



ENVIRONMENTAL EDUCATION, CIVILIZATIONAL CRISIS AND COMPLEXITY

EDUCAÇÃO AMBIENTAL, CRISE CIVILIZATÓRIA E COMPLEXIDADE

EDUCACIÓN AMBIENTAL, CRISIS CIVILIZACIONAL Y COMPLEJIDAD

ABSTRACT

Goal: The article's objective is to make an interpretative, hypothetical reflection, proposing transdisciplinary foundations for a complex, ecological, and critical environmental education, capable of promoting a new relationship between human beings and nature.

Design / Methodology / Approach: Through bibliographic and documentary studies, this article highlights the importance of a complex approach in environmental education to overcome the disjunctive, reductionist, and anthropocentric views of nature as an object, that lead to civilizational, environmental, and global crises. The complex thinking proposed by Edgar Morin is fundamental in this context, as it seeks to overcome the fragmented view of nature to see the interconnections between the parts and the whole and the properties that emerge from its organization. It also contributes to the understanding of the human being in nature, from the view of self-eco-organization, which associates organizational autonomy with dependence on the environment and existing interrelationships.

Results: The article synthetically identifies eight theoretical approaches to environmental education (critical environmental education, political education, eco-pedagogy, ecological literacy, education for sustainability, education for sustainable consumption, education for animal liberation, and education for nature rights), that, when combined and applied in a transdisciplinary way, they can promote a complex and critical thinking, and guide a new relationship between human beings and nature, which includes the protection of the intrinsic value of nature.

Originality / Value: The article presents an original and relevant theoretical proposition for the academy and for organizations based on complex thinking, where the interaction of different approaches of environmental education can promote organizational forms in which emerge new knowledge, new visions, a new understanding of nature, enables understanding environmental issues consistently.


Keywords: Environmental Education. Complex Thinking. Nature Rights.

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Submitted on: 10/08/2023

Approved on: 04/12/2023

How to cite: Dinnebier, F. F., Boeira, S. L., & Leite, J. R. M. (2023). Environmental education, civilizational crisis and complexity. *Revista Alcance (online)*, 30(2), 40-53. Doi: [https://doi.org/10.14210/alcance.v30n2\(maio/ago\).40-53](https://doi.org/10.14210/alcance.v30n2(maio/ago).40-53)





RESUMO

Objetivo: O objetivo do ensaio é fazer uma reflexão interpretativa, hipotética, propondo fundamentos transdisciplinares para uma educação ambiental complexa, ecológica e crítica, capaz de promover uma nova relação entre ser humano e natureza.

Design / metodologia / abordagem: Por meio de estudos bibliográficos e documentais, este artigo destaca a importância de uma abordagem complexa na educação ambiental para superar a visão disjuntora, reducionista e antropocêntrica de natureza-objeto que leva à crise civilizatória, ambiental e global. O pensamento complexo proposto por Edgar Morin é fundamental nesse contexto, pois busca superar a visão fragmentada da natureza para ver as interligações existentes entre as partes e o todo e as propriedades que emergem da sua organização. Traz também contribuições para a compreensão do ser humano na natureza, a partir da visão de autoeco-organização, que associa autonomia organizacional com dependência do meio e das inter-relações existentes.

Resultados: São identificadas sinteticamente oito abordagens teóricas de educação ambiental (educação ambiental crítica, educação ambiental política, ecopedagogia, alfabetização ecológica, educação para sustentabilidade, educação para o consumo sustentável, educação para libertação animal e educação para os direitos da natureza), que, quando combinadas e aplicadas de forma transdisciplinar, podem promover um pensamento complexo e crítico, e pautar uma nova relação entre ser humano e natureza, que inclua a proteção do valor intrínseco da natureza.

Originalidade / valor: O artigo apresenta uma proposição teórica original e relevante para a academia e para as organizações pautada no pensamento complexo, em que a interação de distintas abordagens de educação ambiental pode promover formas organizacionais nas quais emergem novos saberes, novas visões, nova compreensão da natureza, possibilita a compreensão das questões ambientais de forma consistente.

