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RELATIONSHIP BETWEEN THE PROMOTION OF SCIENCE FAIRS, HUMAN HEALTH AND THE ENVIRONMENT CASE STUDY FROM SOFALA PROVINCE

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SUMMARY

The present research aimed to assess whether there is a healthy relationship between the promotion of science fairs and care for the environment and human health from the point of view of the places where the shows originate as well as the places in which the fair activities take place. . For this purpose, it was essential to use direct observation and interviews at the location of the study. The research was hosted at Licungo University, Extension of Beira, with a sample of 36 participants. Supported by content and statistical analysis, the results allowed, through direct observation, to verify a poor organization of the event, meaning that there was a lack of conditioning that would adequately respond to the problem of managing solid waste produced during the days of the event; in the identification, it was noted that all science displays are related to human and environmental health, but that this is not effectively ensured by the protagonists of the experiments in the context of human health; Due to this and the results of the interview, we cannot investigate the relationship between environmental actions observed with human health and the environment, by educational institutions in the region. However, EA is an activity that requires a lot of permanent effort and that educators have time and interest.

Key words: Science fair. Human health. Environmental health. Science shows

ABSTRACT

This research aimed to assess whether there is a healthy relationship between the promotion of science fairs and care for the environment and human health from the point of view of the places where the shows originate as well as the places where the fair activities take place. . For this purpose, it was essential to use direct observation and interview at the place where the study took place. The research took place at Licungo University, Extension of Beira, with a sample of 36 participants. Supported by content and statistical analysis, the results allowed, in direct observation, to verify a deficient organization of the event, so there was a lack of conditioning that would respond to the problem of solid waste management produced during the days of the event; in the identification, it was noted that all science shows are related to human health and the environment, but that is not effectively ensured by the protagonists of the experiments in the context of human health; Due to this and the results of the interview, we cannot verify the relationship applied between environmental actions verified with human health and the environment, by educational institutions in the region. However, EA is an activity that requires a lot of permanent effort and that educators have time and interest.

Keywords: Science fair. Human health. Environmental health. science exhibits

1. INTRODUCTION

Science fairs are "[...] a technical-scientific-cultural enterprise that aims to establish the interrelationship between the school and the community" (MORAES, 1986, cited by BERTOLDO & CUNHA, 2016, p.2). On the other hand, they must not be dissociated from caring for the environment, including human health through the promotion of environmental education in schools, especially in fair activities and/or science exhibitions.

As a result, a bibliographical tour carried out by the authors of this research allowed us to verify that in Mozambique there is an effective lack of studies that address the care of the environment and humans in places where fairs occur and much fewer studies that relate this occurrence to environmental health. environment and human in the places where the experiments originate. The prevalence of a lack of these studies can weaken the integration of knowledge about environmental education, which in turn may affect the health of the environment and humans. And, taking into account that environmental education topics have a great social impact, it is essential to check related actions in places where fairs are prepared and held at all levels. Therefore, the question remains whether the promotion of science fairs is

care for the environment and humans.

The objective of this article is to assess whether there is a healthy relationship between the promotion of science fairs and care for the environment and human health from the point of view of the places where science shows and/or scientific experiments originate, as well as places where fair activities take place. The specific objective was to identify experiments that promote care for the environment and human health displayed at the fair's location; describe experiments that promote care for the environment and human health; verify which environmental actions are carried out by the fair's actors in the places where their exhibitions and/or experiments originate, as well as in the place where the fair took place. The object of study are 36 students participating in the fair, from 12 districts in the Sofala region. However, the study is of great value as it allows students to awaken environmental attitudes in order to consolidate not only their environmental awareness but also the constructive critical spirit in situations experienced in everyday life.

2 LITERATURE REVIEW

2.1 Scientific initiation in secondary education and its benefits

Proposals to encourage the training of student researchers are based, in general, on a criticism that has been made against traditional schools, which is that they are limiting themselves to training students to master certain content and not students who know how to think, reflect, propose solutions to current problems and issues, work and cooperate with each other. The idea has been defended that the school has the role of training critical and participatory beings, aware of their role in social changes.

