

Clues of an environmental education for solid waste management: What do children draw in a municipal school in Cambé, PR?

Pistas de uma educação ambiental para gestão de resíduos sólidos: O que desenham as crianças de uma escola municipal de Cambé-PR?

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ABSTRACT

One of the biggest challenges faced in Brazilian cities is proper solid waste management. The school can be an interlocutor in raising awareness by directing the teaching and learning process in order to change the individual and collective behavior of students. Thematic workshops are characterized as a pedagogical intervention in which environmental education is approached in a dynamic, interactive and creative way. The objective was to identify the perceptions that children from a municipal school in Cambé, PR, have about the solid waste theme, based on drawings made during a workshop called “Composting at school”. The workshop was conducted by 11 undergraduate students attending the Environmental Engineering course at the Federal Technological University of Paraná – accompanied by a professor coordinating the action. As teaching methods, dynamic exercises, games and conversations were used, all with the aim of integrating children and promoting a reflection on the role of each one in proper solid waste management. At the end of the activity, an evaluation questionnaire was proposed to the children, which contained the proposition of a drawing, so that they could portray what they learned and their perceptions about the solid waste theme. From a view guided by Content Analysis, the drawings were classified into three categories: a) workshop stages and dynamic exercises; b) techniques for solid waste management; and c) non-human life forms in solid waste management. The workshop was a promising environmental education strategy, as it was noted that the greater the interaction and the lighter and more pleasant the activity, the greater the learning.

Keywords: Composting. Early childhood education. Environmental education.

RESUMO

Um dos maiores desafios enfrentados pelas cidades brasileiras refere-se ao manejo adequado dos resíduos sólidos. A escola pode ser a interlocutora na sensibilização, direcionando o processo de ensino e aprendizagem para mudar o comportamento individual e coletivo de estudantes. Oficinas temáticas se caracterizam como uma intervenção pedagógica, em que a educação ambiental é abordada de forma dinâmica, interativa e criativa. Neste contexto, o estudo objetivou identificar as percepções de crianças em uma escola municipal de Cambé-PR acerca da temática dos resíduos sólidos, a partir de desenhos elaborados em uma oficina denominada de “Compostagem na escola”. A oficina foi conduzida por 11 estudantes de graduação do curso de Engenharia Ambiental da Universidade Tecnológica Federal do Paraná, acompanhados por uma professora coordenadora da ação. Empregou-se, como métodos de ensino: dinâmicas, jogos, conversas, todas com o intuito de integrar as crianças e promover a reflexão sobre o papel de cada uma no manejo adequado dos resíduos sólidos. Ao final, foi proposto para as crianças um questionário que continha a proposição de um desenho, de modo que pudessem retratar suas percepções acerca da temática de resíduos sólidos. A partir do olhar guiado pela Análise de Conteúdo, os desenhos foram classificados em três categorias: a) etapas e dinâmicas da oficial; b) técnicas para gestão de resíduos sólidos; e c) forma de vida não humana na gestão de resíduos sólidos. A oficina foi uma estratégia de educação ambiental promissora, visto que se notou que quanto maior a interação e prazerosa a atividade, maior é o aprendizado.

Palavras-chave: Compostagem. Educação ambiental. Educação infantil.

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INTRODUCTION

In the National Environmental Education Policy (PNEA), according to its Art. 1, Environmental Education is characterized by the possibility of individuals and the community building “social values, knowledge, skills, attitudes and competences aimed at the conservation of the environment” (Brasil, 1999, online).

This view and demarcation of the importance of Environmental Education is highlighted by the United Nations Educational, Scientific and Cultural Organizations (UNESCO, 1990, p. 92), while it is recognized as a process that must be permanently invested in and operationalized, and, through it,

(...) individuals gain awareness of their environment and acquire knowledge, skills, values, experiences, and also the determination, which will enable them to act – individually and collectively – to solve present and future environmental problems. (UNESCO, 1990, p. 92)

The environmental education process is part of education for citizen formation and, due to its transversal characteristic, it promotes attitudes, values and contributes to the development of “essential skills to respond to the challenges of society in the 21st century” (Câmara et al., 2018, p. 5). It provides subsidies for thinking about the impacts of the present and possible actions from an ecological, value-based, collective and contributory logic.

