

Environmental Education: Historical Aspects and the Scarce Approach to the Theme at School

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Abstract: This research aims to present historical aspects of environmental education in Brazil, as well as to discuss the scarce approach of the theme at school, since preserving the environment should be a topic for discussion in all disciplines of the school curriculum. In this thought, it was observed that in the pedagogical practices of elementary education, especially in Mathematics, little is said about the subject and no effort is made to problematize the debates about the theme, neither occur investments in lectures or training courses for educators of the various disciplines. It is assumed that man and nature relations demand new perspectives for the maintenance of life on Earth. Thus, environmental education as the foundation of human formation, is extremely necessary. This article indicates elements for the process of reflection on the relevance of environmental education in all phases of schooling since the disastrous impacts that represent the environmental transformations that are taking place on the planet are related to the development of the various human activities from unsustainable forms of exploitation, degradation and environmental pollution in the use of natural resources. This research considers the qualitative approach in the bibliographical references used to base the research, as well as, presents a proposal to carry out environmental education in the Mathematics discipline through the use of an audiovisual resource. The conclusions point to the need to insert environmental education in all disciplines of the school curriculum, while the need for inclusion policies and teacher training to carry out this practice emerge.

Key words: mathematics teaching, environmental preservation, chaos theory

1. Introduction

With the arrival of industrialization, the use of fossil fuels such as oil, coal and natural gas, which represent approximately 80% of the energy sources of the world, have increased and these are the main causes of environmental pollution and of the global warming.

Besides, in general, man's violent and incessant way of exploring nature is altering the environment. As examples it is possible to mention: the extinction of certain species of animals as important to the balance of nature as the life of the human being; the constant pollution of water caused many times by the waste of industries

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and the very human being who deposits garbage in the seas, rivers and lakes; the air pollution caused by the burning of fossil fuels generating high rates of air pollution, among others.

On the other hand, the approach of the subject in the school is scarce and many people are not aware of the consequences of the climatic instability and what can happen to the planet if there are no changes of the human being's attitudes towards the environment. It is necessary to make explicit that the events that can happen range from the occurrence of epidemics, to a greater number of deaths caused by events such as floods, hurricanes, landslides, among others.

In this sense, raising awareness among students and society as a whole about environmental preservation as well as the uncontrolled use of these pollution-causing resources is extremely necessary and urgent, since the situation of the planet may worsen, and the consequences may be the most diverse, starting with economic losses, being able to reach the loss of many lives.

The Pan American Health Organization (2008) warns some of the consequences of environmental pollution on the planet, which are climate changes:

Climate changes can have impacts on human health through different pathways. On the one hand it impacts directly, as in the case of heat waves, or deaths caused by other extreme events such as hurricanes and floods. But often this impact is indirect, being mediated by changes in the environment such as the alteration of ecosystems and biogeochemical cycles, which may increase the incidence of infectious diseases, treated in this document in more detail, but also noncommunicable diseases, which include malnutrition and mental illness (BRAZIL, 2008, p. 19).

In this perspective, the objective of this research is to present historical aspects of environmental education in Brazil, to make explicit the scarce approach of the theme at school, as well as to suggest the use of an audiovisual resource to carry out environmental education in Mathematics classes.

2. Methodology

The research was configured as a qualitative of bibliographical nature in which it was possible to carry out a review of the literature on the History of environmental education in Brazil, as well as the scarce approach of the subject in the pedagogical practices of various disciplines that form the school curriculum, with focus on the Mathematics discipline.

According to Fonseca (2002):

The bibliographical research is made from the collection of theoretical references already analyzed, and published by written and electronic means, such as books, scientific articles, web site pages. Any scientific work begins with a bibliographical research, which allows the researcher to know what has already been studied on the subject. However, there are scientific researches based solely on bibliographical research, searching for theoretical references published in order to gather information or prior knowledge about the problem in which the answer is sought (Fonseca, 2002, p. 32).

In the body of the work it is presented a suggestion of an audiovisual resource to be used in Mathematics classes such as the film "The Day After Tomorrow" (2004), directed by Roland Emmerich, that makes possible to make a connection between the mathematical content of the Chaos Theory and Environmental Education.

Such a resource can be presented fully, or clippings of film scenes that are considered relevant to approach the theme can be made. It is also recommended that the presentation of the resource be carried out with students from the ninth year of elementary school.

