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Blue planet mission: a dialogue between science and mathematics in preschool

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ABSTRACT

This article aims to present an Educational Product developed within the scope of a master's research defended in the Graduate Program in Science and Mathematics Teaching at University Federal of Uberlândia (PPGECM-UFU). The product consists of an educational game that addresses environmental issues articulated with mathematical knowledge. The research in question investigated the use of a didactic game in the teaching of solid waste to preschool children. The methodology used was Narrative Research, which integrated the author's trajectory with her experience as a teacher. Data collection was based on the records of the teacher-researcher, including a logbook, photographs and portfolios of activities. To meet the demands of the research, a study was carried out on the legislation of Early Childhood Education, the teaching of Science and Mathematics for young children and the pedagogical possibilities of games. The analysis of the data suggests that playful activities can facilitate the learning of concepts and the development of citizenship skills. Additionally, the research process provided a space for critical reflection on the role of the educator.
KEYWORDS: Preschool; Environmental Education; Game; Solid Waste.

Missão planeta azul: um diálogo entre ciências e matemática na pré-escola

RESUMO

Este artigo tem como objetivo apresentar um Produto Educacional desenvolvido no âmbito de uma pesquisa de mestrado defendida no Programa de Pós-Graduação em Ensino de Ciências e Matemática da Universidade Federal de Uberlândia (PPGECM-UFU). O produto consiste em um jogo educativo que aborda questões ambientais articuladas a conhecimentos matemáticos. A pesquisa em questão investigou o uso de um jogo didático no ensino de resíduos sólidos para crianças da Pré-escola. A metodologia utilizada foi a Pesquisa Narrativa, que integrou a trajetória da autora à sua experiência como professora. A coleta de dados se baseou nos registros da professora-pesquisadora, incluindo diário de bordo, fotografias e portfólios de atividades. Para atender às demandas da pesquisa, realizou-se um estudo sobre a legislação da Educação Infantil, o ensino de Ciências e Matemática para crianças pequenas e as possibilidades pedagógicas dos jogos. A análise dos dados sugere que atividades lúdicas podem facilitar a aprendizagem de conceitos e o desenvolvimento de habilidades de cidadania. Adicionalmente, o processo de pesquisa proporcionou um espaço para a reflexão crítica sobre o papel do educador.
PALAVRAS-CHAVE: Pré-escola. Educação Ambiental. Jogo. Resíduos Sólidos.

INTRODUCTION

This article originates from a professional master's dissertation, developed within the Graduate Program in Science and Mathematics Education at the Federal University of Uberlândia (PPGECM-UFU). The research focused on the design and implementation of a game as a pedagogical strategy for teaching solid waste management in Early Childhood Education. The primary motivation for this study stemmed from children's spontaneous curiosity regarding waste in their daily school environment, combined with their inherent interest in gameplay.

In light of the escalating global environmental crisis, there is an urgent need to reevaluate human behavior and reflect on socio-environmental issues. Within this context, Environmental Education emerges as a fundamental pedagogical practice for fostering critical and conscious citizens committed to social transformation (Luccas & Bonotto, 2020). Indeed, as established by the Brazilian Law of Guidelines and Bases for National Education (LDB), educating for the exercise of citizenship remains a central tenet of the educational system.

In the context of Early Childhood Education, specifically Preschool, it is essential that pedagogical approaches respect the specific developmental characteristics of young learners. This requires the incorporation of methodologies that stimulate curiosity, encourage dialogue, and promote collective action.

In this regard, the National Common Curricular Base (BNCC) emphasizes the importance of integrated and contextualized pedagogical practices, capable of articulating diverse fields of knowledge (Brasil, 2017). From this perspective, games serve as valuable resources to enhance learning within environments characterized by playfulness and experimentation. This is particularly relevant when addressing complex themes, such as solid waste management and caring for the environment.

SCIENCE AND MATHEMATICS EDUCATION IN PRESCHOOL

The global environmental crisis is an incontestable reality that demands urgent and effective responses. In this scenario, Environmental Education emerges as an essential tool for fostering more conscious, critical citizens committed to the construction of a sustainable future (Lacerda, 2022).

Within this context, Early Childhood Education plays a pivotal role; it is during the first years of life that the foundations of attitudes, values, and behaviors are established, particularly regarding children's relationship with the environment. Cultivating respect for nature and an understanding of our interconnectedness from an early age is a decisive step toward forming generations that are more sensitive and responsible in the face of contemporary ecological challenges (Santos et al., 2024).