In this sense, PNEA’s Art. 10 establishes that Environmental Education may be able to trigger an ecological literacy process, being carried out as an “integrated, continuous and permanent educational practice at all levels and in all modalities of formal education” (Brasil, 1999, online).

In the context of formal Environmental Education, taught in schools, Carneiro, Oliveira and Moreira (2016) point out that it can be approached in different ways in the classroom. Berbel (2011) adds that a single form of teaching does not reach all students, making it necessary for teachers to seek diversified and creative methodologies and epistemological perspectives in order to gain the attention and have everyone participating. These methods can bring the student a sense of belonging and promote, in this case, environmental awareness and sensibilization, given that they are a mediative path through which Environmental Education is carried out.

Souza et al. (2014) applied several strategies, such as workshops, games, educational videos and creation of posters, in a municipal childhood education school, with students and teachers, achieving greater environmental awareness in the school community, enhancing the resolution of environmental problems and strengthening care with the environment. Furthermore, the authors

stressed that the initiative to implement an Environmental Education program made the school community adopt new models for solid waste management. Thus, promoting Environmental Education by diversifying teaching methods results in potential learning and encourages other institutions to invest in educational practices from the perspective of thinking about the environment and environmental values.

In this context, the school institution plays a fundamental role in the development of children and the promotion of environmental thinking. Thus, it is necessary to insert environmental education into school practices so that, more and more, environmental awareness becomes something intrinsic in society. This importance becomes even stronger because, according to Menezes (2012), children are agents that multiply information and formation, directly or indirectly, in relation to the environmental issues of which they have knowledge. In this way, investment in Environmental Education processes starting in childhood enhances a critical, shared, disseminated and collaborative environmental awareness for other sectors of society that did not have such an opportunity.

In this sense, the importance of seizing Environmental Education opportunities in childhood is highlighted, thus providing children with a sense of responsibility for a better world – better in the sense of a world with greater environmental awareness, autonomy and responsibility when it comes to acting in society. It is then important that practices develop their creativity and sensibility (Hansen, 2018), bringing about a sense of belonging and a reflection on their actions towards the environment.

With regard to the diversification of teaching methods to enhance such development, it is noteworthy that games, artistic and ludic activities, when used appropriately, provide children with a certain knowledge and expression in a pleasant way (Lopes & Ferreira, 2016). Drawings, for instance, contribute to a better understanding of the subject studied.

Work from a multi-instrumental perspective, that is, with varied teaching methods, is also helpful, as it allows dealing with contemporary themes and allow thinking about contemporary environmental challenges and actions in the face of the latter in multiple ways.

Proper solid waste management is among the biggest challenges for Brazilian municipalities (Souza et al., 2014). The solution to these challenges requires the involvement of citizens, and the school can be the interlocutor in this awareness process, making students actively participate in the educational process, promoting an individual and collective behavioral change, as they socialize by learning with their family nucleus, peers, friends, other students (Carneiro, Oliveira & Moreira, 2016) and with the other members present in their social

networks and connection possibilities.

It should be noted that, in order for such Environmental Education dynamics to be possible, it is extremely important to encourage and train teachers, as well as conduct studies, research and reflections on the difficulties in working with this theme – which is far-reaching and broad (Ruffino, 2003; Machado & Terán, 2008). Faced with this scenario, thematic workshops gain space as a possibility of pedagogical intervention. Through them, environmental education can be approached in dynamic, interactive and creative ways, making use of the possibility to diversify teaching methodologies and student engagement (Grzebieluka, Kubiak & Schiller, 2014).

Almeida, Bicudo and Borges (2004) highlight the importance of using workshops as a didactic strategy, as they involve teachers and students, generating reflections and collective constructions regarding practices, which result in greater interaction with the social and natural environment. These environments make it possible for students to express their perceptions, negotiate them and come up with other possibilities of thinking.

