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Environmental Conception of Students of the 3rd Grade of High School on the Theme Water: A Case Study in the City of Calçoene-AP-Brazil

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Authors' contributions

This investigation was performed in collaboration with all authors. Authors CBRS, RMG, NDA and JSC designed the study, wrote the protocol, involved in writing the first draft, participated in data collection. Authors FSB and LMAV managed the literature search, analyses of the study and manuscript preparation. Authors CBRS, FSB and JSC performed data interpretation and were actively involved in reading the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aims: To assess 50 students of the third grade of high school in a state school of the city of Calçoene-Amapá-Brazil on the concepts physico-chemical and biological characteristcs of water and environmental conception of the students on the subject.
Place and Duration of Study: This study was performed in a public high school of Amapá State in the city of Calçoene-AP, Brazil, which is the only school in the municipal capital, getting students from different locations.
Study Design: The sample population was comprised of high school students (third year), the data was collected through surveys.

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Methodology: The research was qualitative and initially was made the choice of 50 students randomly of the 3rd grade of high school in the city of Calçoene-AP, about their knowledge of physical-chemical and biological characteristics of water and its environmental concepts. There was a bibliographical survey in textbooks of biology discipline used by school teachers, in order to verify that contents are directly related to the subject water and environmental education.
Results: The study revealed that 60% of respondents (30 students) could not satisfactorily answer the question: "Water is made up of?", It is assumed that there was a doubt among the answers: "two hydrogen atoms and one oxygen" and "two oxygen atoms and a hydrogen," because they are similar, apparently. Environmental issues are commonly studied in biology course in high school, so the students were asked: In what biology content the theme water should be better addressed in the classroom? 56% (28 students) prefer to study the subject in water content disease, ecology and evolution; 20% (10 students) cited environmental pollution/contamination of water; 14% (7 students) stated that the issue should be addressed in the waste water treatment contents, sewage purification and production of drinking water. Finishing, 10% (5 students) related to the theme that should be addressed in all biology content in an interdisciplinary way.
Conclusion: The deficiency of students to deal with the subject water is related to its approach in schools. The errors observed in students' responses suggest the need for an organized intervention in classes as a way to make students aware of environmental issues, especially regarding the studied subject. Also in this context, conceptual order problems, related to knowledge about the physical, chemical and biological properties in the theme in water, should be solved.

Keywords: Water; environmental education; water pollution; conceptions.

1. INTRODUCTION

Water covers over 70% of the Earth's surface, and is vital to all life on the planet. It is the most abundant substance in nature, occurring in rivers, lakes, oceans, seas and polar ice caps. Among the many reservoirs, more than 99% correspond to the oceans, glaciers and moisture of soil and air [1].

The amount of freshwater on Earth corresponds to 4.10^{16} liters, or 3% of the entire Earth water (the remaining 97% is salt water), where 2% are part of the ice cap, which is not available in liquid form. So really only 1% of the planet's water is fresh water in liquid form, including the waters of rivers, lakes and groundwater. It is estimated that only 0.02% of this total corresponds to the effective availability of fresh water with which humanity can count on average and overall to sustain itself and meet the environmental needs of other forms of life which it can not dispense. Of the 1% of liquid fresh water available on the planet, 10% is located in Brazilian territory [1].

The water is closely linked to control, biodiversity and maintenance of ecosystems. It has fundamental importance in human activities such as human and industrial consumption, power generation, agriculture, aquaculture, recreation and others. The degradation of watersheds is due to various factors such as deforestation, poorly planned urbanization, earthworks, excessive mining, exploitation of vegetation, excessive use of pesticides, lack of tillage conservation practices and highly polluting industrial activities [2]. Therefore, there is need to use resources in a sustainable manner, that is, knowing how to use natural resources to meet the needs, preserving and maintaining biodiversity.

Pollution sources originate in the domestic and industrial sewage, urban and agricultural surface runoffs and the type of land use and occupation. The large amount of waste and other compounds produced by man and not properly sanitized, imply in the impairment of water quality, which usually get all the pollutant load [3,4]. There is, then, with the progressive loss of quality of surface water, the increased use of groundwater as an alternative, further compounded by the lack of planning for the controlled use of this water and the absence of preventive action for the sources of pollution of groundwater. Contamination of groundwater is a more worrying phenomenon than of the surface water, since the recoverability of these, after ceasing the discharge of effluents, is time consuming and onerous [4,5].