According to Brügger (1999), environmental issues became the focus of superficial trends starting in the 1980s. Consequently, the author argues that in the field of education, it is fundamental to adopt alternative ways of addressing environmental themes to promote engagement and shifts in attitudes and values. Layrargues (2002) contends that a conservative approach to EE tends to focus on individual behaviors, neglecting deeper reflections on the social, economic, and

political structures that sustain environmental crises. Therefore, that author highlights the importance of treating environmental issues more broadly and critically, encouraging for example debates on consumption practices rather than restricting the discussion to isolated elements such as correct waste disposal.

We argue that themes related to Environmental Education should not be addressed sporadically or only on commemorative dates. It is essential that this dialogue is continuously present and integrated into the classroom's daily routine, regardless of the educational stage. Only then will it be possible to consistently build a critical and responsible awareness regarding the environment. We understand that a conservationist approach to EE tends to present content in an uncritical, prescriptive, and moralizing manner (Tozoni-Reis, 2007), without concern for promoting actual transformations, thus disregarding political, social, cultural, and economic aspects (Loureiro, 2006; Lima, 2002; Guimarães, 2000). Consequently, we advocate for the need to move beyond traditional teachings focused solely on recycling and selective collection. It is necessary to broaden the debate to avoid the naturalization of consumption relations and promote, in fact, critical reflection on the impacts and structural causes of environmental degradation.

Currently, the problem of solid waste presents itself as an urgent issue, as there are insufficient landfills worldwide capable of absorbing the vast amount of waste generated daily. Given this reality, it becomes indispensable to rethink not only our consumption relations but also the socioeconomic system as a whole, as well as public policies aimed at waste management and the promotion of sustainability.

According to Brügger (1999), education focused on the environment must promote a true transformation of values, contributing to the reduction of social inequalities and encouraging reflection on the political and economic dimensions involved in the environmental crisis. In this sense, we chose to develop our work aligned with the principles of Critical Environmental Education, utilizing the "5 Rs", Rethink, Refuse, Reduce, Reuse, and Recycle, as a way to encourage conscious practices from the earliest years of life, stimulating profound reflection on the structural causes of environmental problems and promoting transformative action (Freire, 1996).

Thus, through playful, interactive, and contextualized pedagogical activities, we argue that children can be stimulated to rethink their habits, refuse unsustainable practices, reduce consumption, reuse materials, and recycle waste. In doing so, they become active agents in building a more just, equitable, and sustainable future. In this context, the research initially focused exclusively on the theme of solid waste. However, during the development of the "Educational Product"—a game—in a municipal classroom in Uberlândia, Minas Gerais, it was possible to observe a relationship between the activities and certain arithmetic and geometric concepts.

In light of the above, we support our approach with Lorenzato (2008), particularly his emphasis on the importance of a careful, intentional, and critical teaching approach for young children, since it is at this stage that the first links with knowledge are formed and the foundation for cognitive development is established.

According to Lorenzato (2008), the way young children acquire spatial notions follows a natural order that differs from the historical construction of geometric knowledge. Generally, they begin this process through the field of topology, developing elementary notions of proximity, boundary, order, separation, and continuity—important foundations for the construction of geometric thought.

In practice, this notion can be observed in children's drawings, where they begin to differentiate closed figures from open ones and identify internal and external spaces through outlines. At this stage, shapes such as a square and a rectangle, or a circle and an ellipse, are perceived as equivalent. It is precisely at this moment that the child begins to recognize that certain properties of figures remain unchanged while others cease to exist—an important step in the development of spatial perception and geometric thinking.

It is necessary to clarify that one of the objectives of teaching geometry is to enable students to move from experienced space to thought space. In experienced space, they observe, manipulate, decompose, and assemble. In thought space, they operationalize and construct internal spaces based on reasoning; that is, moving from the concrete stage to the capacity for abstraction (Lorenzato, 2008). Therefore, it is appropriate that in preschool, children encounter notions of open/closed, continuous/discontinuous, inside/outside, domain/boundary, whole/part, left/right, above/below, front/back, and displacement/movement, among others.