To this end, holding science fairs held in secondary education institutions has been a contribution to awakening the investigative spirit of students at this level of education. They are events in which students are responsible for communicating projects planned and executed by them during the school year. During the event, students present work that took them several hours of study and investigation, in which they sought information, gathered data and interpreted it, systematizing it to communicate it to others, or building some technological artifact. They experience, in this way, a Junior scientific initiation in a practical way, seeking technical and methodological solutions to problems that they strive to solve (HARTMANN & ZIMMERMANN, 2009, p.2). These science fairs can be summarized into three types:

> 1) assembly work, in which students present artifacts from which they explain a topic studied in science; 2) informative works in which students demonstrate academic knowledge or make alerts and/or complaints; and 3) research work, projects that demonstrate the construction of knowledge by students and a critical awareness of everyday facts (MANCUSO, 2000, cited by HARTMANN & ZIMMERMANN, 2009, p.2)

A study carried out by Costa, Mello & Roehrs (2019), entitled "*Science Fair: bringing basic education students closer to scientific initiation research*", whose objective was to analyze how Science fairs can constitute an opportunity for learning and the formation of a scientific identity in the context of Basic Education, concluded based on a qualitative approach that, in addition to being an important event , the fair is a methodological strategic mediator of Education and encourages scientific activities through the socialization and exchange it makes possible.

Another study carried out by Hartmann & Zimmermann (2009), addresses "*Science fair: Interdisciplinarity and contextualization in productions by high school students*". In their approaches, these authors substantiate the benefit of the science fair in a school or community by citing Mancuso (2000) and Lima (2008). Thus, these include: a) personal growth and expansion of knowledge, as students and teachers mobilize to seek out and delve deeper into scientific topics that are generally not debated in the classroom; b) the expansion of communicative capacity due to the exchange of ideas, cultural exchange and relationships with other people; c) changes in habits and attitudes with the development of self-confidence and initiative, as well as the acquisition of skills such as abstraction, attention, reflection, analysis, synthesis and evaluation; d) the development of criticality with the maturing of the ability to evaluate one's own work and that of others; e) greater involvement and interest and, consequently, greater motivation to study topics related to science; f) the exercise of creativity that leads to the presentation of innovations within the area of science study; g) greater politicization of participants due to the expansion of their worldview, the formation of leadership and decision-making during the work. However, it is a fact that the benefits arising from promoting a science fair are very evident for both students and teachers. For a "screening", it is essential to carry out an "x-ray" which is a different look that relates these fair activities with human health and the environment. For that,

It is necessary to go in depth, but at the "rear end" to try to understand all the scenarios regarding sustainability, conditioned by understanding the origin of the exhibitions as investigative work by the protagonists of the process in question.

2.2 Science fair and human health and the environment

Knowing about the environmental health of a given area or region involves environmental education at all levels, which in turn certainly contributes to human health in all its aspects. That's why,

> One cannot leave aside children's enchantment with nature and all the magic it offers, the need to experiment and experience its sensitivity. Environmental Education pedagogical practices must allow children to feel part of the Environment and encourage them to take care of the environment in which they are located (RODRIGUES; SAHEB, 2019, cited by CORDIOLI, 2022, p.20).

According to Pelegrini and Vlach (2011), discussions on Environmental Education must come from an approximation of different disciplinary fields, which would be possible through the joining, as well as achieving the same purpose, of the disciplines of the social sciences group, as well as some from the natural sciences group.

It is important to highlight that Environmental Education is a pedagogical practice that is not carried out alone, but depends on all relationships in the school environment, on the interaction between different actors and is led by a subject in particular: the teacher (GUIMARÃES, 2012 cited by RODRIGUES; SAHEB, 2019).

> It is in everyday pedagogical practice that environmental education can offer a possibility for reflection on alternatives and social interventions, in which life is constantly valued and acts of disloyalty, injustice and cruelty can be repudiated. In view of these findings, the school, as one of the main formative agencies of human beings, finds itself questioned and challenged by the pressures that the contemporary world experiences. (REIGOTA, 1998, cited by CORDIOLI, 2022, P.20).

In places where science fairs are held, whether of any type and in particular at schools, teachers and the organizing team as a whole are not exempt from continuing to promote environmental education in order to guarantee the health of the environment as well as , in a certain way, affect human health.

In particular, it is essential, taking into account the science exhibitions, to effectively understand sustainable environmental education in places of origin and/or where the experiences carried out by its protagonists were tested, as well as in places where materials and reagents were obtained, whether natural or artificial. .

