



## Lectures on proper garbage disposal: Awareness among high school students

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### **ABSTRACT**

The development of activities related to Environmental Education has a significant impact on the formation of a more conscious society. The approach to the environment in the school plays a crucial role, since the school is an institution where students must learn to socialize and adopt an ethical behavior towards society and nature, and this can be done through contextualization in the teaching of Chemistry. In the present study, which aimed to raise students' awareness through lectures about the impacts of garbage on people's health and the environment, it was observed that students showed interest in the theme, suggesting that schools should include more information about it in their curriculum. The data obtained during the lectures and questionnaires show a variety of perceptions, knowledge and attitudes of the students in relation to the correct disposal of garbage and its consequences. This information is crucial for the improvement of classes and to promote more responsible waste management practices, contributing to the preservation of the environment and public health. The results also help in the preparation of future lectures, since students may or may not have previous knowledge about the topic addressed.

**Keywords:** Environmental education, Contextualization, Chemistry Teaching.

### **1 INTRODUCTION**

The teaching of Chemistry requires an educational approach that ends in the construction of critical citizens with sufficient autonomy to appropriate the reality in which they are inserted and modify it in a constructive way, because learning is intimately linked to the act of building and interacting (SANTOS *et al.*, 2011). It should enable students to understand in a holistic way the chemical transformations that take place in the physical world, so that they can conceive the information and phenomena that happen in everyday life with confidence and grounding (ALMEIDA *et al.*, 2008).

Contextualization in the teaching of Chemistry goes beyond the mere reproduction of the objectives established in the contents of the program, as it instead involves the reinterpretation of these in the light of the interests of the population, the local peculiarities and the social issues faced by the students (COELHO; LIMA, 2020). And one of the ways in which this can be done to effectively contribute to the good of all is through Environmental Education, which is understood as the processes in which the individual and the community build social values, knowledge, skills, attitudes and competencies aimed at the conservation of the environment (BRASIL, 1999).

The stimulation and development of activities related to Environmental Education have a significant impact on the formation of a more conscious society. The approach to the environment in the school plays



a crucial role, since the school is an institution where students must learn to socialize and adopt an ethical behavior in relation to society and nature (SILVA; SILVA, 2020). In addition, the insertion of Environmental Education in different phases of education is an important tool for social transformation (PROCÓPIO *et al.*, 2021). In this change, people can realize that the inappropriate use of natural resources can harm everyone's quality of life, and that caring for the environment is everyone's responsibility, not just the government. In addition, citizens should be able to actively participate in decision-making to help control and supervise agents responsible for environmental degradation (BORTOLON; MENDES, 2014).

Reflections on the interactions between living beings, between human beings and their own nature, and between human beings and their peers is fundamental in all educational practices for Environmental Education to be effective. Therefore, in addition to addressing environmental issues, it should promote the formation of values and encourage people to play an active role in the exercise of citizenship (SILVA *et al.*, 2019). Thus, it is useful to implement Environmental Education in the classroom when the object is to contribute to the preservation of nature and public health.

In this sense, within Chemistry classes it is possible to promote Environmental Education by exploring various topics of the basic curriculum, especially because Chemistry is intrinsically related to various sources of pollution caused by human activity, including the generation of electronic waste, pollution of the atmosphere, degradation of water reserves, contamination by plastics and fossil fuels, use of pesticides, among others (ROCHA *et al.*, 2021). However, in order to get the attention of the class, the teacher must contextualize their contents, creating problem situations that relate that particular theme to the students' daily lives. Thus, it is essential that Environmental Education be carried out in an interdisciplinary way (VELOZO *et al.*, 2022).

Since it is essential to make people aware of environmental issues and that they play an active role in contributing to the preservation of the environment and by demanding actions from the government (ROCHA *et al.*, 2021), Chemistry can serve as a tool through which Environmental Education is conceived as a continuous learning process that enables the valorization of multiple forms of knowledge, enabling individuals to become conscious citizens (SANTOS *et al.*, 2011).

Until the 1990s, in Brazil, there was no discussion about the problem of environmental contamination arising from the post-consumption of batteries, and the lack of awareness of people about the environmental risks associated with the improper disposal of these products, or even due to the absence of collection points, which should be provided by the companies that sell these items. They were routinely discarded in the common garbage (SILVA *et al.*, 2022).

However, the disclosure of environmental issues has expanded considerably, offering a wide variety of ways to access information related to this topic. This includes the use of news reports, documentaries,



television programs, experiments, visits to museums, universities, zoos and lectures as tools for an interdisciplinary approach to environmental issues (BENASSI *et al.*, 2015).