In order to link the content of Chaos Theory with environmental education, it is necessary to establish relationships between preservation and respect for the environment and the extreme geological phenomena presented in the film, since pointing out the condition of “cause and effect” is essential to understand the functioning of chaotic systems and alert students that the actions taken today can profoundly alter the future.

3. Results

When carrying out the bibliographic research on the history of environmental education, it was verified that the path taken by this one, to conquer its space both in education and in society in general faced several clivus, since for the developmentalist ideology of the time, the environmental discourse was characterized as an obstacle to economic growth and industrialization.

In this sense, it was verified the need of the educators to know the historical-social trajectory of environmental education, as well as the influence of this in the Brazilian Educational System, because thus the educator undergoes a process of reflection, allowing the understanding that they are also actors in the theater of life, direct participants in the construction of a renewed and critical environmental education, aiming improvements in the teaching and learning process, in the teaching methodologies, in the epistemological principles, in the form of organization and in the relation to the environment and with those around you.

In addition, nowadays, it is observed that the educators of the different areas do not have in their annual or weekly planning, educational practices that involve the environmental education, realizing that only the discipline of Sciences brings in its curriculum a small approach of the theme.

Some schools devote one week of classes during the year to take an approach to the environment, but there is a lack of interdisciplinarity in the proposals and some groups pass without knowing what is happening. Ending the week dedicated to the theme, no one else remembers or talks about it.

In this perspective, critical education has emerged precisely to transform conservative and individualistic education, creating policies that aim at an environmental education that can be extended to all areas of education and can be worked at all stages of basic and higher education, in both formal and non-formal levels.

It is unacceptable for the State to suppress the frequent actions of environmental degradation in favor of economic development, since the environment belongs to everyone and everyone will suffer the consequences of that bad conduct.

4. Discussion

Environmental education in Brazil emerged between the 1970s and 1980s, and in its origin brought together a plurality of contributions from even scientific disciplines, philosophical matrices, political-pedagogical positions, and social movements. However, some dominant tendencies have adulterated its profile, among them, the critical trend that has led to debates and the direction of its historical course.

Among the sectors that influenced the formation of environmental education in Brazil, Lima (2009) emphasizes:

[...] international bodies, namely the UN, UNESCO and associated financial bodies; environmental governmental systems at the federal, state and municipal levels; associations, movements and environmental NGOs, representatives of organized civil society: scientific, educational or religious institutions; and companies in some way involved with the financing or development of educational actions focused on the

environment (Lima, 2009, p. 149).

According to the author, the credit for the influence of Marxist or Frankfurtian criticism on environmental education came through popular education and through the pedagogical reflection carried out by important authors of History as described:

The critical influences of Marxist or Frankfurtian origins, which draw our attention at this moment, reach Brazilian environmental education through popular education, especially through the pedagogical and political reflection of names such as Paulo Freire, Carlos Rodrigues Brandão, Moacir Gadotti, among others. Gadotti and Torres (1994) define popular education as a political-pedagogical alternative to dominant traditional educational projects, which was simultaneously a theoretical model and a social practice (Lima, 2009, p. 148).

At this time the country lived an authoritarian period that began with the military coup of 1964 and that would only return to the democratic state with the indirect election of a civil president of the republic (1985), thus the political debate did not advance neither the question was thriving because of the dominant conservationism. One of the consequences of this climate of authoritarianism of the time is evidenced in the fact that the Brazilian environmental education was guided by a technicist, conservationist, apolitical and conservative profile.

In the Lima's studies (2009), we found that environmental education was inserted in the governmental and scientific sectors with the initial idea of conserving natural assets, however with a strong behaviorist and technicist sense, including ecology teaching and problem solving. However, there were clear perspectives in some sectors and organs of the environment that linked the social to the environmental. Examples include: State Foundation for Engineering and Environment (FEEMA), in Rio de Janeiro; the Environmental Sanitation Technology Company (CETESB) in Sao Paulo, which provided textbooks and didactic guides in the 70s and 80s.

An important factor worth highlighting is the fact that environmental education has only advanced from the initiative of organisms involved with the environment and not from the educational institutions, which, according to (Dias, 1991, p. 6) "[...] the Brazilian educational system did not assimilate the new ideas, the organs related to the environment decided to take the question for themselves, which was not bad, because, on the contrary, we would still be on square one".