We understand that it is important to provide children with opportunities for spatial exploration to develop their spatial sense, building upon their experiences prior to entering school. It can be said that it is from spatial perception that they begin their discoveries: reading, writing, drawing, moving, playing, painting, and even listening to music. Another aspect highlighted by Lorenzato (2008) is that in Early Childhood Education, Mathematics is organized into three main fields: the numerical, which covers quantities and arithmetic operations; the geometric, focused on the recognition and exploration of shapes and spaces; and the measurement field, involving the comparison and quantification of physical attributes such as length, mass, time, and volume.

He states that work with basic concepts, such as large/small, far/near, and inside/outside, must begin through concrete experiences that allow children to explore different situations. The diversity in the presentation of concepts enables the perception of their meanings (Lorenzato, 2008). Thus, we understand that for teaching Mathematics, especially in Early Childhood Education, it is necessary for the teacher to understand the fundamental mental processes for the development of mathematical skills, such as correspondence, classification, and seriation—in addition to creating conditions for interaction and peer dialogue (Motta, 2019). "If the teacher does not work on these processes, children may even present correct answers, but without fully understanding the concepts involved" (Lorenzato, 2008, p. 48).

Furthermore, the BNCC (National Common Curricular Base) emphasizes that Early Childhood Education must be organized around interactions and play, elements that promote the integral development of students through activities that favor active participation and engagement. According to the document, "interactions and play are the structuring axes [...] considering the specificities of

child development" (Brasil, 2017, p. 40). Consequently, it is fundamental that Mathematics teaching goes beyond memorization and promotes playful and contextualized learning.

Given these reflections on the teaching of geometry, numerical representations, and the problem of solid waste, the challenge proposed in this work consisted of investigating the use of games in the context of Early Childhood Education. The aim was to understand their potential and limitations in order to design and develop an educational game aimed at four- and five-year-old children, promoting meaningful learning in a playful and contextualized manner.

ON GAMES AND THE PEDAGOGICAL INTERVENTION FRAMEWORK

According to Grando (2004), educational games can serve as a bridge between formal and everyday knowledge, enabling the exploration of mathematical concepts in a natural and enjoyable manner.

In this regard, Kishimoto (2011) emphasizes that games should not be viewed merely as leisure, but as learning tools. Through play, children explore the world, experiment with different social roles, develop motor skills, and enhance their problem-solving abilities. It is the educator's responsibility to create environments that stimulate the intentional use of games, as improper implementation can lead to a loss of playfulness or result in activities lacking pedagogical purpose (Grando, 2004).

According to Vygotsky (2002), toys and games play a fundamental role in the creation of the Zone of Proximal Development (ZPD), as they allow children to go beyond what they can achieve alone, thereby expanding their conceptual skills. However, it is essential for the teacher to act intentionally in this process, proposing challenges and conducting pedagogical interventions that trigger cognitive conflicts and stimulate the development of abstract thinking.

Recognizing the pedagogical potential of games and the importance of their organized and intentional use, Grando (2004) proposes a pedagogical intervention protocol structured into seven stages: familiarization, recognition of rules, playing for the sake of play, verbal pedagogical intervention, game recording, written intervention, and playing with competence. This framework served as the inspiration for the interventions carried out during the design and application of the game developed for this study, which will be presented and analyzed in this article.

During “Familiarization”, children have their first interaction with game materials. The objective is to allow them to recognize the game components, experiment with simulated moves, and even draw comparisons with other games they already know.

“Recognition of rules” comes next, and can be conducted through teacher explanations, reading instructions (if students are already literate), or simulated matches where the teacher plays with a student to demonstrate the rules to the group.

The third stage is “Playing to ensure the rules”: The goal here is to ensure the understanding of the rules through practice. In this phase, maintaining the

playfulness of the activity is essential. The teacher observes closely and makes only occasional interventions, allowing students to interact, develop concentration, understand the mechanics of the rules, and experience situations involving victory, defeat, and new challenges.

The next stage is “Verbal pedagogical intervention”. Characterized by teacher questioning and observation, this stage aims to prompt students to reflect on their moves, predict future movements, correct errors, and analyze strategies. The focus is on the cognitive processes used by children to solve problems and link them to mathematical concepts. In the game Contig 60, for instance, this stage encourages mental calculation through various strategies. The teacher's verbal mediation renders the student's reasoning visible, something that often goes unnoticed without such interaction.