Therefore, and especially lectures, from the perspective of Environmental Education, it has the potential to instruct people to have a more critical and contextualized look at the events that occur in the world, which can contribute to a more conscious society, with more people willing to take a stand on environmental issues. In addition to Environmental Education having an interdisciplinary content and encouraging people to practice the exercise of citizenship, scientific dissemination through lectures, under the sociocultural bias, is conceived as a propeller of critical-reflective capacity, as it integrates technical-scientific learning with cultural and political training (PARRA; KASSEBOEHMER, 2018).

## **2 OBJECTIVE**

The objective of this work is to promote awareness among high school students about the importance of proper garbage disposal and to collect information about the degree of familiarity and perception of students in relation to the subject.

## **3 METHODOLOGY**

The lectures were promoted by students belonging to the PET-Chemistry group of the Education and Health Center of the Federal University of Campina Grande, located in the municipality of Cuité-PB. They were held on June 15, 2023 at the Orlando Venâncio dos Santos Integral Citizen School, in the municipality of Cuité-PB, in a class of the 1st year of High School and on August 25, 2023 at the José Vitorino de Medeiros Integral Citizen School, located in the municipality of Sossêgo-PB, involving two classes of the 2nd year of High School. Figure 1 shows the moment when the lectures were conducted in the schools.

Figure 1. Execution of lectures in schools



Source: Survey data (2023).

To increase the visibility of the lectures, Instagram was used as a dissemination tool. This strategy was carried out through the official profile of the PET-Química group, enabling an effective approach to reach and engage the target audience. Instagram, as a popular social network for sharing visual content, made it possible to create attractive and informative posters, containing date, place, speaker and topic addressed, as can be seen in figure 2.

Figure 2. Informative posters about the lectures that took place in the schools.



Source: Survey data (2023).

In the preparation of the lectures, a bibliographic survey was carried out on the impact of garbage on human health and the environment, the types of garbage and their consequences, waste management,



correct disposal practices, as well as recycling and composting, and the relationship between Environmental Education and awareness.

At the beginning of the lectures, a quantitative questionnaire was applied, with eight questions, to be collected only at the end. The objective of this questionnaire was to obtain a survey of information about the age group of the class, the level of contact and the conceptions of the students regarding the theme, and what suggestions they would have about Environmental Education practices to avoid the improper disposal of garbage.

The lecture began with some questions for the students about what they knew about Environmental Education and garbage disposal. After that, some important points were addressed, such as the impact of garbage on human health and the environment. Then, each type of waste and its consequences was presented, as well as some correct disposal practices that students could do in their homes. The lecture ended with some explanations about Environmental Education and awareness, examples of good practices, and how engagement in communities on the subject can arise from individual and collective actions.

It should be noted that the lectures and the application of the questionnaires were carried out in the classroom, with the presence of the teachers responsible for the classes.

#### **4 DEVELOPMENT**

The results of the first question of the questionnaire, "What is your age group?", revealed an interesting distribution among the age groups of the students who participated in the lectures. Of the options provided, "13-15 years old", "16-18 years old" and "19-21 years old", the majority, representing 57% of the students, marked that they were in the age group of 13 to 15 years. Meanwhile, 43% of the students answered that they were in the age group of 16 to 18 years, as can be seen in graph 1. These results raise several reflections and have important implications for the approach of the lectures and for raising awareness about the correct disposal of garbage.

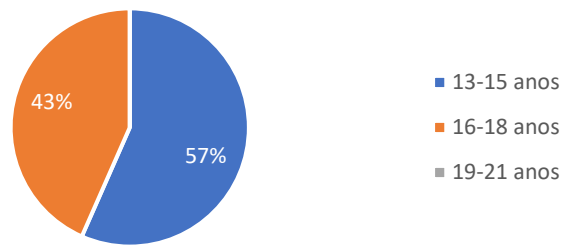
Firstly, the predominance of the age group of 13 to 15 years suggests a young target audience that is in a crucial period of life, where they are beginning to develop their identities, values and habits (TERRUGGI *et al.*, 2019; PENHA; TAVARES, 2019). These results are relevant for EE, since in this age group it can play a fundamental role in the formation of responsible citizens who are aware of the impact of their actions on the environment.

The considerable presence of students aged 16 to 18 is also significant. At this stage, adolescents are approaching adulthood and begin to make more autonomous decisions in their lives (TERRUGGI *et al.*, 2019; PENHA; TAVARES, 2019). Therefore, it is important that they are also well-informed about environmental issues, since they will soon be responsible for their own consumption choices and disposal practices.