Palavras-chave: Educação Ambiental. Pensamento Complexo. Direitos Da Natureza.

RESÚMEN

Objetivo: El objetivo del artículo es hacer una reflexión interpretativa, hipotética, proponiendo fundamentos transdisciplinarios para una educación ambiental compleja, ecológica y crítica, capaz de promover una nueva relación entre el ser humano y la naturaleza.

Diseño / metodología / enfoque: Por medio de estudios bibliográficos y documentales, este artículo destaca la importancia de un enfoque complejo en la educación ambiental para superar la visión disyuntora, reduccionista y antropocéntrica de naturaleza-objeto, que conduce a la crisis civilizacional, ambiental y global. El pensamiento complejo propuesto por Edgar Morin es fundamental en este contexto, ya que busca superar la visión fragmentada de la naturaleza para ver las interconexiones entre las partes y el todo y las propiedades que surgen de su organización. También trae contribuciones a la comprensión del ser humano en la naturaleza, desde la visión de la auto-eco-organización, que asocia la autonomía organizacional con la dependencia del medio ambiente y de las interrelaciones existentes.

Resultados: Se identifican sintéticamente ocho enfoques teóricos para la educación ambiental (educación ambiental crítica, educación política, ecopedagogía, alfabetización ecológica, educación para la sostenibilidad, educación para el consumo sostenible, educación para liberación animal y educación para los derechos de la naturaleza), que cuando combinadas y aplicadas de manera transdisciplinaria, pueden promover un pensamiento complejo y crítico, y guiar una nueva relación entre el ser humano y la naturaleza, que incluya la protección del valor intrínseco de la naturaleza.

Originalidad / valor: El artículo presenta una proposición teórica original y relevante para la academia y para las organizaciones basada en un pensamiento complejo, donde la interacción de diferentes enfoques para la educación ambiental puede promover formas organizativas en las que surgen nuevos conocimientos, nuevas visiones, nueva comprensión de la naturaleza, permite la comprensión de los problemas ambientales de manera consistente.

Palabras clave: Educación Ambiental. Pensamiento Complejo. Derechos De La Naturaleza.



INTRODUCTION

Civilization (industrial, western, global) is in crisis, suffering the consequences of the technical-economic development of humanity, of the nature-object vision, which sees nature as a collection of raw materials to be exploited and a sink for waste. Such a development triggered a global environmental crisis, bringing the Earth and the conditions of life as we know it to the risk of collapse. The impact of the dominant forms of human organization on Earth (nation-state, large companies and their interactions) became a decisive factor, generating intense debates on notions such as the Anthropocene (Crutzen, 2006), capitalocene (Moore, 2022) and theory of world risk society (Beck, 2021).

In the organizational context, the debate often comes down to the so-called ESG criteria (*environmental, social, governance*) and to forms of *greenwashing*. On the other hand, the field of organizational studies has contributed to an opening to interdisciplinary dialogue in the areas of public and business administration, accounting, and tourism (as defined by CAPES). This interdisciplinary opening has been expanded over time, with the recognition of existing "paradigmatic dilemmas" (Boeira & Vieira, 2006). Given this, we ask: will the field of organizational studies be opened to dialogue with education, in particular with environmental education seen from the angle of complex thinking? We assume that the field of organizational studies, amongst a huge civilizing crisis, is open to such dialogue. And this article seeks to initiate the dialogue associating but without merging, distinguishing but without separating EA and organizational studies. In this sense, the article starts with the contribution of a doctoral thesis in school organizations (Dinnebier, 2021), with the research of case studies and theoretical approaches.

Nature is often seen as something separate from the human being, it is reduced to fragments and parts, without a vision of the *whole* (context that can be an ecosystem, an organization, a city, etc.) and the existing and intrinsic relationships and interconnections to it. This affects the understanding of complex issues, such as environmental problems, making it challenging to face the environmental crisis, with conceptions

that are part of the disjunctive-reducer paradigm (Morin, 2000a), which includes education.