No less important, work with environmental health goes beyond the development of school fair activities, from its preparation to the presentation phase, it involves different dimensions (social, political and cultural). For EE, teachers must determine their actions through objectives developed for each age group to be worked on, and they must also know, experiment, experience possible practices, thus being able to make it part of their planning by choice. and not out of an obligation (RODRIGUES; SAHEB, 2019).

2.3 Solid waste management and the science fair

Now,

> Considering that the amount of organic and inorganic waste produced by people increases every day, it is essential that students become aware of their role as citizens, being aware of their duties for the maintenance and preservation of the environment in which they live, understanding that separating waste for recycling is an action that favors the environment, and consequently, favors the quality of life of people and other living beings (SOFA & LOPES, 2017, p. 3)

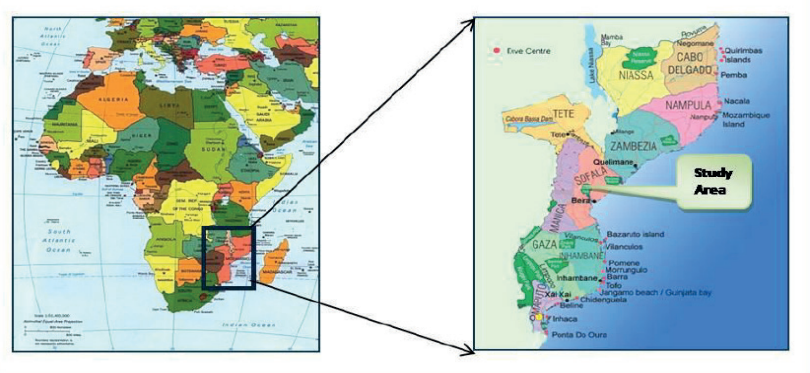
At a school science fair, it is important that students know how to selectively collect the solid waste generated, conditioned by effectively knowing its classification (organic, hospital, nuclear, electronic, urban and industrial waste), the colors (Blue: paper/ cardboard; Red: plastic; Green: glass; Yellow: metal; Orange: hazardous waste; White: outpatient and healthcare waste; Purple: radioactive waste; Brown: organic waste; Black: wood; Gray: general non-recyclable waste or mixed)
as collection indicators and the importance of recycling.

According to Souza (2015), taking into account the four large groups: paper, metal, plastic and glass, it is important for students to know what can and cannot be separated, to facilitate selective collection and work. of collectors and workers who collect and separate these materials. The author,*ibidem*(2015), further explains that: a) For paper, we separate: newspapers and magazines, notebook pages, computer forms, boxes in general, scrap paper, photocopies, envelopes, drafts, old posters and fax paper. Adhesive labels, carbon paper and cellophane, masking tape, sanitary paper, metallized paper, paraffin paper, napkins, plastic paper, cigarette butts and photographs must not be separated; b) For Metal Separate: tinplate, bottle caps, oil cans, powdered milk and preserves, cans of

soda, beer and juice, aluminum, metal packaging for frozen foods. Do not separate: clips, staples, steel sponges, tacks, nails and pipes; c) As for plastics, separate: pipes and tubes, bags, CDs, floppy disks, margarine and cleaning product packaging, PET packaging: soft drinks, juice and cooking oil, plastics in general. Does not separate: pot cables and sockets; c) Regarding glass, the following are separated: containers in general, bottles and glasses. Do not separate: mirrors, flat glass and crystal, ceramics and porcelain, TV tubes and computers.

3 METHODOLOGY

3.1 Study area



3.2 Methodological procedure

For the research, a qualitative and quantitative approach was designed. The objectives are understood to be exploratory and descriptive. According to Gil (2007), it is exploratory because it has the effect of enabling greater familiarity with the problem, in order to make it more understandable or to build hypotheses. It is descriptive, as it allows the "description of aspects of a given population or phenomenon or, the establishment of relationships between variables [...] and aims to study the characteristics of a group [...]" (GIL, 1988, p. 44) For data collection, bibliographical research was initially used. It "seeks to clarify a problem based on theoretical references published in documents" (CERVO; BERVIAN, 2002, cited by MELO; CINTRA; LUZ, 2022, p.123). The bibliographical research was carried out on material published in books, scientific magazines, academic articles, dissertation comments and others, as a foundation for the research. The bibliographical research was preceded by participant observation, as being an "attempt to place the observer and the observed on the same side, making the observer a member of the group in order to experience what they experience and work within their system of reference " (MANN, 1970, cited by MARCONI & LAKATOS, 2003, p. 194).