Graph 1. Question Result "What is your age group?" in the questionnaires administered to the students.



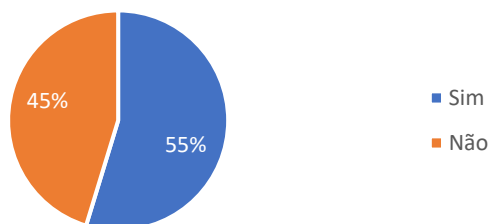
Source: Survey data (2023).

In addition, these results emphasize the importance of tailoring the approach of the lectures to meet the specific needs and interests of each age group. The topics covered and communication strategies can be adjusted to be more effective, taking into account the characteristics and stage of development of each group of students.

The second question in the questionnaire was: "Have you participated in any activity on the correct disposal of garbage before?" And the answer options were "Yes" or "No." The data obtained from this question revealed an interesting divide among the students.

As shown in graph 2, of the students who participated in the lectures, 55% answered "Yes", indicating that they had already had contact with the topic before attending the lectures. On the other hand, 45% of students checked the "No" option. Pointing out that a considerable portion of the audience was being exposed to information about the correct disposal of garbage for the first time during the lectures.

Graph 2. Result of the question "Have you participated in any activity on the correct disposal of garbage before?" in the questionnaires applied to the students.



Source: Survey data (2023).

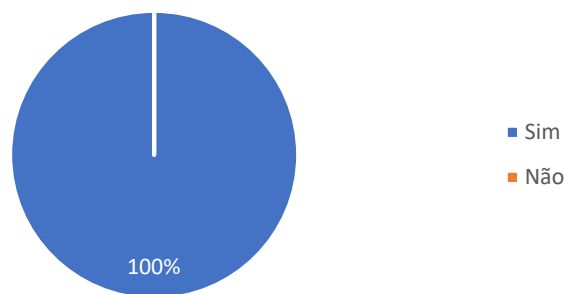
For students who have had previous experience, lectures can serve as a reinforcement and offer more advanced information to deepen their knowledge. On the other hand, for students who answered "No," the lectures represent a valuable opportunity to introduce themselves to this critical topic. This reinforces the



importance of tailoring lectures to meet the specific needs of both groups of learners, offering basic and advanced information as needed.

The results of the third question revealed that all the students who participated in the lectures answered affirmatively to the question "Do you believe that the incorrect disposal of garbage can affect people's health?", which had the options of marking "Yes" and "No", as shown in graph 3.

Graph 3. Result of the question "Do you believe that the incorrect disposal of garbage can affect people's health?" in the questionnaires applied to the students.



Source: Survey data (2023).

This unanimity in the answer "Yes" indicates a consensus among students regarding the direct connection between improper waste disposal and potential adverse impacts on human health. This unanimous perception suggests that students are well-informed about the risks associated with improper waste disposal and highlights an awareness effectively communicated during lectures. This understanding on the part of the students is relevant, since garbage not only interferes with the environment, but also with quality of life and public health (GOMES; BETHLEHEM, 2022).

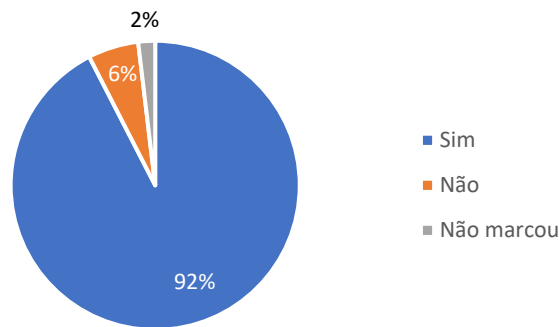
In addition, the results of this question demonstrate that all students recognize the importance of responsible waste disposal practices not only for the preservation of the environment, but also for the protection of public health. This insight creates a solid foundation for promoting positive behavior change. Because with a collective understanding of the health risks associated with incorrect waste disposal, students are more likely to adopt responsible disposal practices and influence their families and communities to do the same.

The data obtained through the fourth question of the questionnaire, "Do you believe that the incorrect disposal of garbage can cause harm to the environment?", which had the options of marking "Yes" or "No" showed that a total of 92% of the students believe that the incorrect disposal of garbage can cause damage to the environment. This significant percentage reflects a clear awareness among students that their individual and collective actions in relation to waste disposal can have adverse impacts on the environment.



