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## RESEARCH ARTICLE

### ENVIRONMENTAL EDUCATION AS A STRATEGY TO FOSTER CIRCULAR ECONOMY IN A PUBLIC SCHOOL IN THE STATE OF AMAZONAS

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#### ABSTRACT

This paper aims to present a study carried out in a municipal school in the city of Manaus, in the state of Amazonas (Brazil). The purpose of the proposal was to assess students' perception of the concepts advocated by the circular economy and how environmental education contributes to circular actions in order to boost the local economy. Since environmental education is a political and pedagogical process, it was intended to assess the lifestyle, consumption habits and values of the students involved and their relationship with their environment. The methodology consisted of the application of a questionnaire to students of a public school, in order to assess their perception about the environmental theme and the promotion of circular actions, followed by an exploratory analysis of the information obtained. As a conclusion of the study, from the premise that the Amazon region is extremely vulnerable to human actions, it was realized that the lack of understanding about the environmental issue is strongly linked to the lack of actions focused on Environmental Management and Education, such as a bridge for clarification, awareness and training of those involved.

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## INTRODUCTION

This 20th century was a watershed when issues such as technology and consumption were put in check at the expense of our natural resources, since the rudimentary and artisanal style of production was totally modified by the advent of the industrial revolution. In the last 150 years, we have developed a linear production system, where we remove resources from nature, produce items for our consumption and dispose of at the end of the process. Added to this system, the population in a century has quadrupled, which has resulted in an overload of planet Earth, where today 1.5 planet per year is needed to sustain our consumption habits (Weetman, 2017).

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The United Nations already calls attention to the need for a change in this paradigm, where we need to start organizing the economy in a circular way so that waste is put back into a production chain, and where consumers - the last link in a chain - abandon the idea of using and throwing away (Sustainable Development Goals, 2020). In Latin America, 90% of municipal waste is sent to landfills. Data from the IPEA ([https://www.ipea.gov.br/portal/index.php?option=com\\_content&view=frontpage&Itemid=61](https://www.ipea.gov.br/portal/index.php?option=com_content&view=frontpage&Itemid=61)) record that only 13% of all this solid waste generated is destined for recycling, turning all this potential waste into a product. In Brazil, this percentage is distributed as follows: 50% Organic, 16% Paper, 11% Plastic, 5% Glass, 3% Metal and 13% Others. In this way, it is possible to see where the movement towards a circular economy begins, placing these already processed resources in a new production chain.

The data show urgency, indicating that responsibilities need to be assumed by all links in the chain. The industries need to improve the environmental management of their processes - both by managing their waste in production operations and their policies regarding reverse logistics, and simply looking for solutions that do not generate waste in their distribution. The public agent, through effective public policies, that will boost environmental education, which, in turn, will act as a link for awareness and decision making aiming at the preservation of the ecosystem, being a mechanism for the development of circular policies with sustainability. This work is the result of an Extension Project developed by the Federal University of Amazonas with a Municipal Public School, in order to observe the school's strategies regarding the Environmental Education theme, as this theme is discussed with students (children and youth) and how the school works in this environment. Cycles of lectures were carried out as well as practical activities with the community, regarding to recycling activities and selective collection for sending to recycling companies. The main objective of this work was related to the development of a critical sense to motivate students to change their attitude, to be aware of the impact on the environment according to their behavior and consumption pattern.

## LITERATURE REVIEW

**Environmental Education:** Considering that more recently the concepts of economics have been more widely discussed in teaching environments (Merli, 2017), the environmental issue becomes increasingly relevant, and it is vitally important to make people aware of their consumption habits and systems of production. Higher-education institutions have started to develop academic curricula, research capacity and extension activities that are related to the circular economy seeking to foster such practices through environmental awareness (Mendoza, 2019; Kirchherr, 2019). The themes of selective collection, waste disposal and the consumption of organic products are considered of low relevance to be worked on Environmental Education in municipal schools in Manaus. Thus, the relationship with the very low level of recycling of our solid urban waste is evident, data from SEMULSP show that from January to December 2018, 99% of the waste went to landfill, 0,05% were destined for recycling and 0, 92% were destined for composting (Environment Ministry, 2020; Municipal Secretariat of Urban Cleaning, 2020).