Withing the stage of “Game recording”, students document the points, strategies, and calculations used, promoting the systematization and formalization of reasoning through mathematical language. This record is fundamental for the teacher to understand each child's learning trajectory and plan interventions that give meaning to the activity, preventing it from becoming a mere formality. Grando (2004) emphasizes that written systematization significantly contributes to making the students' forms of thought explicit and comprehensible.

During “Written intervention”, students are invited to solve problems related to the game, proposed by either the teacher or peers. This phase allows for the exploration of situations that did not arise during the matches and enables a closer look at individual needs while revealing different lines of reasoning.

Finally, “Playing with competence” represents a moment of learning verification. After moving through the previous stages and receiving necessary interventions, students participate in a new round of the game, applying the knowledge acquired. For the teacher, this is a privileged moment to observe progress and the consolidation of learning.

These seven stages proposed by Grando (2004) allow the game to be explored didactically to favor learning. However, in Early Childhood Education, certain adaptations were necessary, especially in activities involving writing. In these instances, records can be made through drawings or pictorial representations, respecting the specificities of child development.

Therefore, when planned and mediated intentionally by the teacher, games constitute pedagogical tools capable of articulating playfulness and learning. The stages proposed by Grando (2004) offer a methodological path that favors the construction of mathematical knowledge in a contextualized, collaborative, and pleasurable way. By respecting the particularities of child development and promoting challenging and reflective situations, the pedagogical use of games contributes to children's cognitive, social, and emotional development, establishing itself as a powerful educational practice.

METHODOLOGICAL ASPECTS

This study adopted a qualitative approach, grounded in Narrative Inquiry as proposed by Clandinin and Connelly (2015). This perspective enabled the first

author to articulate her personal trajectory with the pedagogical practice experienced during the development of the game.

Although Clandinin and Connelly (2015) do not prioritize a rigid definition of Narrative Inquiry, they identify key elements that delineate the field and establish fundamental characteristics for its understanding. The framework is organized around what the authors term the three-dimensional inquiry space, consisting of three interrelated dimensions: the personal and social (interaction); the past, present, and future (continuity or temporality); and the place (situation, context, or physical location). Within this structure, temporality traverses the first dimension, the personal and social occupy the second, and place constitutes the third.

Furthermore, the authors indicate four possible directions for a narrative investigation: inward (focusing on internal aspects, such as feelings and aesthetic reactions), outward (relating to the environment), backward and forward (linked to the temporal dimension: past, present, and future). Within this approach, temporality is central, as situating events in time is essential for their comprehension. To be fully understood, any event must be analyzed in consideration of its past, present, and future.

Another relevant aspect concerns the transformation of individuals over time. Narrative Inquiry recognizes that people change, particularly within educational contexts. Action is, therefore, understood as a narrative symbol. Curricular actions such as assessments and classroom practices are expressions of the stories that subjects live and tell. If analyzed in isolation, these actions lose their potency; however, within a narrative context, they gain meaning and depth.

Thus, rather than seeking an absolute truth about facts, Narrative Inquiry proposes a way of understanding experience (Clandinin & Connelly, 2013). From the perspective of the biographical-narrative approach, as described by Silva-Peña (2019), there is a constant dialogue between the researcher and their own stories, constructed from personal and professional experiences. Recounting these experiences is, in itself, a formative movement.

Consequently, choosing a Narrative Inquiry represented, for the first author, an invitation to relive memories and experiences in a continuous process of (trans)formation. The narratives mobilized throughout the research mediated different versions of her identity as an educator: the personal, professional, social, and individual — inseparable dimensions that intertwine to constitute teaching practice.

We sought to analyze pedagogical practice in order to understand the impacts of this research on the author's development as an educator. The alignment of this investigation with the foundations of Narrative Inquiry is evident in the construction of parallels, reflections, and the reframing of the past, the present lived during the research, and the future projected from it.

Thus, Narrative Inquiry is understood as a study of lived and told stories, in which the researcher’s role is to construct a new plot based on the interpretation of other narratives. Data may be produced in both oral and written forms; it is up to the researcher to identify which of these languages (or both) aligns best with the analysis.

The corpus of analysis comprised one of the modules of the educational product, specifically the one dedicated to Environmental Education. Additionally, photographic records, field journals, and activity portfolios developed during the implementation of the game were considered. Together, these formed a data set that allowed for the analysis of the learning process and the interactions generated by the proposal.