Another effect of the authoritarian period on environmental education was, according to Lima (2009), the migration of leftist political cadres to environmental struggles, since these were not seen by authoritarian government as political movements. In this way, it was possible to act in these sectors that were prevented through the suspension of democratic freedoms, thus channeling, in the environmentalist movement, the previously blocked political energies. This displacement added to the environmental movement a critical and social element, originary from anarchist and socialist traditions that marked the orientation of environmental education.

It should also be noted that during the end of the authoritarian period and the beginning of the process of redemocratization, a diversity of social movements, NGOs and associations emerged regarding the environmental issue.

The developmentalism, political-cultural ideology of the time, also led debates and environmental discourses. However, for this ideology, the environmental discourse represented an obstacle to economic growth, since Brazil was experiencing, at the moment, the phase of accelerated industrial growth known as the "Brazilian Miracle" (1969–1973), thus, issues of environmental preservation reverberated as a disturbance.

According to Lima (2009):

[...] at the UN International Conference on the Environment held in Stockholm, and

in 1972, the Brazilian government delegation led the resistance of the peripheral countries in defense of industrial growth “at any cost” and against what they understood as maneuvers of the central countries to prevent their growth (Lima, 2009, p. 151).

In addition, the developmentalist ideology considered the environmental issue totally dissociated from the social question. Being social issues a priority issue, while considering issues of environmental degradation as a problem or luxury of developed countries.

Later, with the improvement of the way that environmental and political issues were treated, environmentalists and members of social movements realized that the two issues were not antagonistic but dependent on the same structure and development model that afflicted mainly the poorest. And that the environmental issue was not just about teaching to keep the ecosystem clean and the natural resources preserved, but a new awareness emerged and detected the difficulty of discussing this issue since the problem was the development model itself.

Although environmental education is a subject currently explored by the media, in educational institutions, however, this type of approach is scarce since it should start in the first literacy cycles and extend to the final stages of schooling

Raising awareness about the consequences of violating nature, as well as the emergence of preserving it, is extremely important, however, it is not enough to carry out this approach in isolation in a particular discipline or particular course year, this approach needs to be collective and should be carried out in all phases of schooling.

According to law 9795 the theme that involves environmental education should be explored in basic education, higher education, special education, vocational education and education for youth and adults, as we see in the full quote of the law:

Art. 9th Environmental education in school education is understood to be developed within the curricula of public and private educational institutions, encompassing:

I – basic education:

a) childhood education;

b) elementary school and

c) high school;

II – higher education;

III – special education;

IV – professional education;

V – youth and adults’ education (BRAZIL, 1999, p. 03)

In addition, the precariousness of educational policies involving the theme of environmental education has been clear since it has not been included in the annual plans of various disciplines and is only discussed in Science classes as a complement to some other theme. In Mathematics classes, however, little is said about the subject. In economic terms, in the last years, no funds have been made available to invest in events or lectures in schools that allow the discussion of the theme and the teachers’ formation.

According to Sauv  (2005), it is primarily a matter of being aware that environmental problems are, in fact, socio-environmental issues, which are usually linked to games of interest, power and the choice of values. While for a community project, it is necessary to engage mutually. The environment is a shared and especially complex object, and a collaborative approach could favor a better understanding and a more effective intervention.

According to Law N. 9,795, of April 27th, 1999, environmental education is an indispensable and endless element of national education, and, for this reason, it must be articulated at all levels and modalities of the educational process, both formal and non-formal. should prepare individuals to participate actively in the process of change and adaptation of new habits in order to contribute to the defense of the environment.

The objective of environmental education is, in fact, our relationship with the environment, so that we can intervene in the most appropriate way possible in favor of this. According to Sauv  (2005), “[...] It is necessary to reconstruct our feeling of belonging to nature, to this flow of life in which we participate” (Sauv , 2005, p. 317).

However, Loureiro (2006) states that it is not enough to have laws and principles that allow the inclusion of environmental education in school if the school does not carry out the necessary reflections in order to have changes in social practices:

[...] it is not enough good general formulations, laws, principles and official documents or principles approved in meetings, it is necessary that these become social practices, assumed by the agents of education and legitimized by the collective, because it is in this dimension that the objective is to change, recognizing that it is insufficient to want to change the individual without changing the social reality in which he/she is situated as subject [...] (Loureiro, 2006, p. 109).