Environmental issues have been discussed worldwide for decades. Despite this, awareness is still insufficient because the problems continue to persist and only increase each year. The environmental problems that were and still were faced in the world have solutions that transcend politics and geographic issues due to their complexity and interdependence (Morad, 2015). One of the tools that can reverse this scenario is education, which is seen as the main lever for generating change. The authors also state that the present education is inefficient, as it is not appropriate for sustainable development and, of course, it leads society to live in an unprecedented way. Education is the key to intervention to bring about changes in values, behaviors and the lifestyle required to achieve sustainable development (Rodríguez-Chueca, 2019) point out that recent graduates which will be inserted in the market for the power to change they will still continue with an unsustainable mentality and will not take decisions based on awareness about sustainability and the environment.

For this reason, (Morad, 2015) emphasize that it is important that educational systems are reoriented towards sustainability, as the next generations will be aware of how their way of life impacts the environment, one that education is essential for having engaged citizens and willing to act in the face of environmental difficulties. Therefore, new forms of learning must be encouraged so that barriers to discipline, and culture of unsustainable thoughts are discouraged (Sandin, 2018; Suárez-Eiroa, 2019; Saavedra, 2017).

**Circular Economy:** According to (Ellen MacArthur Foundation, 2020) the economic model based on extraction, production and waste that we currently practice is reaching its physical limits. In this context, the circular economy is an alternative to redefine the notion of growth, with a focus on benefits for the entire society, decoupling economic activity from the consumption of finite resources, and eliminating waste from the system on a principle. Supported by a transition to renewable-energy sources, the circular model builds economic, natural and social capital, based on the principles of eliminating waste and pollution from the beginning, keeping products and materials in use and regenerating natural systems (MacArthur, 2013; Ellen MacArthur Foundation, 2020). In recent years, there has been pressure to accelerate the transition to a more sustainable society, as environmental problems such as, for example, the loss of biodiversity, resource exploitation and the most diverse types of pollution have increased (Geissdoerfer, 2017).

According to (Weetman, 2017), from the concepts called Cradle to Cradle, biomimicry, ecosystem services, industrial ecology and over-cycling, drive the concept of innovation for circular actions. Also according to the author, the pillars who support an economic and sustainable vision of society are related to nature conservation; limitation of toxicity; resource productivity; social ecology; cultural ecology. In fact, the concept of circular economy is also associated with that of sustainability, and they are widely disseminated through the initiatives of various entities and researchers (Sandin, 2018; Wilts, 2016; Romero, 2017; Mestre, 2017). In this context, sustainability can be defined as a set of human activities that are conducted without affecting global ecosystems. It is a transformation in the lifestyle of society that optimizes the conditions of well-being and health of the environment, always maintaining the supply of non-renewable materials (Geissdoerfer, 2016).

## METHODOLOGY

This work was elaborated from a case study. In this sense, the proposal sought to investigate how the contemporary problem of solid waste is related to environmental education. The research in question was carried out in a public school in the municipal school system, located in the south zone of the city of Manaus in the São Francisco neighborhood, which serves about 450 children between the morning and afternoon shifts, and covers early childhood education up to the 5th year, with children aged 5 to 11 years. In addition to regular activities, the school offers a program called "pit-stop" for school reinforcement for students who have difficulties. The study was carried out in the months of July and August 2019, where, first, the research proposal was presented to teachers, coordinators and pedagogues so that everyone understood the work plan that would be developed at the school.