A survey of articles in the SciELO database (Scientific Electronic Library Online) with the search terms "environmental education" and "complexity" resulted in 20 articles, of which 12 are clearly identified with the two themes. Based on this survey, it is possible to distinguish three major historical phases of environmental education (EE): a) criticism of the social sciences to the teaching of ecology as a discipline restricted to the natural sciences (1948-1976); b) search for interdisciplinarity as the basis of EE principles (1977-2000); c) emergence of transdisciplinarity and complexity as the basis of EE principles (2001 until present). There is no linear or merely academic succession between them, as environmental social movements play a relevant role in the dissemination of EE.

EE, as a field of research, has different approaches, and often each of them emphasizes specific issues, giving priority to the natural, social, or global aspect, with the risk of reinforcing a logic of disjunction and reduction of knowledge.

Given this, it is questioned: what are the foundations of an EE able to contribute to the confrontation of the civilizational crisis and human domination over other species? Thus, the objective is to elaborate transdisciplinary foundations for a complex, ecological, and critical education, forming a new relationship between human beings and nature. The objective is also to synthetically identify eight theoretical approaches, and understand them in relation to complex thinking in the context of the field of research in EE. The research is carried out from a transdisciplinary, documentary, and bibliographical perspective, aiming at an interpretative, hypothetical reflection.

Current environmental problems cannot be solved in a reductionist or simplified way, they are complex problems that require real changes in society, including in the way of understanding and knowing reality, and in the way of acting on it. Among the most cited authors in the field of EE research in the current century, Edgar Morin stands out, who basically proposes two great paradigms: the reducer-disjunctive (or Great Western Paradigm) and the paradigm of



complexity (or complex thinking).

This article is structured as follows: in addition to this brief introduction, there is a second topic on nature-object, anthropocentrism, and the disjunctive-reducer paradigm, a third topic on complexity as the epistemological foundation of EE, a fourth topic on eight approaches of EE and a fifth with final considerations.

NATURE-OBJECT, ANTHROPOCENTRISM AND THE DISJUNCTIVE-REDUCER PARADIGM

In historical processes, human beings have used and adapted nature to their needs, generating changes in human relationships and living conditions. Anthropocentrism has the human being as the center of reflection, from which everything that surrounds him is valued and quantified, and everything that benefits or is useful to him will be valuable. In this view, human beings can destroy ecosystems, change landscapes, and endanger biodiversity to satisfy their desires. Anthropocentrism has a selfish and closed view of itself, which instrumentalizes all other beings and bases human superiority on rationality and other capacities that human beings, through their forms of organization and society, have developed over the centuries (Ortegon, 2010).

In this conception, the natural world and the cultural world began to be separated and divided as if they were distinct and distant things. Human beings no longer "belong" to the same category as other beings, because through science they can understand nature, through technology they can transform it, and, through the legal institutions of property, nature becomes an object that humans can explore or "improve" (Capra & Mattei, 2015).

Another key element of this anthropocentric vision is its utilitarian bias, in which the appropriation of nature is seen as necessary for any type of development, and natural components are seen as fuel for the desired growth. As a consequence of the anthropocentric and utilitarian perspective, nature is fragmented into artifacts called resources, which can be appropriated for extraction, separation, modification, and transformation into profit

(Gudynas, 2019).

The fragmentation of nature is consistent with the fragmentation of scientific knowledge, which is divided into specialized and compartmentalized disciplines, which, in general, communicate little or nothing with each other. Thus, the complexity of the world is broken into fragments, making it difficult to truly understand it (Morin, 2013).

Scientific development and its worldview are part of a paradigm, which, according to Morin, would be the disjunctive-reducer paradigm. Abstract and one-dimensional rationality prevails, partial, compartmentalized, mechanical, disjunctive, reductionist intelligence, which breaks down the complex world, and breaks down problems, bringing a myopic intelligence of the world. The specialized knowledge of the parts ends up blinding science in relation to the whole, to the context (Morin, 2000b). These principles were important in the past to increase knowledge, but today they have become an obstacle to it and have reached the limit of intelligibility (Morin, 2005).