Thus, the relevance of working on environmental education in Mathematics classes is observed, seeking to associate mathematical contents with environmental issues, such as Chaos Theory, a theme of many contemporary researches, which makes it possible to associate environmental impacts with chaotic behaviors. It is proposed here the use of the film “The Day After Tomorrow” that allows interdisciplinarity with the science subject and allows to introduce elementary concepts of Chaos Theory, as well as to carry out environmental education by a methodology that is different from the one traditionally used in the discipline.

According to Andrade (2012),

The use of Mathematics in the analysis of development and the urban environment is part of a new vision about the educational character of this discipline, which has traditionally been used pedagogically to measure, calculate, quantify nature without establishing a dialogue with other areas of knowledge. This lack of integration with other areas of knowledge and reality was linked to the project of the industrial society of fragmentation of knowledge in areas, which broke the links with the political reflection about socio-environmental problems (Andrade, 2012, p. 45).

And yet Souza (2005) believes that Mathematics remained and remains deformed when it refers to identifying the elements of the concrete totality of the environment, since it practically does not establish interlocutions with other areas of knowledge.

[...] Mathematics as a basis for explaining nature uncritically, without establishing dialogues with other areas of knowledge, was crippled by the sensitivity of identifying the visible and the invisible present in the concrete totality of the environment (p. 45).

In this way, providing students with a critical Mathematics class, focused on development and the environment, in order to interact with other areas of knowledge, are necessary conditions for meaningful and

discerning mathematical learning.

5. Final Thoughts

The planet is degrading with environmental problems, the result of man's unreasonable and irresponsible action towards nature. In this sense, it is necessary that the school has initiative and recognizes with the teaching staff that the theme "Environment" needs to be embraced by all disciplines and discussed at all levels and modalities of the educational process.

Thus, knowing the history of environmental education in Brazil, it is possible to conclude that despite the limitations found to include the theme in a continuous way in the school, it is necessary to continue, to charge educational policies that allow adequate formation for the different areas to bring within their planning approach to the topic.

Finally, the use of the film "The day after tomorrow" in mathematics classes is reiterated, since it allows us to hold discussions about preserving the environment.

References

- Andrade V. C. (2012). "Matemática e pedagogia ambiental no espaço urbano da cidade de Belém: Um estudo a partir do sistema particular de ensino", Dissertação, Mestrado em Desenvolvimento e Meio Ambiente urbano.
- BRASIL (1999). *Política Nacional de Educação Ambiental*. Lei 9795/99. Brasília.
- BRASIL (2008). *Mudanças Climáticas e Ambientais e Seus Efeitos na Saúde: Cenários e Incertezas Para o Brasil/BRASIL*, Ministério da Saúde, Organização Pan-Americana da Saúde, Brasília: Organização Pan-Americana da Saúde, p. 40.
- Dias G. F. (1991). *Educação Ambiental: Princípios e Práticas*, São Paulo: Gaia.
- Fonseca J. J. S. (2002). *Metodologia da Pesquisa Científica*, Fortaleza: UEC, Apostila.
- Lima G. F. C. (Jan/Abr. 2009). "Educação ambiental crítica: Do sócioambientalismo às sociedades sustentáveis", *Educação e Pesquisa*, Vol. 35, No. 1, pp. 145-163.
- Loureiro C. F. and Lima M. J. G. S. (2012). "Ampliando o debate entre educação e educação ambiental", *Revista Contemporânea de Educação*, No. 14, ago/dez, São Paulo.
- Loureiro C. F. (2006). "Educação Ambiental Crítica: contribuições e desafios", in: *Vamos Cuidar do Brasil: Conceitos e Práticas em Educação Ambiental na Escola*, Brasília: Ministério da Educação, Coordenação Geral de Educação Ambiental: Ministério do Meio Ambiente, Departamento de Educação Ambiental, UNESCO, pp. 65–71.
- Sauvé L. (2005). "Educação Ambiental: possibilidades e limitações", *Educação e Pesquisa*, Vol. 31, No. 2, pp. 317–322.
- Souza A. C. C. O. (2005). "O Sujeito da paisagem. Teias de poder, táticas e estratégias em Educação Matemática e Educação Ambiental", in: Bicudo M. A. V., Borba M. C., *Educação Matemática: Pesquisa em Movimento*, São Paulo: Cortez.