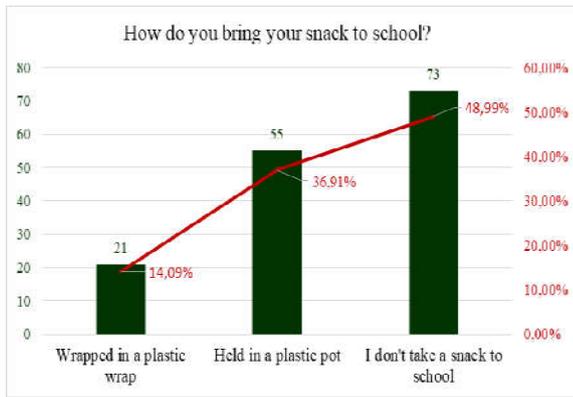


Fig. 1. Plastic utilization

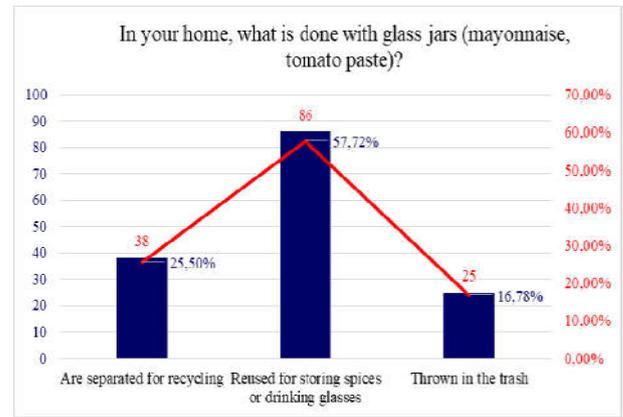


Fig. 5. Use of glass utensils

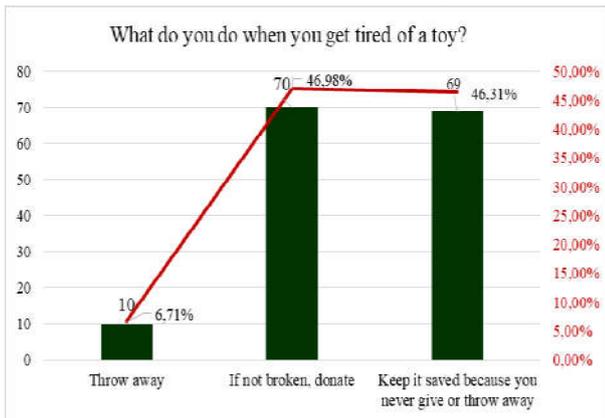


Fig. 2. Posture with respect to the use of toys

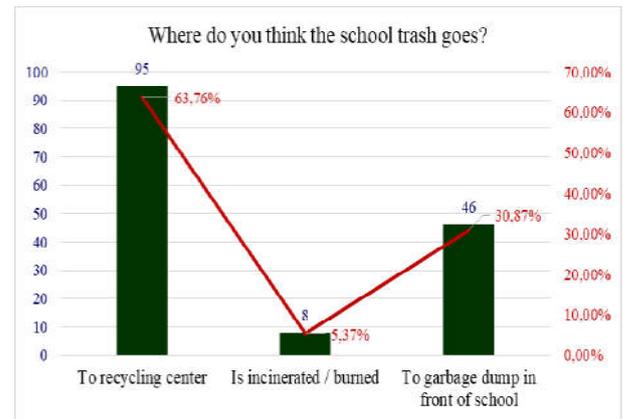


Fig. 6. Waste destination generated at school

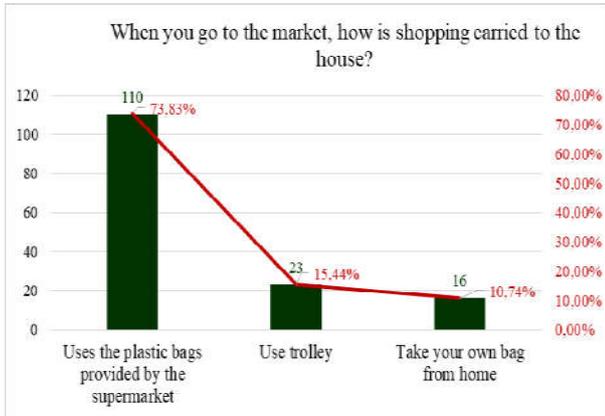


Fig. 3. Habit of using plastic bags in supermarkets



Fig. 7. Waste destination generated at student's home.