Camargo [6] says that, according to the United Nations (UN), in less than fifty years, more than four billion people, or 45% of the world population, will suffer from a lack of water. Water is becoming an economic good, since the world economy adds value to this resource. Neutzling [7] states that the water emerges a petrolinization

process, a tendency to understand the water as an economic good. Then the water can be treated as a commodity based on the market price.

According to this trend, rainwater and water from rivers and lakes are, in nature, common goods. From the moment in which there is a human intervention and therefore a cost for turning this into drinking water or irrigation water, it ceases to be a common good "of all" to become an economic good, object of trade and private ownership. Most of the usable water availability comes from both surface water (those that flow or accumulate on the soil surface, such as rivers, streams, lakes, ponds, marshes) and groundwater (which is the water that infiltrated the soil and penetrated by gravity in deep underground layers reaching the level of the saturation zone, thus becoming a reservoir of groundwater - aquifers), capable of extraction and use. The saturated zone may be considered as a single tank or a system of natural reservoir whose capacity and the total volume of the pores or interstices are filled with water [7].

The immensity of Brazil and its vast natural resources causes the false impression that these resources are inexhaustible. But this misconception can cause serious difficulties and also compromise the survival of future generations. Given this fact, environmental education has been considered and adopted as a sponsor of actions able to collaborate in the transformation of the pattern of current environmental aggradation. The school was one of the first areas to absorb this process of environmentalization of society, receiving its share of responsibility to improve the population's quality of life, through information and awareness [8].

According to Chapter 1, Article 1 of the National Environmental Education Policy [9,10] it's understood by Environmental Education the processes by which the individual and the collectivity build social values, knowledge, attitudes and skills aimed at the conservation of the environment, a good of common use, essential to a healthy quality of life and sustainability. According to National Curriculum Guidelines for High School (NCGHS), the Environmental contents will be integrated into the curriculum through mainstreaming, because they will be treated in various areas of knowledge, in order to aggregate across the educational practice and at the same time create a global and comprehensive view of environmental issues [9,10].

The NCGHS suggest further environmental education through common themes included in any discipline as an essential element for the education. It is important to point out in NCGHS, that the main function of dealing with the topic Environment is to contribute to the formation of aware citizens, able to decide and act in the socio-environmental reality in a committed way with life and with the good -being of each and society, local and global [9].

To Reigota [10], environmental education inside or outside school will continue to be a radical conception of education, not because he prefers to be the rebellious tendency of contemporary educational thinking, but because our time and our historical and ecological heritage require radical, fair and peaceful alternatives. Educating means, first, "self-becoming", for environmental education needs to be transformative, educational, cultural, informational, political, training and above all, emancipatory [10,11].

The environmental conception can be defined as an environmental awareness of man, that is, the act of perceiving the environment that is inserted, learning to protect and take care of it [12,13]. Environmental education is seen today as a possibility of active transformation of ecological awareness of all citizens and the quality of life conditions, due to a close nature-individual relationship [14]. This study aimed to evaluate 50 students of the 3rd year of the state high school in the city of Calçoene-Amapá, Brazil on the basics of physicochemical and biological characteristics of water, and their environmental views on the subject, considering that the city's population has a direct relationship with the environment.

2. MATERIALS AND METHODS

2.1 Area of Study

The study was conducted in the city of Calçoene (Fig. 1). The Calçoene municipality is located northeast of the state of Amapá, Brazil, on the banks of Calçoene River, with an area of 14,269 km^2 and 9,000 inhabitants [15]. Geographical coordinates: Latitude: N 02º 29'56" and Longitude: W 50 56'59". Makes limits with the municipalities of Oiapoque, Amapá, Serra do Navio and Pracuúba. The access to the city is the BR-156 and BR-210 highways. The city is located 302 km from the city of Macapá, Amapá

state capital. The transport used to access is the interstate and alternative bus, departing daily from the bus station of Macapá. It can also be accessed by air through small aircraft.

2.2 Research Site

For this study, a public high school of Calçoene-AP municipality was chosen which is located in the county seat getting students from different locations. Initially was made the choice of 50 students randomly of the 3rd grade of high school in the city of Calçoene-AP. The students selected had ages between 16 and 35 years. The school was chosen due to be the only school in the city to offer high school, being possible to achieve the research objectives.