Understanding this scenario, the present research work aims to identify the perceptions of children from a municipal school in the state of Paraná about the solid waste theme, based on drawings made during a workshop called “Composting at school”.

MATERIALS AND METHODS

In order to understand children’s perceptions about solid waste, this study sought to be anchored in a qualitative investigation of an exploratory nature (Minayo, 2012). Qualitative research seeks to present an interpretation of the world, in accordance with the meaning that people give to events (Denzin & Lincoln, 2006). According to Vieira and Zouain (2005), qualitative research proposes itself to study reports, speeches, actions and meanings referring to everything that is transmitted by the people involved.

The data presented in this manuscript were produced from a workshop with the “Composting at school” theme. The workshop was conducted by 11 undergraduate students enrolled in the Environmental Education discipline pertaining to the Environmental Engineering course, at the Federal Technological University of Paraná – Londrina Campus –, accompanied by a professor coordinating the action –, during a one-off intervention that took place on October 5th, 2018. This intervention was carried out in the multisport court of a municipal school located in the outskirts of the municipality of Cambé - PR. A total of 45 elementary education children, aged between 7 and 10 years old, participated in the activity.

The intervention was prepared in the format of a workshop entitled “Composting at school”. This workshop was organized with a view to diversifying the teaching methods employed, using: dynamic exercises,

games and conversations, all seeking to integrate the children and promote a reflection on the role of each one in proper solid waste management. Each theme presented was divided into “stations”, but first, the objective of the “Composting at school” workshop was presented, and a dialogue was conducted with the children, with a view to raising awareness about the importance of waste sorting and composting.

For the first dynamic exercise, two areas were delimited at the center of the court in order to represent polluted rivers, and the waste present was that generated in the children’s daily life, such as paper, plastic packages, bottles, etc. A story was told, involving cities close to the riverbank and affected by the pollution. The children reflected, expressed themselves verbally/orally and were invited to clean up the river. Such a mission was only possible with the participation of the entire group and resulted in a reflection on how much we are all involved in the causes and consequences of environmental problems, so everyone needs to be involved in problem solving – that is, it sought to create the conception of a collective practice for action in the face of environmental problems.

After the dynamic exercise, the children were split into groups of 6-8 people and went through the activity stations. At the first station, they played a small game to segregate solid waste into recyclable, organic and reject. Initially, there was a brief dialogued expository presentation of the types of waste and proper disposal, and then the children, subdivided into two rows, took samples of waste available in a bag and discarded it in the corresponding bin (green, brown and gray).

At the second station, the children, mediated by the undergraduate students, learned about the materials that could be treated via composting and the classification in accordance with their predominance as a source of carbon and source of nitrogen for the process.

Then, at the third station, they were presented, through images and explanations, with methods for composting, the proportions of waste that should be used, and the advantages and disadvantages of each system.

At the fourth station, the children were introduced to vermicomposting and, using gloves, they could pick up the worms in their hands and analyze their morphology. They learned about the benefits of this technique, saw the final compost and evaluated its visual appearance, texture and smell.

After going through all the stations, the children were able to plant a flower, whose seedlings were donated by the Municipal Secretariat for the Environment (SEMA) of Londrina - PR. Planting was done in a PET bottle vase, with the addition of organic compost resulting from composting. Thus, the children were able to experience the end of the composting cycle: the use of compost to fertilize plants.

In the week following the “Composting at school” workshop, a questionnaire was proposed to evaluate the latter, which contained the proposition of a drawing, so that the children could portray what they learned from the activities and their perceptions about the solid waste theme.

The drawings presented by the children were analyzed using Content Analysis (CA), based on Bardin (2016). To this end, the analytical movements described by the author were employed, namely: I) a pre-analysis movement, in which the material was selected and organized, a scanning reading was performed, and the material’s potential for analysis in relation to the objective of the investigation was identified; II) a material exploration movement, in which the materials were coded in relation to the child who delivered them and the delivery-analysis order, the drawings were taken as units of record, and the latter were aggregated into categories; and III) the results processing movement, which sought, from the categorizations, to enable movements for interpretation and inference from the reading, as well as support and discuss the categories, from specialized bibliographic bases available in the literature.