On the other hand, a minority portion, equivalent to 6% of the students, chose to mark the alternative "No", expressing a divergent opinion and stating that there is no relationship between the improper disposal of garbage and damage to the environment. Additionally, 2% of students did not check any option, indicating a possible lack of response or indecision.

Graph 4. Result of the question "Do you believe that the incorrect disposal of garbage can cause harm to the environment?" in the questionnaires applied to the students.



Source: Survey data (2023).

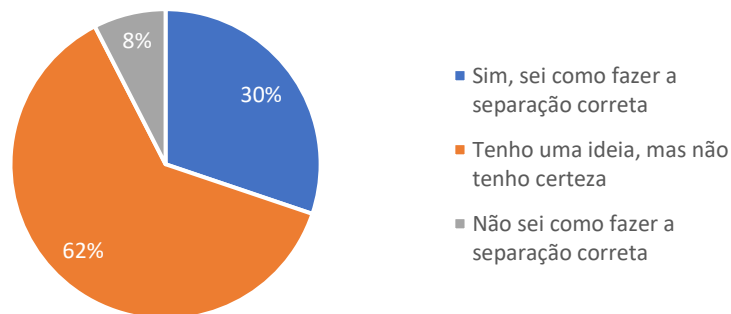
Since the improper disposal of garbage – among other things – can cause contamination of water bodies, floods, proliferation of vectors that transmit diseases and pests (MUCELIN; BELLINI, 2008), the results of this question reveal that most students recognize the interconnection between inappropriate waste disposal and potential environmental damage. However, the presence of a minority who expressed a different opinion highlights the complexity of perceptions and attitudes towards environmental issues. This reinforces the continuous need for practices that promote Environmental Education in schools to address concepts and clarify doubts regarding the interaction between human actions and environmental health. In this context, it is hoped that the lectures have contributed to the students' awareness.

To the fifth question, "Do you know how to properly separate garbage for recycling?", a percentage of 30% of the students answered affirmatively, as can be seen in graph 5. Indicating that they possess skills and know the proper procedures for separating waste destined for recycling. This portion demonstrates a satisfactory level of understanding and competence in relation to recycling practices. This positive finding is relevant, since simple measures such as selective collection and recycling are essential to reverse soil pollution, assist in the treatment of domestic and industrial waste, collaborate in reforestation and encourage the use of biodegradable materials (SOARES *et al.*, 2020).





Graph 5. Result of the question "Do you know how to properly separate garbage for recycling?" in the questionnaires applied to the students.



Source: Survey data (2023).

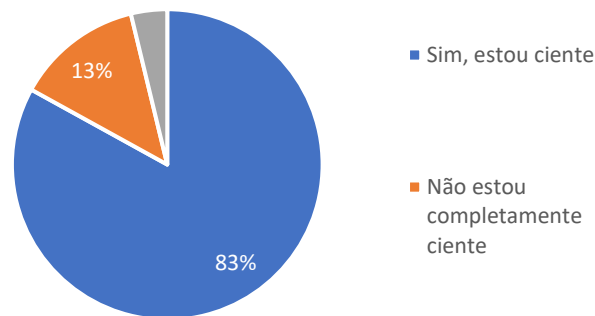
On the other hand, a significant majority of 62% of participants expressed that they "Have an idea, but are not sure" about how to carry out the correct separation of waste for recycling. This response suggests that many students possess some degree of knowledge or awareness of the topic, but may not be fully confident in their abilities or knowledge. This category represents a valuable opportunity to enhance retraining education and training through practices that approach Environmental Education in a more instructive way. In addition, the percentage of 8% of students who answered that they do not know how to do the correct separation reinforces the need for Environmental Education in schools to promote more comprehensive information about recycling and waste separation practices.

This survey also points to the continued importance of lectures and environmental awareness programs in schools. It also indicates that educational efforts should be directed at providing clear and practical information about recycling, ensuring that students not only know the importance but also know how to effectively implement these practices in their everyday lives.

With the sixth question, "Are you aware of the negative consequences of not disposing of garbage correctly?", which had the options of marking "Yes, I am aware", "I am not completely aware" and "I am not aware of the consequences", an overview of the students' perception of the theme of the lectures was obtained. As shown in Graph 6, a significant percentage of 83% of students responded that they are aware of the negative consequences of improper waste disposal. This finding is satisfactory, given that the effects generated by garbage have the capacity to affect large areas, representing a threat to the fauna and flora present in the environment, as well as to everything that is around them, as is the case of electronic waste (GALVÃO *et al.*, 2021).