Problems that are part of the reducer-disjunctive paradigm also affect EA. When teaching turns to environmental issues, to the environmental crisis, the transmitted vision is also often part of fragmented knowledge. Water, soil and air pollution, waste generation, the devastation of forests, impacts of energy generation, etc., are taught separately, as if they were different and disconnected problems, often without considering their interactions.

Another problem: EE often defines correct behaviors independently of the existing specificities in the reality it deals with, without considering economic inequalities and cultural peculiarities. The main consequence of this low reflection on the implications arising from social processes is that many initiatives end up reproducing dichotomies and reductionisms that agents, in principle, reject (Loureiro, 2004).

One of the factors that cause EE not to be implemented across curricular disciplines is the view of what EE itself is, reduced to a practice restricted to the natural sciences, related to resource management, and restricted to the



physical aspects of the environment. However, environmental issues are directly linked to human behavior, to the way of living in society, and are linked to socio-historical-cultural factors (Barcelos, 2003).

Outdated mental and institutional structures, as well as economic interests, hold back the progression of ecological awareness, which is also lacking in political thought and has not yet managed to generate the growth of a planetary force capable of effecting the necessary changes. Thus, we consider of utmost importance an epistemological and paradigmatic reform of knowledge from disjunction and reduction to knowledge through distinction and conjunction (Morin, 2013).

COMPLEXITY AS AN EPISTEMOLOGICAL FOUNDATION OF ENVIRONMENTAL EDUCATION

To oppose the reducer-disjunctive paradigm, Morin presents the paradigm of complexity, stating that opening up science is an urgent and necessary task to recover critical thinking about thinking itself and its methods. Teaching should be thought considering the harmful effects of hyperspecialization of knowledge, which generates an inability to articulate knowledge, to see the global and the essential, to contextualize and organize knowledge. Thus, the reform of thought, inseparable from the reform of education, leads to a reform of life necessary for living well (Morin, 2015).

The complexity paradigm seeks to bring together notions that were separated and overcome the idea of simplifying reality into laws (Morin, 2007); considers not only the fragmented parts but also the whole and the properties that emerge in this whole (Morin, 2000a). It seeks knowledge in movement, which goes from the parts to the whole and from the whole to the parts, which sees the multiple organizations that take place in these phenomena (Morin, 2003).

The paradigm of complexity does not want to destroy what was created by the disciplines, but that they open up while maintaining their knowledge, adding to the disciplinary knowledge a study within a context, with the perception of

the qualities that emerge in the formation of a complex system (Morin, 2000a).

Complex thinking is a call to inter and transdisciplinarity. It is a thought that connects, that does not exclude, that aggregates, that does not analyze an object of study by removing it from its context as something inanimate, but rather that involves knowledge of the whole and of the existing relationships between the object and its surroundings. Complex thinking also includes the principle of "reintroduction of the knower into all knowledge", that is, it notes that "from perception to scientific theory, all knowledge is a reconstruction/translation by a spirit/brain in a certain culture and at a certain time" (Morin, 2000a, p. 34).

Other principles for "overcoming specialization" and "false rationality" developed by Morin are the following: systemic or organizational (the whole is more than the sum of its parts, but it is also less than the sum of its parts, whose qualities are inhibited by the organization of the set); "hologramatic" (inspired by the hologram, it indicates that not only the part is in the whole but also the whole is inscribed in the part); retroactive ring principle (*feedback* negative or positive, breaks with the principle of linear causality), the recursive ring (overcomes the notion of regulation with that of self-production and self-organization), self-eco-organization (or autonomy/dependence; living beings are self-organizers that self-produce under the condition of extracting energy, information and organization from the environment, on which they depend) and the dialogical (this principle makes it possible to associate contradictory notions to conceive the same complex phenomenon, such as particle-waves of energy in physics, such as the dialogic order/disorder/organization since the birth of the universe). (Morin, 2000a).

Complexity is an essential epistemological basis for reasoning about the world and for EE (Dickmann & Caneiro, 2012). There are several currents of EE, that contribute to the growth of discussions and engagement in various areas of knowledge, and the search for a single concept of environmental education could jeopardize the understanding of the environmental crisis and the interconnection between the parties and the



whole that compose it. EE is complex in nature and does not fit into closed concepts (Amorim & Calloni, 2013).