2.3 Methodological Steps

This work was developed in three methodological steps:

2.3.1 First step

Realization of bibliographical survey in textbooks used by school teachers, and the following books: (a) Amabis and Martho [16], (b) Boshilia [17] and (c) Lopes [18] in order to verify the content of biology that is directly related to the theme water and environmental education.

2.3.2 Second step

Conduction of survey in a qualitative way with the application of open-ended and closed-ended questionnaires. The questionnaires had objective and ended questions for the 3rd grade high school students. We sought to evaluate the knowledge on the physicochemical and biological characteristics of water, and check the environmental conceptions about the degradation of water resources (causes and consequences) as well as social and environmental vision, since the city's population has a direct relationship with the environment.

2.3.3 Third step

Questioning of ethical aspects, where participants were instructed that there would be assurance of anonymity, because their IDs in their respective evaluation activities were treated in a respectful and confidential manner, and aimed to defend the interests of research participants in its entirety dignity to contribute to the development of research within ethical standards.

Fig. 1. Calçoene municipalty highlighted in red color on the map of Amapá, Brazil

3. RESULTS AND DISCUSSION

3.1 The Relationship between Biology and Water in Selected Textbooks

From the literature in high school biology textbooks used in schools by teachers, it was found that the water issue is more addressed in the contents related to environmental education than in biology content, once the authors prefer to mention the theme water linked with social relations inherent to the water cycle and its use. The authors use chapters in their books to refer to the subject water, and these are treated as auxiliary and complementary themes.

Amabis and Martho [16] address the issue water mainly in content that deal with water borne diseases related to sanitation, causing the spread of etiological agents such as bacteria, protozoa, worms in contaminated liquids. Lopes [18], beyond mentioning the topic in content related to waterborne diseases also approaches the theme in ecology, making the relationship between water quality in manuntenção ecosystem. The Boshilia's [17] textbook is one of the books that most deepens, addressing the content in both the 2nd year as the 3rd year of high school, and deals with environmental issues having a chapter on the issues: land, global warming, waste, biopiracy and water as its causes and consequences of water pollution to humans, fauna, flora and biosphere clearly and intra- and interdisciplinary way, as proposed by NCGHS [9].

The importance of linking content and certain themes in the educational environment, is the fact that knowledge itself is not fragmented, the existing fragmentation in disciplines (in the case of Basic Education) and areas of knowledge (in the case of higher level) are lagged educational mechanisms used for professionals to investigate in more detail and specificity a particular object of study. However, the idea of interdisciplinarity has been widely discussed as a search for the defragmentation of knowledge, like the aforementioned authors about the use of textbooks. Accordingly, most often a science naturally relates to other when occur the intention of investigating a fact/phenomena, even if this fact can be the most specific [19].

3.2 Students' Knowledge of the Physico-chemical and Biological Characteristics of Water

According to Peruzo and Canto [20], water has a simple molecular structure and is composed of one oxygen atom and two hydrogen atoms (H_2O), and each hydrogen atom covalently binds to the atom oxygen. Oxygen has two pairs of electrons not shared, so there are 4 free electrons around the oxygen atom. According Peruzo and Canto water has a "polar" molecule, which means it has an uneven distribution of the electron density presenting dipole moment different from zero ($\mu \neq 0$) and is then considered a universal solvent. Water has a partial negative charge near the oxygen atom because of unshared electron pairs, and has partial positive charges near the hydrogen atoms.

In the questionnaire applied to the students regarding the physical-chemical and biological knowledge of the water, it was sought to evaluate the conception of the students about the basic knowledge of the water molecular structure and physicochemical characteristic. Fig. 2 shows the relative frequency of the responses of the students interviewed about the chemical composition of water, where 60% of respondents (30 students) could not satisfactorily answer the question: "Water is made up of?". It is assumed that there was a doubt between answers: "two hydrogen atoms and one oxygen" and "two oxygen atoms and one hydrogen" because they are apparently similar, and 20% of respondents (10 students) classified hydrogen peroxide (H_2O_2) as water, clearly showing that the students have doubts about its chemical formula for water, for the quantity and arrangement of atoms constituting the water molecule.