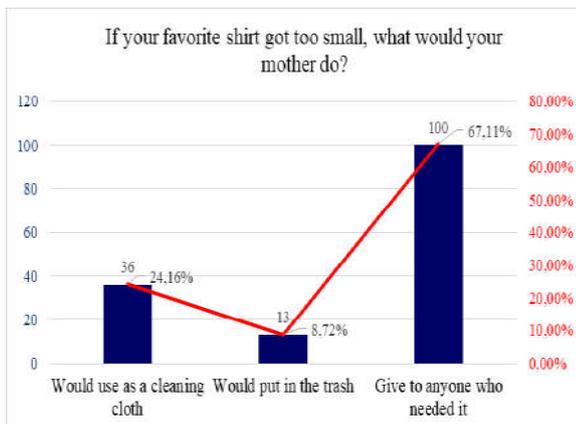


Fig. 4. Habit of using clothes

In a second step, the work was developed by the children, with the application of a questionnaire. The questionnaire was developed for the purpose of understanding how children relate to the solid waste generated both at school and in their home space, what is the understanding of this chain and how they see themselves as part of the process. An amount of 152 students answered the questionnaire, resulting in a rate and response of around 35%. Based on the data obtained, an exploratory study was carried out related to the students' environmental practices. In addition, the physical structure of the school was analyzed in relation to its performance regarding solid waste. The collectors used in the school were verified, both in common spaces and in classrooms. It was also analyzed how the waste produced by the school itself in its operation is discarded, and whether the school has any visual orientation for students or even the existence of class activities related to the theme of environmental education.

## RESULT AND DISCUSSION

Next, we evaluate the data obtained in the research and a brief discussion of its content, from those related to the consumption pattern such as those related to the environment. Regarding the question that investigates whether students take snacks to school and how they store them, we have that 48% of respondents say they do not take food from each to school. However, those who claim to take a meal, about 52% use bags or plastic pots, and the bags are thrown in the trash, as shown in Figure 1. Regarding to the question that investigates what students do when they no longer want a toy, we have that 47% of respondents donate them and 46% put them kept. However, about 10% throw toys in the trash, as shown in Figure 2. Regarding the question related to the purchase of products in supermarkets, we have that 73% of respondents use plastic bags offered by supermarkets to store and transport their purchases. Only 10% take their plastic bags to transport their purchases in supermarkets, as shown in Figure 3. Regarding the question related to the use of clothes, we have that 67% of respondents use to donate them when they are no longer used. However, about 24% use them as a household cleaning cloth and 9% throw garbage that no longer serves, as shown in Figure 4. Regarding the question related to the use of utensils made of glass, usually consumer products (soft drinks, food, etc.) that use this type of packaging, we have that, after its use, about 25% of respondents separate them for recycling. However, about 58% reuse it for different applications and 17% throws it in the trash after use, as shown in Figure 5.

Regarding the question related to the destination of the garbage generated in the school, we have that about 64% of the respondents believe that they are sent for recycling. For about 31%, it is sent to containers that exist at the school, in order to be collected for the dump. 5% already believe that the garbage is incinerated, as shown in Figure 6. Regarding the question related to the destination of the garbage generated in the students' homes, we have that about 64% of the respondents believe that they are sent for recycling. For about 31%, it is sent to containers that exist at the school, in order to be collected for the dump. 5% believe that the garbage is incinerated, as shown in Figure 7. Finally, regarding the last question in the questionnaire, in which it is intended to know whether the waste generated in the residence was separated and sent for recycling, we have that about 55% of the respondents reported that the waste was recycled. For 45% of respondents they reported did not separate waste to recycle, believing that this is the responsibility of the public agency.

### Conclusion

After the presentation of the theme that this work proposed, the teachers were very willing and engaged to participate in the project, including contributing ideas for the improvement of activities. The first observation of the school structure is the lack of appropriate containers for the selective collection of waste generated by the school's own operation. For example, in the cafeteria where food is produced, a large daily amount of plastic food packaging is generated, organic waste and oil already used in food preparation, which are not disposed of properly. It was also noticed that the students' attitude is to believe that they have no environmental responsibilities, since they understand that this is the role of the public sector. That is, the collection, separation and recycling of materials should be the responsibility of public agents, forgetting themselves that they are the initiating agents of this process. It is a fact that

immediate actions to promote new sustainable production models and consumption habits must be implemented. How it takes time, as these are habits developed over many years, and behavioral and cultural change are known to be a slower process of consolidation.

In this context, the emphasis on educational public policies, oriented towards environmental preservation, can assist in the understanding and implementation of the concepts advocated by the circular economy, seeking more sustainable and environmentally correct operations. However, this will not be possible without the development and maturity of the main agents of this process: the human being. Moreover, a space opens up for reflection on the socio-economic-environmental future if these possibilities brought about by circular models are neglected. Actions aimed at environmental education will be the spearhead for the development of research that results in better products, processes and business models. However, its main task will be to promote people's awareness and their role in society, which will happen through education and, in this study, in particular, environmental education.

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