It is necessary to teach about the complex planetary crisis that marks the 21st Century and about feeling solidarity with the Planet, on which our life depends. "To become full citizens of the Earth, it is imperative to change our way of inhabiting it" (Morin, 2013, p. 105). The ecological safeguard should promote the quality of life, the qualitative and not just the quantitative use of natural resources (Morin, 2013).

It is essential to introduce ecological science in every teaching cycle, which is based on the notion of ecosystem, which is a transdisciplinary knowledge, as it brings together diverse knowledge from geography, geology, chemistry, physics, biology, climate, and human sciences. Ecological science makes it possible to unite multiple disciplines, generating communication between them, without being unified, however, in a reductive vision, and can be seen as a complex science, that studies the relationship of human beings with nature, allowing the search and awareness on biosphere degradation (Morin, 2015).

Concerning the human-nature relationship, Morin brings the notion of self-eco-organization, that we are self-eco-organized beings, and that as much as we have autonomy in our social, and cultural organization, in our daily lives, we are also totally dependent on nature and the environment for our existence and survival. Thus, we human beings are nature, but we are also culture, and one does not eliminate the other (Morin, 2000a).

EE, when analyzing themes that focus on the relationship between human beings and the natural environment and social relations, can be present in all disciplines, even if each one has its specificities (Reigota, 2012). Teaching other knowledge, not exclusively scientific knowledge, is also part of a complex education.

Because it is complex, it is understood that EE must work with environmental issues in an interconnected way, uniting different knowledge about nature and environmental problems. In addition, environmental education based on complexity interconnects the different existing approaches to environmental education,

encourages complementarity between them, and allows the emergence of new complex knowledge essential to education and worldview.

ENVIRONMENTAL EDUCATION APPROACHES

EE deals with how human beings perceive nature and what they do with it, identifying existing problems in order to face them, with critical reflection and action. It works with relevant information for understanding the environmental crisis, such as scientific data, data on climate change, and the extinction and reduction of flora and fauna species, among others.

For Reigota (2012), one of the ethical principles of environmental education is to deconstruct the anthropocentric notion, according to which humans are seen as the most important beings in the universe and other beings are seen as objects and/or subjects to be used at work, at leisure or as food.

EE aims to play a fundamental role in the relationship between human beings and the environment, both collectively and individually (Monteiro & Ortiz Monteiro, 2019), and goes far beyond being a mere tool for problem-solving or management of the environment (Sauvé, 2005).

There is no neutrality in environmental education, and in this process, students and teachers must be recognized as moral agents for the critical exploration of themselves and their relationships. It is necessary to face controversial issues and not ignore them (Sato, 2004), which is consistent with the vision of the complexity of a retroactive process between complementary opposites, in not ignoring complicated or contradictory issues.

Environmental education is worked on by authors from different areas of knowledge and it is an inter and transdisciplinary study, which adds knowledge from disciplines, social and daily practices. There are several approaches to environmental education and here only eight are contemplated among those considered of great relevance according to the literature review carried out.



Critical environmental education

Critical EE, in addition to being one of the approaches to environmental education, is present in almost all the others that will be investigated here, and it is essential to have a critical view that goes beyond the individual sphere but includes the form of development, business performance, governmental, institutional.

Critical EE aims to modify the relationships between humanity and nature and between human beings themselves (Reigota, 2012). In general, the reflection on the subject (as important as the active or behavioral component) has been based on the current way of life and on the exploratory form of relationship with the environment, in which production and consumption occur in a way that is harmful to every type of life (Reigota, 2010).

Critical EE goes against the culture-nature separation, it criticizes the way education is given and the standards adopted by society. Assumes that itself can repeat impregnated social standards, and therefore must be self-critical, and admit mistakes, which are inherent in the search for the transformation of reality (Loureiro da Silva, 2007).