Fig. 3 shows the relative frequency of students' answers on the concept of drinking water. Having mention of the risks to public health that poor water quality can lead to humans, students answered questions about what constitutes safe water, and the result was that 44% respondents (22 students) correctly defined the concept of drinking water, "AS BEING THAT ONE THAT DOES NOT OFFER HEALTH RISKS". Water for human consumption following physical, chemical, biological and radioactive parameters that meet the potability standards. NOTING ALSO THAT ORDINANCE Nº 2914/2011 of the Health Ministry Brazil [21] has mandatory observation parameters for measuring and ensuring microbiological potability standards, including

setting standards for chemicals that pose a risk to health.

A common occurrence is the association of clear water as good quality water. In the same figure can be noted that 36% of respondents (18 students) stated that drinking water is the one that is clear, but only clarity of the water does not guarantee its good quality, inasmuch as chemical, biological agents such as viruses, bacteria, protozoa and worms may alter the physicochemical and microbiological characteristics. However, only 20% (10 students) could not conceptualize the drinking water.

According to Ordinance Nº 2914/2011 of the Ministry of Health Brazil [21] aims to promote improvement of water quality for the people from the generation of timely information for planning, making decision and implementation of health actions related to drinking water. According to Legislation of National Environmental Council (LNEC) Nº 357/2005 [22] provides for the classification of water bodies and environmental guidelines for its framework and establishes the conditions and effluent discharge standards, and other measures.

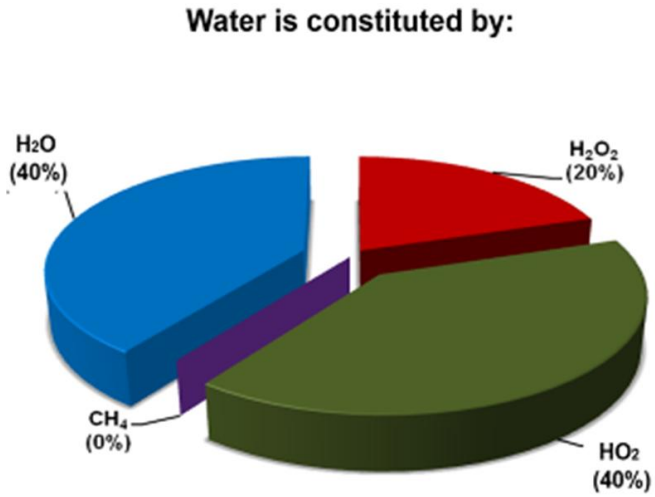

Fig. 2. Relative frequency of the responses of the students interviewed about the chemical composition of water

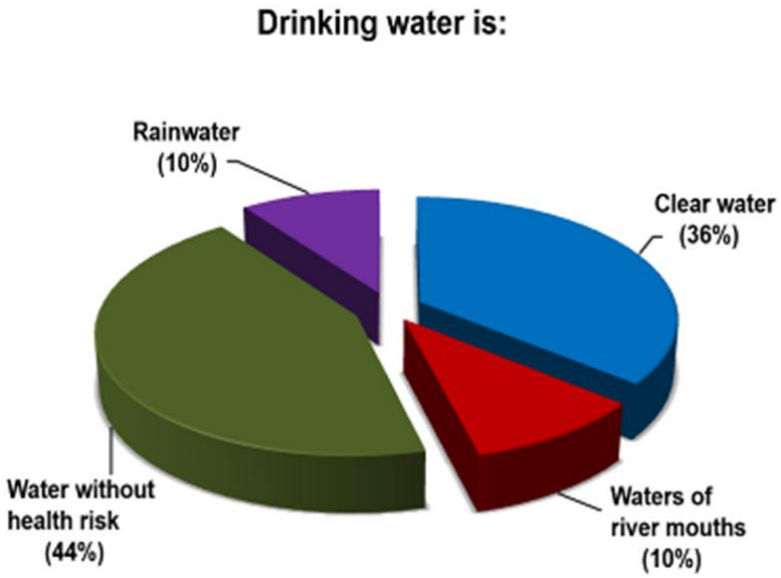

Fig. 3. Relative frequency of students' answers on the concept of drinking water

3.3 Students' Environmental Conception

Regarding environmental design in relation to the question: "Despite the large amount of water on the planet, why there is deficiency of drinking water?". The students answered that it is because of the severe rainfall regimes. Other students gave answers close to their reality since the capture and treatment system is deficient in the municipality of Calçoene-AP, especially in the months of drought where the uptake depends on the tide tables. This situation is aggravated in the months from October to December, by the sudden changes of water features, due to the entry of brackish waters of the estuary where is located the Goiabal Beach, the only beach of Amapá bathed by the Atlantic Ocean, which is one of the city's attractions (Fig. 4).