It is noteworthy that this work is anchored in the guidelines of Resolution No. 510, April 7th, 2016 (Brasil, 2016). Such investigation is based on Article 1, paragraph VII, which mentions that all research that aims at the theoretical deepening of situations that emerge spontaneously and contingently in professional practice, as long as it does not reveal data that can identify the subject, safeguards the identities of students and does not need to be submitted to the Ethics and Research Committee on Human Studies.

RESULTS AND DISCUSSION

In this sense, the analytical movement sought to identify the perceptions that children from a municipal school in the state of Paraná have about the solid waste theme, based on drawings made in the workshop called “Composting at school”. According to Candau (1999, p.11):

(. . .) workshops are spaces for collective construction of knowledge, for analyzing reality, for confronting and exchanging experiences, for the concrete exercise of human rights. Activity, participation, socialization of the word, experiencing concrete situations through sociodramas, analyzing events, reading and discussing texts, holding video debates, working with different expressions of popular culture, etc., are elements present in the dynamics of workshops.

This movement carried out from the drawings

produced by the children and the view guided by Content Analysis (Bardin, 2016) made it possible to elaborate on three emerging categories: Category A) Workshop stages and dynamic exercises, in which perceptions about solid waste and intervention are portrayed by means of representations of the stages and exercises related to the very pedagogical dynamics organized in a workshop format, which highlights this way of organizing the educational process; Category B) Techniques for solid waste management, in which the students’ perceptions about the theme are associated with a practical term, with action, with acting guided by a technique that makes environmental care possible; and Category C) Non-human life forms in solid waste management: this category represents that the environmental perception is related to other beings, to other non-human forms of life that can be enabled or harmed by the ways in which we deal with solid waste, that is, it is the category that represents the perception of forms of life other than human.

An organization was carried out as to the categories and to the number of units/drawings that integrate these visual representations of the category (Table 1).

In Category A, drawings involving the processes of the “Composting at school” workshop were presented, evidencing at least two relationships: I) the relationship that the elaborated perceptions have a direct relationship with the choice of the format of the pedagogical intervention and teaching methods employed along the lines of a workshop, representing its potential; II) the relationship that the perceptions have a direct connection with the processes by which children learn and elaborate knowledge about what they have learned. This was evidenced by means of the illustrations that refer to the stages and items of each of the “stations”, making it possible to identify what most drew the children’s attention.

Throughout the workshop, the stages sought to be attractive to the children, creating the possibility of an environmental awareness elaborated from dynamic exercises, games and activities, with composting being a means for children to understand waste management aspects, other living beings involved in them and the development of environmental care practices (such as composting). It should be noted that composting is a controlled process of aerobic decomposition of organic waste, which, through the action of microorganisms, transforms organic matter into a more humified product. During the process, heat, carbon dioxide and water vapor are produced (Kiehl, 2002).

In addition, the workshop provided, in this sense, the creation of a scenario for the children to reflect on waste and their reality. The workshop provided a space for locating these themes in the children’s lives. Teixeira (1995, p. 23) points out that “ludic activities help children play, that is, they have fun and, at the same time,

Table 1
Drawings and units of records in categories.

Categories	Units of record	Drawings
Workshop stages and dynamic exercises	11	
Techniques for solid waste management	16	
Non-human life forms in solid waste management	18	

Source: The authors.

act, feel, think, learn and develop". Thus, the workshop exercises created this possible territory – due to this, the children's illustrative representation shows the workshop stages in this process.