To check the information collected within the scope of the observation carried out, an interview was carried out using a questionnaire with students who presented their experiences at the place of execution. The interview, according to Marconi & Lakatos (2003), has the main objective of obtaining information from the interviewee on a specific subject or problem.
The questionnaires were only given to students who presented their communications. The sample consisted of 36 participants from different districts, a total of 12, from the province of Sofala and from different classes at secondary school level.
To study the data, content analysis was carried out, which is "a set of communication analysis techniques, which uses systematic and objective procedures for describing the content of messages" (BARDIN, 2006, p. 38). With the technique, value judgments were made through an in-depth assessment of the content of the questions that made it possible to identify as well as describe the science exhibitions that promoted comes the care for the environment and human health displayed at the fair activity site. The categories constructed through this allowed us to reach final considerations. Statistical analysis was also used to work on questions that do not require numerical comparison, which even allowed the construction of categories, making it possible to reach possible relevant considerations.

4 RESULTS AND DISCUSSION

4.1 Analysis of intensive observation at the school fair

In relation to EA in the context of solid waste management, it was observed on the first day that there was poor preparation of aspects that would make positive management of waste produced at the event possible. Notably, there were no containers for selective disposal of waste generated. Because of this, when it came to meals, including snacks, each group member was advised to save their solid waste. And, as there was no specific place for meals, some people ate their meals in the event room, others outside, but adrift. Due to the level of awareness, food waste remained in these places and, even more so, plastic waste (mainly packaging, bags, mineral water bottles, juice bottles and aluminum cans, commonly known as canned soft drink containers).

Image 1: Plastic waste adrift at the event site after snack

Source: Authors, 2022

Some looked for any available container in the institution's courtyard to dispose of the waste generated, but the containers were not suitable.

Image 2: Incorrect disposal of plastic waste

Source: Authors, 2022

At the end of the meeting of the day mentioned, the students and managers did not pay attention to the waste left behind in the different places where it was generated. It was the responsibility of auxiliary employees of the institution to clean places where it was possible to identify solid waste generated by event participants.

Considering that the amount of organic and inorganic waste produced by people increases every day, it is essential that students become aware of their role as citizens, being aware of their duties for the maintenance and preservation of the environment in which they live, understanding that separating waste for recycling is an action that favors the environment, and consequently, favors the quality of life of people and other living beings (SOFA & LOPES, 2017, p. 3)

On the second day of the event, the scenario was no different. There was the production of several solid wastes, again. If so, it was very obvious to note:

The)Various cardboard waste drifting beneath the testing tables, including plastic hoses, plastic bottles, plastic packaging;

Image 3: Waste drifting and under the test table

Source: Authors, 2022

b) Presence of PET bottles adrift on the ground, at the school fair location

Image 4: PET bottles adrift on the ground, at the event location

Source: Authors, 2022

4.2 Identification of the relationship between science exhibitions, human health and the environment

Table 1: Data on the relationship between experiments and human and environmental health

Title	Relevance	It is related to
Production of insecticide based in tobacco extracts (E1)	[...] combat chewing insects	Environmental health (due to plant care)
Lecture on HIV/AIDS (E2)	[...] helps young people to be aware [...], prepare an annual rescue action plan HIV/AIDS post	Human health (due to the so-called attention)
Welding machine (E3)	Low cost and economical to purchase	Health of the environment (due to waste generated in production)
Artistic drawing (E4)	If you don't have a camera, you can use realism to portray a landscape. gem or person	Environmental health (due to waste duos generated in production)
Construction of wind city (E5)	[...] provides society with renewable energy stable and clean based on wind [...]	Environmental health (due to waste generated)
Hydraulic pump made of pres-are made of air (E6)	[...] replace the motorbikes – pumps because pollute the environment [...]	Environmental health (due to waste generated in production)
Vase made from paper (E7)	Helps reduce paper waste in schools and the community	Environmental health (due to of secondary waste generated)

Source: Authors, 2022

According to table 1, we understand that with the exception of E2, all experiences have their relationship with the environment, this fact is justified and/or conditioned by the care of plants (E1), management of waste generated during production (E3, E4, E5 , E6) and due to secondary waste generated (E7). E2 has an inseparable relationship with human health as it focuses on drawing attention to all young people in the fight against HIV/AIDS.