A DIALOGUE ON THE DEVELOPMENT OF AN EDUCATIONAL PRODUCT FOR CHILDREN AGED 4 AND 5

The activities to Environmental Education aimed to discuss environmental issues through the lens of solid waste management. The goal was to reflect on the "5 Rs": Rethink, Reduce, Refuse, Reuse, and Recycle, while highlighting the social importance of urban sanitation and waste collection services.

The Educational Product consists of a pedagogical proposal based on a trail-style board game featuring thirteen challenges focused on solid waste management. The game's narrative is led by a fictional character, "Ecoguarda" (Eco-guardian), an astronaut residing on the "Blue Planet" dedicated to environmental preservation. Upon noticing an alarming increase in space debris threatening her planet, Ecoguarda embarks on an intergalactic mission through the "Geometer System."

During this journey, she visits various geometric planets to gather resources and knowledge to combat the problem. Each planet presents playful educational challenges related to reducing, reusing, recycling, and rethinking consumption, inviting participants to collaborate with Ecoguarda to promote a culture of socio-environmental responsibility.

In the activity "Visit to Planet Circle," the objective was to provoke reflections on consumption patterns using age-appropriate language. The plot featured children from a fictional planet who possessed numerous toys and constantly desired more due to advertisements, yet never donated their old ones. Conversely, other children on the same planet had no toys at all. This activity included a "conversation circle" where students reflected on these attitudes and recorded their perceptions in their journals.

Following this, "Visit to Planet Pentagon" required groups to create toys or games using non-structured (recycled) materials. Interestingly, this coincided with the school's "Toy Day"; it was observed that students were more engaged and happier playing with their self-made creations than with the toys brought from home.

Other activities explored the use of recyclable materials in structured play, like bowling with PET bottles (“Visit to Planet Parallelogram”) and basket-waste-ball (“Visit to Planet Trapezoid”).

We also explored activities aimed at the valorization of urban sanitation professionals. In "Visit to Planet Cylinder" and "Visit to Planet Semicircle," students engaged in dialogue about the importance of waste collectors and took home some informative folders with guidelines for waste disposal and prevention of accidents.

In the activity "Visit to Planet Parallelogram," the challenge consists of each team playing a round of bowling using PET bottles, with one participant from each team taking a turn. The winning team is the one with the most points at the end. At the conclusion of the activity, participants have the opportunity to learn how to recreate this game at home, thereby promoting recycling and environmental awareness in a playful and collaborative manner.

The challenge "Visit to Planet Trapezoid" involves a game called basket-waste-ball, which consists of throwing trash into the trash can. The challenge is composed of four rounds in which participants attempt to throw the greatest number of "waste items" into the "bin." The team with the most successful hits at the end of the rounds is the winner. The activity aims to encourage awareness regarding the reuse of materials and the importance of sustainable practices using a playful and collaborative approach.

The activity "Visit to Planet Cylinder" proposes a reflection about waste collection professionals and the necessary precautions for waste disposal. Following the screening of an introductory video, groups are challenged to produce awareness posters addressing the importance of correct disposal and the recognition of the collectors' labor. These posters were taken home with the goal of expanding the dialogue to family members. The activity stimulates socio-environmental responsibility and promotes the development of empathy, being linked to the "Rethink" axis.

The activity "Visit to Planet Semicircle" focused on valuing cleaning and waste collection professionals through the production of a collective thank-you letter. The proposal was for students to recognize the importance of these workers in maintaining common spaces and to express this recognition in writing. The letter is symbolically addressed to the astronaut Ecoguarda, the central character of the game's plot and the mediator of interactions between the planets and participants, who represents ecological consciousness and environmental commitment within the game's playful universe. A copy of the letter is also delivered to the school's cleaning staff, promoting a concrete gesture of appreciation and empathy. The activity stimulates respect, social responsibility, and the recognition of work that is often rendered invisible by society.

Two moments stood out as highlights: the Pedagogical Exhibition, featuring toys made from recyclables, and the implementation of selective waste collection at the school, marking a significant step toward a culture of sustainability.

Inspired by the pedagogical principles of Paulo Freire, these activities sought to establish a problem-posing and dialogic environmental education. From this perspective, Freire’s concept of the "viable unprecedented" (2001) becomes pertinent: the belief that social transformation, though not yet fully realized, is possible through concrete, collective action. By proposing activities involving the 5 Rs and the valorization of workers, we aimed to create reflection scenarios accessible to children, aligning with the idea that education must start from the learner's reality (Freire, 1996).