The student ASM, 17 years old, said that "because of equipment missing in our county. Equipment that can lead drinking water for the house taps". 90% of respondents students (45 students) have pointed out the issues related to waste and contamination of rivers connected to the lack of a practical environmental education. The student PCD, 19 years old, said that "because most people do not take care of the water, pollute the water and also waste as if the water was going to be good all the time and never end." It is common to hear people say that "water will end". Water goes through a cycle without losses in quantity and may only change their physical state, according to the weather and seasons. The problem is related to the reduced availability of drinking water.

The environmental conception in relation to consumption, waste and degradation, the interviewed students were asked "do you think the simple turn off a light or stop the shower while you are soaping, makes a difference to environmental damage?". The 50 respondents answered yes, because avoid wasting aid in preserving the environment, relating to the expenses in the budget that waste generates. Highlighting response of the student TBC, 17 years old, who mentioned "yes, because if I'm doing this I will contribute to the environment, now imagine half the people doing the same thing, will help too, so it's better to do, right?".

The student got to do your part needs a collective and effective action in society for environmental conservation. For the student LM, 19 years, "Yes, it does, in addition to saving water and energy, reduce damage to the environment." However, for the student LPF, 26 years old, "Of course it does, will minimize costs and bring improvements for the environment, lead to improvements in water consumption and waste". Therefore, environmental education should seek the individual to the collective and the collective to the individual, that is, one should seek to amplify the idea of the need for environmentally friendly behaviour, with the role of forming political individuals, able to critically understand the society, in a continuous and ongoing process.

Despite knowing that the waste generates costs for both financial and for the environment, students have in their answers no further relationship of cause and consequence. The over-consumption consumes nature, since increased the demand, for example, for electric power, it requires the need for more power generation, leading to construction of new hydroelectric plants, thermoelectric, and others, needing for that to deforest, flooding vast areas, generate the burning of fossil fuels and release harmful gases such as carbon dioxide, methane and other gases that contribute to global warming, and move people and disrupt the fauna and flora [23].

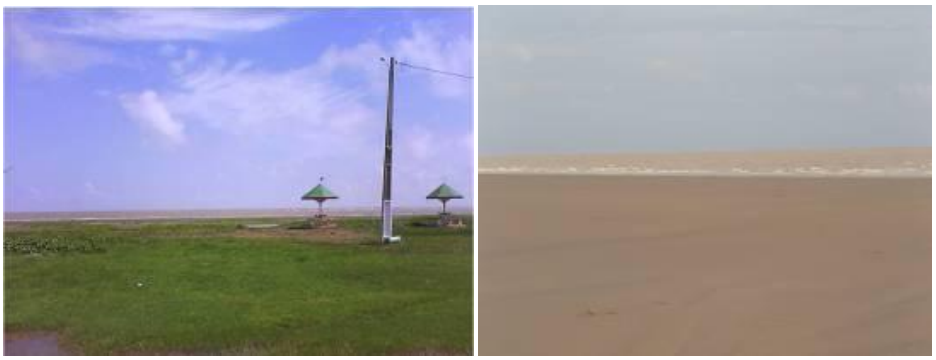

Fig. 4. Goiabal beach, tourist spot of the city of Calçoene

An educational and social praxis aims at building values, concepts, skills and attitudes that enable the understanding of the reality of life and the lucid and responsible performance of individual and collective social actors in the environment. In this sense, contributes to the attempt to implement a civilizational and societal standard distinct of the current one, based on a new ethic of the relationship between society and nature [24].

Respondent students have basic notions of environmental conservation, however 88% of respondents (44 students) pointed out that the residents of Calçoence-AP municipality do not care about environmental issues and do not apply practices to avoid waste and pollution of water. Just 12% of respondents (6 students) said that the city population is careful not to pollute the water and avoid waste.