Table 2: Data on the relationship between experiments, human health and the environment...cont.

Title	Relevance	It is related to
Juice production that combats sexual drive or premature ejaculation and erectile dysfunction (E8)	[...] helps men who have problems of premature ejaculation [...] (e) washing the body, creating immunity [...]	Human health (offers healing)
Manual rice pillar machine (made of local material) – E9	[...] brings a solution to areas [...] without energy. And, in other places (corners) of the country [...]	Environment (due to the product obtained for consumption and waste generated in production
Young teenagers in the fight against HIV and AIDS (E10)	[...] aims to inform all young people to protect themselves against HIV and AIDS [...] and abstain from sexual relations [...]	Human health (by promoting about healthy living)
Wind Generator (E11)	[...] helps with the recycling of plastics in rural areas [...] and electrification in areas rural areas without electricity	Environmental health and well-being - be social
Preparation of medicinal tea based on euphorbia maculata leaves (E12)	Alleviates diseases (such as) asthma, parasitosis, purifies the kidneys, is anti-inflammatory, relieves anxiety, vomiting and diarrhea	Human health (by promoting cure)

Source: Authors, 2022

According to the table, E8, E10 E12 is closely related to human health. If we take relevance into account, we can see that E8 and E12 promote healing because E8, for example, helps men who have problems with premature ejaculation, washing the body, creating immunity, while E12 mitigates diseases such as asthma, parasitosis, purification of the kidneys , relieves anxiety, vomiting and diarrhea. E10 promotes a healthy life, aiming to provide information to all young people to prevent HIV and AIDS. Only E9 and E11 are related to the health of the environment. To justify this fact, it is clear that for the implementation of E9 it is inevitable to produce solid waste, which means that such waste provides good environmental health when better managed. E11 confirms that it helps with the recycling of plastics in rural areas, as well as in the aforementioned areas, but that it does not have electricity.

4.3 Results of interviews about educational environmental actions carried out by fair participants in institutions of origin

4.3.1 Profile of interviewees

Sex: Of those interviewed, 72% (majority) were men and 28% (minority) were women. This result allows us to infer that the difference in gender participation in the interview is high.
Age range: In terms of age group, it was found that 44.4% is the majority, and is in the age group between 14 and 17 years old. The minority is in the age group between 22 and 25 years old. No less important, the intermediate range is 38.8% whose age varies between 18 and 21 years.
School level: Regarding the educational level, it was possible to verify that 47.2% have the 12th grade, 27.7% the 11th grade, while 19.4% have the 10th grade. Participants in the 8th and 9th classes are equally at 2.7%. These data give us the indication that only 12th grade students participated in the fair (47.2%) while in smaller numbers the 8th and 9th classes.

4.3.2 Knowledge about new planting due to the use of roots to promote healing

Q1: Do you plant again the trees whose roots you pulled out and bring to the science fair to show the cure they promote for certain diseases in humans?

Figure 2- data regarding knowledge about the new planting

Source: Authors, 2022

According to the data, 55% do not plant new trees after using their roots for medicinal purposes, while 33.3% say they carry out this activity. No less important, only 11.1% sometimes carry out new planting. Given that the majority (55%) do not carry out the new planting, it could mean that it is not a focus for the students at the moment according to the objectives, but it could also mean that this activity is not taken into account due to their lack of knowledge. Fedrizzi et al. (200-) highlighted the importance of vegetation in improving the quality of life in environments, adding aesthetic value, comfort and constituting a valuable tool for environmental education.

4.3.3 Knowledge about caring for trees and/or plants whose leaves are plucked for healing

Q2: Do you take care of the trees and/or plants whose leaves are removed to prepare a cure for certain diseases that are promoted here at the science fair?

