, is a necessity in the context of global environmental challenges. Early environmental education not only develops a sensitive consciousness towards nature but also contributes to the formation of fundamental values such as responsibility, empathy, and collaboration. Innovative methods, such as interdisciplinary approaches and STE(A)M, provide students with opportunities to learn through experience, connecting ecological theories with everyday reality.

Such integration transforms the educational process into a dynamic, engaging, and relevant one, preparing students to become active citizens in protecting the environment. The results highlight that ecological education positively influences students' behavior, turning them into changemakers in their communities. As Cristea (2016) states, an early education oriented towards sustainability creates the premises of a balanced society, based on respect for the environment.

Therefore, the integration of environmental education in the primary curriculum is essential for the development of a generation aware of environmental impact and capable of contributing to a sustainable future. The promotion of modern pedagogical practices and a curriculum adapted to the current demands of societies is the key to a sustainable educational transformation.

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