Fig. 5 shows the relative frequency of students' answers on their environmental practices. When students argued on their educational practices, for example, if they usually save the trash when they go to the beach. Students included themselves as belonging to the group who care about environmental issues, where 60% of respondents (30 students) almost always keep their trash when they go to the beach, while 16% of respondents (8 students) keep their trash and 24% of respondents (12 students) do not keep their trash.

Environmental education as political education is committed to the expansion of citizenship, freedom, autonomy and direct involvement of citizens in the search for solutions and alternatives that allow dignified and focused cooperation for the common good. Environmental education is of vital importance because it is the first step to the related awareness of environmental issues and the relationship of good practices with the environment, but the speech by speech does not become effective without the environmental practice, it is necessary that people begin to police and try to apply these first practices in your home with your family, then with friends, schools and other [9].

For Freire [25] "teaching is not transferring knowledge, but to create the possibilities for its production or construction." The educator must go beyond a mere professional, be a thinker, a critic. Have to love what he does, always reflecting on his actions and improving every day in order to make a difference in each student. When referring to environmental issues, a major focus in the discourse are the means that cause these problems, and what nations around the world can do to minimize these problems.

Respondents had difficulty when asked about the consequences of water pollution can cause, and in preparing their responses cited the public health problems related to water and the imbalance in the fish fauna. The student MSF, 17 years old, said "it can cause health problems for the population and costing the earth. Brings several types of harmful diseases" and for JB, 17 years old, "it may poison the fish, animals and all living beings". According to the answers of respondents, it was noted that students have a restricted view of the consequences of the degradation of water, they made no globally relationship, since the problem extends throughout the world.

Regarding the association between economic development and possible environmental damage that enterprises can bring by its installation, the following question was asked: "What do you think about the installation of platforms for the removal of oil on the coast of the city of Calçoene, even knowing this can generate environmental damage, if any serious accident happen on the platforms?"

The student DM, 19 years old, mentions "I think it's an absurd, because such a thing should be very careful," and KR, 17 years old, "I've always been against it because actually will end up with the environment and also the place where people live." The student TBS, 18 years old, says "The entire population of Calçoene runs the risk of being contaminated when such an accident happen", and JS, 23 years old, says "This can harm our health and can also end our means of survival, which is fishing, and can also harm living beings". This group of respondents transmits a conservationist, individualistic vision; one whose teachings lead to the rational use of natural resources or the maintenance of intact nature, where it must be protected at any cost, with man as a being not na integrant, that is not part of the natural environment.

The municipality had several problems with mineral exploration. It is noteworthy that the mining of Lourenço, Calçoene district, generated and generates large impact on the environment, principally through the emission of mercury and sedimentation of rivers due to gold mining. To Tozoni-Reis [26], the man-nature relationship is

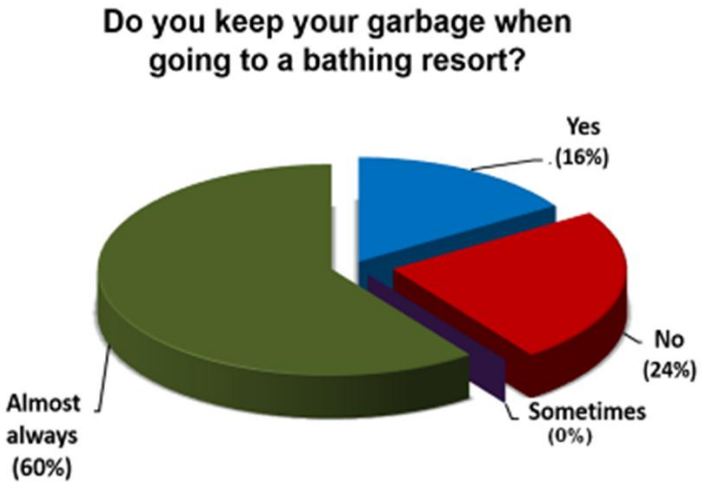

Fig. 5. Relative frequency of students' responses about their environmental practices

mediated by the technical-scientific knowledge. Nature is understood as a resource to be exploited and dominated by men. This concern increases because of the installation of oil rigs, being built in the city's coast, may have as an effect the Calçoene river pollution, in the case of a serious accident especially affecting the fish fauna, which generates employment and income for the population.