Graph 6. Result of the question "Are you aware of the negative consequences of not disposing of garbage correctly?" in the questionnaires applied to the students.



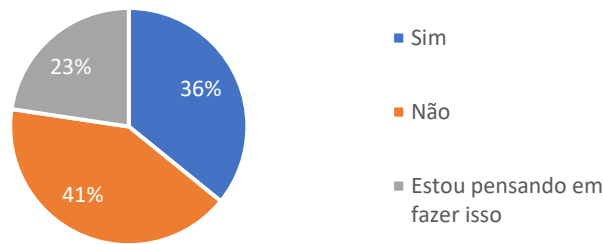
Source: Survey data (2023).

However, 13% of students stated that they are not fully aware and 4% that they are not aware of the consequences. Suggesting that there is room for further awareness and education in this segment in order to provide more detailed information on the implications of improper waste disposal. It also highlights the importance of educational programs that aim to provide basic information about the impacts of improper disposal. And on this occasion, it is hoped that the lectures will have contributed.

In the seventh and penultimate question, "Have you taken any measures to minimize the impact of waste on your community or the environment in general?", the results seen in graph 7 reflect the attitude and engagement of students towards reducing the impact of waste. A significant 36% of students checked the "Yes" option, indicating that they have already taken concrete steps to minimize the impact of littering. This percentage demonstrates an active group of students who are aware of the importance of action and who are already contributing positively to the reduction of environmental impacts. On the other hand, 41% of participants ticked "No," signaling that they have not yet taken specific steps to minimize the impact of litter on their communities or the environment. This group of students represents an opportunity for awareness and education, highlighting the importance of providing information and incentives to promote more sustainable actions.



Graph 7. Result of the question "Have you taken any measures to minimize the impact of waste on your community or the environment in general?" in the questionnaires applied to the students.

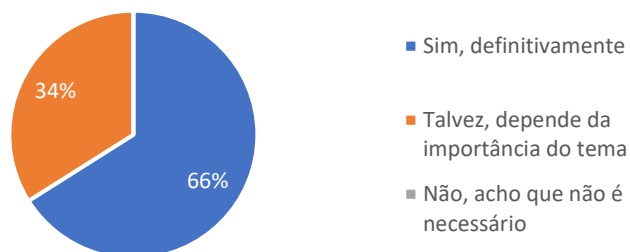


Source: Survey data (2023).

Finally, the 23% of students who checked the option "I'm thinking about doing this" denotes that a significant portion are considering the possibility of acting more responsibly regarding waste disposal. This disposition suggests an openness to awareness and future action, which can be harnessed by educational approaches that take into account sustainable principles.

The results obtained in the last question, "Do you think schools should include more information about the correct disposal of garbage in their curriculum?" were positive, as 66% of the students answered that schools should include more information about the correct disposal of garbage in their curriculum and 34% answered that maybe, depending on the importance of the topic. There was, therefore, no answer "No, I don't think it's necessary" to that question.

Graph 8. Result of the question "Do you think schools should include more information about the correct disposal of garbage in their curriculum?" in the questionnaires applied to the students.



Source: Survey data (2023).

These responses express strong support on the part of students for the idea that the topic of waste disposal is relevant and fundamental enough to be addressed more comprehensively in the school environment, as well as reflecting the importance of weighing the relevance of the topic based on its actual impact and perceived importance. Thus, emphasizing the continuous need for education and awareness on



environmental issues, and highlighting that the approach must be attractive to students when promoting Environmental Education actions.

## **5 FINAL THOUGHTS**

In the present study, which aimed to make students aware, through lectures, about the impacts of garbage on people's health and the environment, promoting information on ways to dispose of various types of garbage, it was observed that students showed interest in the theme, suggesting that schools should include more information about it in their curriculum. However, the approach and relevance of the contents are of paramount importance. It should be noted that some students stated that they did not know or were not fully aware of some topics covered in the lectures, thus, it is hoped that the lectures have favored the students' awareness.

In addition, the data obtained during the lectures and questionnaires show a variety of perceptions, knowledge and attitudes of the students in relation to the correct disposal of garbage and its consequences. This information is crucial for the improvement of classes and to promote more responsible waste management practices, contributing to the preservation of the environment and public health. Still in this context, the results also help in the elaboration of future lectures, since students may or may not have previous knowledge about the topic addressed.

## **ACKNOWLEDGMENT**

The authors would like to thank the MEC/FNDE for the financial support for the development of the project linked to the PET-Chemistry of UFCG.



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