It does not aim to standardize behaviors seen as ecologically correct but to advocate new social relationships with nature, a rethinking of understanding the world and relationships. Each social formation, with its peculiar characteristics, must permanently be questioned and overcome in search of a genuinely sustainable society. Critical EE focuses on problematizing reality, values, and behaviors, on the emancipation of subjects, on transforming the way of life, and on overcoming domineering and discriminatory relationships (Loureiro da Silva, 2007).

Many pedagogical practices seek to "raise awareness", which in general aims to raise awareness about the environment, transmit knowledge and teach appropriate behavior, using students as mere receivers, aiming, unidirectionally, at teaching those who do not know. However, for critical EA, the issue goes far beyond just knowing to be aware of something. It is a contextualized, critical knowledge, with its local specificities and cultural practices (Loureiro da Silva, 2007).

In addition, the issue of environmental protection, with critical EE, is not linked to individual responsibility, because, when taken in isolation, it weakens the discussion of the multiple causes of environmental problems (Pelicioni & Philippi Jr., 2005). Nor does it aim to encourage moralistic discourse, but to deepen the discussion on the complexity of each behavior, political, social, economic, and cultural relations, seeking alternatives and suggestions for change (Reigota, 2012).

A presupposition of critical environmental education is to focus on the nature of the socio-environmental problems that are found in the critique of the current model of society, which goes beyond the walls of the school and the mere description of existing problems. EE allows educators and students to seek to transform reality based on understanding paradigms and their influence on social and collective practices, understanding modes of production, and existing domination relations between individual/society/nature (Guimarães, 2007).

It is an education focused on a reflective, collective action, problematizing the socio-environmental reality, going beyond the mere description and information about the facts, exploring cognitive and affective aspects, and living experiences in accordance with sustainability to provide new values and attitudes (Guimaraes, 2007).

Political environmental education

Political EE aims to increase people's participation in the search for solutions for a dignified life and for the environment as a common good, in addition to rethinking everyday relationships between human beings and between these and other beings (Reigota, 2012). It prepares for the exercise of citizenship, through individual and collective active participation (Pelicioni; Philippi Jr., 2005).

Political environmental education is not linked to the transmission of knowledge about nature but aims at a new relationship between human beings and nature, in which ethics is part and component of political, social, economic, and personal relationships. It aims to enable people



to identify, explore and analyze environmental problems to be overcome and to search for solutions or alternatives to these issues (Reigota, 2012).

Gudynas (2019) when dealing with citizenship, speaks of ecological meta-citizenships. This means that the realization of citizenship is possible only in a specific ecological context. Ecological meta-citizenships are plural and are expressed in different cultural, ethical, and environmental dimensions, even promoting the rights of nature. Such plurality determines that it is not possible to establish a single standard that can be imposed on all human communities and all ecosystems. Therefore, it is multicultural, which is why it must be understood for each social group and each ecosystem (Gudynas, 2019).

This idea allows for different ways out of the anthropocentric dualism, incorporating perspectives from the social and ecological community, being related to a territory and its particularities. They can be articulated with a biocentric perspective, in addition to being ways of expressing other conceptions of the world and of nature (Gudynas, 2019).

Ecological meta-citizenship has a political, environmental, and territorial emphasis, it seeks the collective social and ecological good. It is based on respect, solidarity, reciprocity, and renunciation between human beings and between them and nature, and aims at political and environmental activism (Gudynas, 2019).

Thus, political environmental education can aim at forming meta-citizens, who seek to act on the problems that are close to them, related to specific locations, who act in search of the protection of nature not only for the benefit of human beings but also for its intrinsic value, which connects to education for the rights of nature.

Education for the rights of nature

The rights of nature have been debated on the international scene for decades, and in recent years there has been legal and judicial recognition not only of animal rights but also of rivers, ecosystems, and nature as a whole. The rights of nature are an evolutionary milestone in

Law, with an expansion of the moral and justice community, they are a new model of protection of nature, its ecosystems, and non-human beings, including as subjects those who had been excluded by anthropocentric law.

But change is slow, as "Not only our laws, but also our cultures require a fundamental reorientation, transforming humans from conquerors of nature to members of the planet's community of life" (Boyed, 2017, p. 219).