Figure 3: care for trees and/or plants whose leaves are removed for medicinal purposes

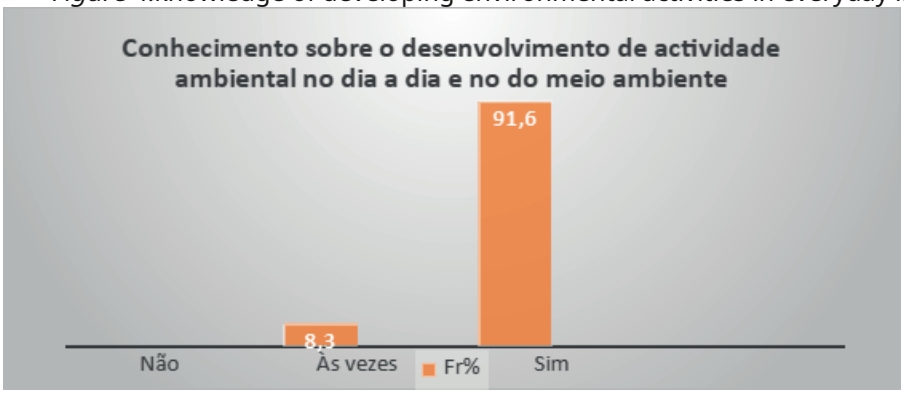
Source: Authors, 2022

Figure 3 informs that 80.5% claim to care for the trees and/or plants whose leaves were removed for the purpose of medicinal portions promoted at the fair. This could mean that there is an environmentalist behavior on the part of students in pruning trees or even taking care of the health of trees in general. However, the evolution of environmental concepts began with the idea of conserving environments for their aesthetic value, moving on to valuing the quality of life related to human health and, currently, is linked to sustainable development (DÍAZ, 2002). The minority (2.7%) takes care of trees and/or plants sometimes and/or does not do so because of the distance. Still, there are those who do not take care of anything at all (13.8%), perhaps due to a lack of knowledge or desire to do so.

4.3.4 Knowledge about developing environmental activities related to learning science in everyday life and the environment

Q3: Does your school develop environmental activities that are related to the teaching of science on a daily basis and on environmental days?

*Figure 4:*knowledge of developing environmental activities in everyday life and on environmental days



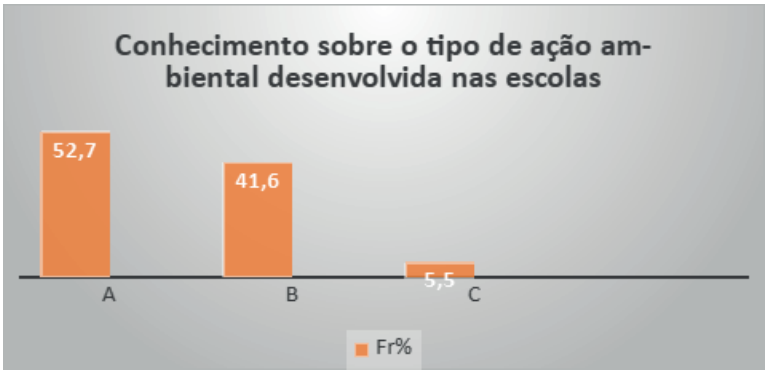
Source: Authors, 2022

Figure 4 states that the majority (91.6%) say they develop environmental activities that are related to the teaching of science on a daily basis and on the environment. This data could mean that schools are also (indirectly) guided by environmental actions along this path. For Marcos Reigota (1998), it is in everyday pedagogical practice that environmental education can offer a possibility of reflection on alternatives and social interventions, in which life is constantly valued and acts of disloyalty, injustice and cruelty can be repudiated. On the other hand, the minority (8.3) sometimes does so.

4.3.5 Environmental activity carried out in schools, if so and/or sometimes

Q4: If yes or sometimes (as per question 3), what are the environmental activities carried out at your school?

Figure 5: data on the type of environmental action developed in schools



Source: Authors, 2022

NB: A= Cleaning rooms before the start of classes, carrying out general cleaning activities during the opposite period of classes, cleaning changing rooms; B= Paper recycling, management of waste generated at school level, planting trees, holding a paper recycling workshop; C= Did not respond

The results indicate that 52.7% chose option A, while 41.6% chose option B. As tree planting is one of the indicators of option B (which unfortunately does not happen), it allows us to state that, taking care of quality of school yards (for example) can be achieved through the use of vegetation, making these places more attractive to the community (FEDRIZZI et al., 200-). Still, some 5.5% chose neither option A nor option B.