The involvement of students demonstrated that the problematization of daily life is a powerful path toward autonomy and critical thinking. Environmental Education, in this sense, is not merely the transmission of content; it must create conditions for students to understand their reality critically and act upon it. Freire

(1983) argues that learning is a collective, emancipatory act. This was observed in the interactions between students, families, and the school community throughout the project.

Finally, a relevant takeaway from this practice was the realization that a game, despite its potential, does not automatically solve the challenges of Environmental Education or guarantee environmental awareness. The game must be understood as a didactic strategy within a larger process, where the intentional mediation of the teacher is essential. The educational potential of play is fully realized only when embedded in planned pedagogical actions that give meaning to the students' lived experiences and stimulate significant reflection.

FINAL CONSIDERATIONS

Prior to this study, it was a common assumption that solid waste management was not a subject of interest for children in Early Childhood Education. However, the curiosity demonstrated by the students motivated the primary author to explore this theme. Although waste-related issues are not traditionally considered a concern of early childhood, the role of education is to foster conscious citizens, as mandated by the Brazilian Law of Guidelines and Bases for National Education (Brasil, 1996).

Initially, it was assumed that instructing children on the importance of correct disposal and selective collection would suffice, under the belief that they were too young to grasp complex aspects such as consumption relations. As the research progressed, however, it became evident that by adapting the language to the relevant age group, it was possible to broaden the scope of the approach and incorporate more comprehensive discussions.

Furthermore, we recognized that a game, in isolation, would not be sufficient to promote the practices of rethinking, refusing, reducing, reusing, and recycling. Consequently, it became essential to design and implement complementary activities that encouraged critical reflection on our relationship with waste. Classroom observations allowed for adjustments to the game's narrative and structure, making it more engaging and aligned with the principles of Critical Environmental Education. As a result, the final version of the Educational Product incorporated these refinements through new graphic elements and a reorganization of activities, thereby reinforcing its pedagogical intentionality.

The key findings that contributed to the continuing education of the authors, particularly the primary author, include:

- The Limitations and Potential of Games: Games do not solve pedagogical challenges automatically; however, when carefully planned, they serve as potent instructional strategies.

- Pedagogical Intentionality: The deliberate organization of activities is a determining factor in educational success, requiring an active and engaged role from the teacher.

- Student Curiosity as a Facilitator: Children’s inherent curiosity accelerates learning. When a topic sparks interest, as seen with waste disposal, instruction becomes significantly more meaningful.

- Sequential Concept Introduction: In the field of Mathematics, a progressive approach proved most effective. Starting with elementary notions such as large/small, inside/outside, above/below, seriation, and classification, before advancing to numerical representations, facilitated student comprehension and the use of tools such as scoreboards.

The process of creating, developing, and refining the game was essential, as it required theoretical and practical investigations that broadened our understanding of the educator's role. The experience further highlighted the potential of games to integrate diverse knowledge areas and serve as tools to engage students in complex themes from early childhood. Through a ludic approach, it was possible to address environmental awareness, social responsibility, and mathematical concepts such as numbers and geometric shapes.

By participating in games, children are encouraged to solve problems, make decisions, and explore strategies to achieve objectives. This promotes active and autonomous learning, where children become protagonists in the construction of mathematical knowledge, as advocated by Grando (2004).

In conclusion, education plays a central role in forming environmental consciousness and introducing mathematical concepts from the earliest years of schooling. The use of a board game as an educational tool prompted reflection about the children's relationship with solid waste and, when coupled with intentional pedagogical interventions, proved to be a viable methodological path.

A concrete example of this impact was the implementation of selective collection at the school, facilitated by a partnership with the Municipal Water and Sewage Department (DMAE). Although not initially planned, this initiative emerged as an outgrowth of the children's actions, reflecting a pedagogy focused not only on content delivery but also on the involvement of the school community in practices of social transformation (Freire, 1996). Awareness of solid waste and sustainability gained a significant foothold in daily school life.

Thus, it is hoped that this research has contributed to planting a seed for a collective sense of environmental responsibility. We conclude by affirming that the concept of the "viable unprecedented" materialized not only in the children's learning process but also in the transformation of the author’s teaching practice, particularly regarding environmental issues, mathematics instruction, and the intentionality of pedagogical actions.

NOTES

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