However, records indicate that the highest accident rates in the oil sector occurs during the transport of loads, so that this segment is worthy of further attention in the fulfillment of pre-established norms [27]. According to Silva [28], Petrobras acts as promoter of environmental projects, training courses, partnerships in municipal projects or providing services as fuel supplies.

Respondents below believe that the installation of the oil platforms is an opportunity to explore their wealth with environmental responsibility, creating wealth and income for the population, in addition to bringing the latest technology and courses in related fields.

The student MR, 20 years old, said "Very good, because it will create jobs for people of our county, but just do the installation of platform correctly". The importance of oil in society, as it is currently organized, is extensive and fundamental. Oil is not only a major source of energy used by mankind. Besides its importance as an energy supplier, its derivatives are the raw material for the manufacture of many consumer goods, and thus have a role more and more present and relevant in people life [29].

The student NF, 19 years old, also agree "I think it might be a good option for the development of the municipality" and NF, 19 years, says "I think it will open the door to jobs and will take our municipality from poverty". With the implementation of Petrobras the municipality would receive funds through the royalties that would serve to reward producing regions, a kind of "compensation" for the withdrawal of wealth and rising costs in basic education and health services, overload transport, infrastructure demand. The project will bring to the city disordered urban and coast occupation not only with companies linked to the oil as well as for new subdivisions for housing.

Respondents were asked about access to water. “Do you believe that with increasing degradation of water it will one day become scarce and tends to end?”

Regarding access to water 92% of respondents (46 students), answered yes, believe that water will end. This is the case of the student DCF, 17 years old "yes, because in many places it already happened, and I do not think anything doubtful that one day this happen", and AM, 18 years old, says "yes, because it is well water, if we not care or use too much, one day it Just ends". Environmental discourses are outdated, misinterpreted. As previously mentioned, what will happen is to reduce the availability of drinking water and consequently the increase in its price (water stress). Based on this, students were asked to point out who are the main pollutants of water in their municipality.

Student CA, 19 years old, said “Are the fishmongers" and NO, 16 years old, says "Trash and diesel falling from the craft", and also the student MN, 30 years old, says "Fishermen, and even residents of the municipality". Being a fishing region, transit of vessels is very intense, whatever is for loading and unloading of fish or fixing and maintain of vessels. During these processes are launched in the river fish remains, ice after unloading of fish, human waste, garbage and often leaks fuel from ships, bringing the strong odor of diesel oil and rotten fish, characteristic of local where there are the fishing vessels. Each individual perceives, reacts and responds differently to the actions on the environment in which he lives. The resulting responses or events are consequences of concepts (individual and collective), cognitive processes, judgments and expectations of each person [12].

The student LO, 32 years old, says "All pollute the water, especially when they are drunk". The amount of cans that are thrown on the edge of town is great despite having bins in its extent. As quoted by the student this is more common on weekends when alcohol consumption is higher.

The school is a means of formal education of the individual, and the discipline of biology is which is directly associated with environmental issues. The students answered the following question: "Do you think in biology classes, would have to be given more importance to the theme water and its relationship to daily life and environment? Justify your answer".

All respondents (100%) answered yes, demonstrating the need and the interest on the subject. The student KS, 17 years old, says "yes, because through this theme we can find a solution so there is no pollution, and educate students to take the knowledge out of the classroom and inform relatives and acquaintances about the importance of water for our survival", and CM, 18 years old, mentions "yes, because water is so important for us and for the growth of our economy. So it's good more address this issue in the classroom to educate students like us to preserve and give more value to water. As well as our body is moved from health and food, is also moved the water". It is of interest whether the Environmental education is being effectively implemented in basic education, and what political-pedagogical orientation is conducting its practices, as there are at least two major political-pedagogical blocks that have different interfaces and internal aspects: one labeled conservative or behaviorist, and another called transformer, critical or emancipatory [11].

The practice of EE is connected to environmental issues, and it is common sense that should make changes, however, it is difficult to link environmental and social issues, which are indispensable. Working environmental education with social responsibility implies considering the socioeconomic, political and cultural contexts, whilst developing an ecological conscience, but contextualizing their political-pedagogical project to address, as well as environmental degradation, also the cultural standardization, social exclusion, income concentration and political apathy [30].