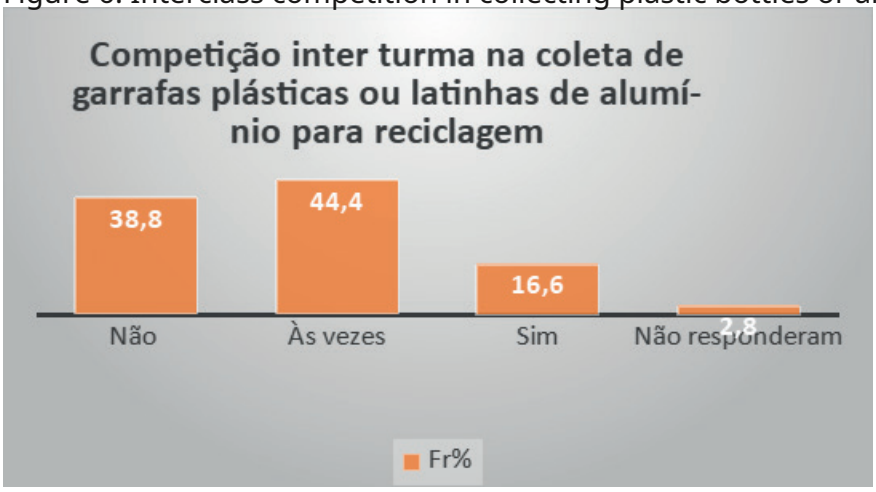
A percentage of 52.7% could be misleading, as it contradicts the results.

of those in question number 3 (Q3) who respond to the development of environmental activities in schools (91.6%). Trindade (2011, p. 2) emphasizes that "the school must favor the work on environmental issues, promoting integration, dissemination and discussion of the activities carried out, as well as developing an environmental policy for the institution"

4.3.6 Knowledge about promoting interclass competition in the collection of PET bottles or cans aluminum to recycle

Q7: Does your school promote an interclass competition to collect more PET bottles or aluminum cans (also known as canned drinks) for recycling?

Figure 6: Interclass competition in collecting plastic bottles or aluminum cans for recycling



Source: Authors, 2022

The results illustrate that, sometimes (44.4%) there is an inter-class competition promoted with the aim of collecting plastic bottles and aluminum cans for recycling. According to Nani (2012, p.15), the separation of recyclable waste "contributes to reducing soil, water and air pollution. In addition to improving cleanliness and the population's quality of life, it extends the useful life of landfills", thus contributing to creating ecological awareness. This activity is not carried out by certain schools (38.8%) but is carried out by 16.6% of them.

5 FINAL CONSIDERATIONS

The present research work aimed to assess whether there is a healthy relationship between the promotion of school fairs and care for the environment and human health from the point of view of places of origin of science shows and/or scientific experiments as well as places where fair activities take place. This made it possible to check the following:

Intensive observation revealed poor organization of the event, meaning that there was a lack of conditioning that would adequately respond to the problem of solid waste management produced during the 2 days of the event. Due to this, we cannot check the relationship between environmental actions observed with human health and the environment by event participants;

It was observed in the identification that all science displays are related to human health and the environment, but that this is not effectively ensured by the protagonists of the experiments in the context of human health (due to the lack of scientific evidence, found through laboratory analysis);

The results also reveal that the use of roots for medicinal purposes in science shows does not culminate in new planting (55.5), but there is care taken with the trees and/or plants whose leaves were removed for the purposes of medicinal portions promoted in the fair (80.5%)

Schools also focus on environmental actions (91.6%) but not in the strict sense, so the interviewees indicated as environmental action the cleaning of rooms before the start of classes, carrying out cleaning activities.

general cleanliness during the period other than classes and cleaning in changing rooms (52.7%). Furthermore, the lack of coherence

In the results collected, we understand that the environmental actions developed should not be significant. Another fact is that interclass competitions are sometimes promoted with the aim of collecting plastic bottles and aluminum cans for recycling (44.4%), although it was found that many (83.3%) state that in Their schools teach the proper disposal of waste generated in their daily lives during the teaching and learning process.

Due to these results, we conclude that there is no healthy relationship between the promotion of the science fair and human health and the environment. However, EA is an activity that requires a lot of permanent effort and that educators have time and interest.

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