The relationship of the represented figure is linked to the lived experience and the way in which the children's ludic side allows them to perceive and represent such a drawing. It is noted that the ludic character – and ludic activity –, in addition to prioritizing freedom of expression, also makes children learn in a participatory manner and reach different levels of development (Lopes & Ferreira, 2016). Each workshop stage stimulated the children's creativity and curiosity, a contributing factor to learning, since, according to Bertuncello and Bortoleto (2017), creativity and curiosity can be understood as "an intense desire to see, hear, know, experience something". This may explain, in a way, the reason for the children's attention in the workshop stages and why 11 of them illustrated the process.

In Category B, the techniques for solid waste management were illustrated, regarding the treatment of organic waste, recyclables and rejects. This category

represents that the construction of a perception about solid waste and environmental aspects is spanned by practices of action in the world. With respect to these practices, the composting method using drums was illustrated, an alternative to composting windrows and ideal for compact spaces, and so was content on the composting process, such as: carbon/nitrogen ratio, best waste for the process, and monitoring of the system. Some drawings also illustrated the correct separation of waste into rejects, recyclables and organic waste.

According to Santos (2007), projects using composting and solid waste management, inside and outside the classroom, with 3rd and 4th grade children were important for the students' learning with regard to environmental values, as they showed great interest in and knowledge about the topic, in addition to developing environmental responsibility. This interest derives from two relational movements: I) an interest in facing a new practice crossed by technical production and marked by science as a possibility of construction and understanding; II) the understanding that acting in the world is crossed by practices through which we are able to establish a

relationship with nature.

According to Peres (2017), environmental education, based mainly on the ecologically correct composting process, can significantly contribute to the school education of children, promoting changes in their conduct and raising awareness about their choices as consumers and as citizens who continually produce and need to dispose of solid waste. Composting practices for children in the 3rd and 4th grades of elementary school aroused greater interest in the theme concerning the preservation of the environment and disposal, for recycling, of various types of waste, as presented by Peres (2017).

The children also learned, at the fourth station, about vermicomposting with the presence of earthworms. Vermicomposting is understood as

(. . .) degradation, under controlled conditions and in the presence of oxygen, of the organic fraction of certain types of waste, using the best possible technologies and different species of earthworms as a biological agent in symbiosis with the microbial fauna. The interaction between organic substrates, microbial fauna, earthworms and other invertebrates causes their rapid bio-oxidation and stabilization. (Lourenço, 2010, p. 41)

In this sense, Category C presented drawings that were related to non-human life forms in solid waste management, such as earthworms and flowers, a process in which it is understood that other forms of life that make up the environment are related to the cycling of solid waste, and may be harmed by poor waste management. From the number of drawings illustrating earthworms (18), it was noticed that the interaction with their morphology by touch caught the children's attention.

Taylor and Pacini-Ketchabaw (2015) observed that earthworms attract children, who are fascinated by their movements. Some children often pick them up with a stick or even their hands and focus on the worms' responses as they contort under the soil or in their hands, or remain still while attached to the stick.

The authors (Taylor & Pacini-Ketchabaw, 2015)

also observed some of the children's behaviors when they come into contact with earthworms; some jump and laugh while commenting on how they tickle their hands, others look for a place to leave them safe and even seek to name them, while others also spend long moments watching their movements in their hands while sharing their own stories with the earthworms.

CONCLUSION

From the drawings made by the children, it was possible to identify their perceptions about the solid waste theme, showing what most caught their attention during the process, how they felt about this practice, and even signs of awareness and change. It was also possible to notice that dynamic exercises assist in their learning about more complex content, such as solid waste management and composting.

Category A contained drawings involving the steps taken during the workshop, enabling the creation of a space for locating these themes in the children's lives. Category B comprised illustrations on the techniques for solid waste management, perceptions that contribute to practices of action in the world, a type learning that enables change in each child's life. Finally, Category C was composed of drawings related to non-human life forms in solid waste management, such as earthworms and flowers. It was possible to notice that the interaction with the morphology by touch drew the attention of the children, both those who really liked the contact and those who did not want to touch them.

It can be considered that collecting drawings/illustrations provides relevant data with regard to what most calls children's attention; it is possible to understand how the message passed on reached the children, in addition to being a way of evaluating what should be maintained or changed for the next workshops.

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