Despite being a cross-cutting issue, environmental issues are commonly studied in biology course in high school, so the students were asked: "In which the theme of biology water content should be addressed in the classroom?".

Fig. 6 shows the relative frequency of responses, where 56% of respondents (28 students) prefer to study the theme 'water' in the contents: disease, ecology and evolution. 20% of respondents (10 students) cite environmental pollution/contamination of water; 14% of respondents (7 students) say the thematic water should be addressed in the waste water treatment content, sewage purification and production of drinking water. And, 10% (5 students) said that the theme water should be addressed in all biology content.

According to Dias [31], the contents are defined based on the problems encountered in daily life, enabling the transformation of understanding concerning the experience and giving opportunities for the construction of meaningful knowledge, which will reorganize in the relationship between daily life and scientific concepts. Therefore it can not be let the subject to address only the biological aspects. It’s worthy to remember that man is a bio-psycho-social and spiritual being, being need, always that possible, to review political, historical, social and economical issues that the theme requires.

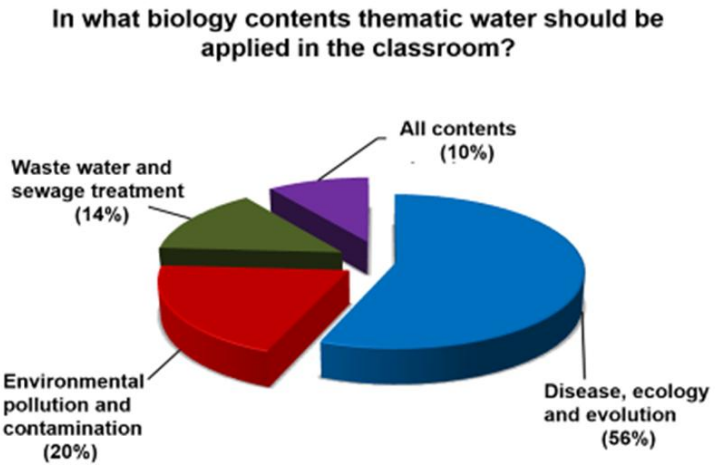

Fig. 6. Relative frequency of responses about the biology of content in which the water issue should be addressed in the classroom

4. CONCLUSION

The deficiency of students to deal with the subject water is related to its approach in schools. The errors observed in students' responses suggest the need for an organized intervention in classes as a way to make students aware of environmental issues, especially regarding the studied subject. Also in this context, conceptual order problems, related to knowledge about the physical, chemical and biological properties in the theme in water, should be solved. On the conception that students have on the water thematic, it was noted that lack a solid foundation in the concepts of cause and effect that water pollution can cause, and did not make a correlation of these problems in local and regional level linked to economic, because currently Brazil is going through a crisis involving lack of water. Mainly in the northeast and southeast of the country.

Respondents repeated simpletons' speeches, as "the water needs to be preserved for future generations", "people are polluting the water and one day it will end". Because they are influenced by these speeches, respondents are against the deployment of platforms for oil exploration in the city, even if it generates employment and income for the population.

Students believe that the theme water needs to be addressed during the biology classes because of their close relationship with their daily lives, since they live in a fishing and tourism economy region. The water, as a cross-cutting issue, should be worked together with the various disciplines, no longer exclusive to science teachers, addressing interdisciplinary questions.

The new curriculum proposals oriented towards an Environmental Education for Sustainability are placed to the teachers. However, these have not always show the necessary training in this area. The implementation of Laboratory Work (LW) and Field Work (FW) will be an alternative proposal to achieve all the benefits that you are corresponded. This same reflection has importance for understanding the role that the articulation of the LW and FW can play in environmental education. Based on this principle, the intention is to, make an analysis of concepts and practices in a future work with the physics, chemistry and biology teachers in the city of Calçoene-AP-Brazil, in order to enable the knowledge of factors that will enable the effectuation of new methodologies and changes in conceptions and practices of the trainees, necessary for teaching practice for Environmental Education assumptions.

Studies of this type assume primary importance in the construction of new teaching methodologies able to integrate the didactic potential of the laboratory practical work and of field, in the study of the environment and exercise of citizenship. This investigation could provide important data for initial and continuing teacher training, because will be with a perception of the domains of most pressing training. Thus, will be possible make plans of action that address the needs presented by the students.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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