For the protection of the rights of nature to be effective, it is necessary to go beyond the Law, so that a new vision of what is nature is learned and practiced by people – and, for this, EE is a fundamental action/reflection.

To the rights of nature, all species must be protected, regardless of their real or potential utility, or their beauty, including species that are not useful for human purposes. All species have the right to continue with their ecological and evolutionary processes, and protective measures must be adopted for all living beings (Gudynas, 2019). This principle presents enormous complexity of implementation since in many circumstances there is competition, or even antagonism, between humans and other species.

Several international documents and national laws deal with the protection of the rights of nature or protection of nature for its intrinsic value, such as: the Earth Charter, Nature Charter, Declaration of Rights of Mother Earth, Declaration of Rights of Rivers, resolutions of the initiative of the United Organizations "Harmony With Nature", Municipal Organic Laws of the Municipalities of Florianópolis-SC, Paudalho-PE, and Bonito-PE, in addition to these rights having been judicially recognized by several countries.

The rights of nature brought in these documents can be exemplified by some premises to be worked on by EA: nature and all beings have the right to life; living beings have the right to have their natural habitats preserved, an environment free of pollution and with drinking water; nature and its beings have the right of respect of their existence, the maintenance, and regeneration of their vital cycles, their structure, functions and evolutionary processes; the protection of nature, its essential beings, components, and processes for their own and intrinsic value; nature has the



right to restoration, that is, that the damage it has suffered be restored and that it can return to the state it was in before suffering it; nature has the right to act with caution and prevention in activities that may cause damage to it, species, ecosystems or alteration of natural cycles.

The protection of the rights of nature also presupposes the adoption of ecocentric or biocentric ethics, which includes other beings on Earth and nature as a whole as essential for life, an ethics that recognizes intrinsic value in human beings, in other living beings, and in nature. Nature and its beings also come to have moral consideration, which does not mean no longer seeing the differences between subjects. Thus, the recognition of the intrinsic value of nature and the understanding that the human being is part of the network of life, and not superior to it and independent of it, are also fundamental foundations for EE.

Ecopedagogy

In the 1990s, the Paulo Freire Institute launched the ecopedagogy movement, which aimed at learning the meaning of things from everyday life, and rediscovering the value of biodiversity and cultural diversity, considering the planet as the only community, the Earth as "mother" and as a living organism in evolution. Ecopedagogy is based on the awareness that we belong to a community of life and that the planet is a living being and it is intelligent and promotes EE based on critical and innovative thinking (Instituto Paulo Freire, 2000).

The "Ecopedagogy Charter" was created based on the Earth Charter (2000) and aims to re-educate people's vision to avoid aggressions to the environment, pollution, and waste, aims at harmonious coexistence between human beings, between them and nature, and deals with planetary citizenship. It states that economic sustainability and preservation of the environment also depend on ecological awareness and education (Gadotti, 2005).

Ecopedagogy seeks a radical change in mentality concerning the quality of life and the environment, which is directly linked to the type of coexistence we maintain with ourselves, with

others, and with nature. The environment forms as much as it is formed and deformed, and eco-formation is essential to recovering awareness of everyday experiences (Instituto Paulo Freire, 2000).

For this approach, it is important to raise awareness and motivation concerning environmental problems and act/reflect on them (Oliveira, 2014). It is an education that aims to respect nature based on daily attitudes and to solve problems generated by human beings in the environment (Halal, 2009). The path to more solidary and friendly development models for the planet and for other human beings starts with each of us, with everyday life, family, and community relations (Dimas, Pena & Herran, 2017).

Ecological literacy

Ecological literacy aims at learning from nature and its principles, seeking to reproduce them for a more sustainable life. It is a perspective brought in the work of Fritjof Capra (2006) and proposes the recreation of principles and values inspired by natural systems, considering that the wisdom of nature is the essence of eco-literacy. Ecosystems have organized themselves in complex ways, maximizing sustainability, for billions of years, so society needs to learn the basic principles of ecology, from ecosystem studies, to reconnect to the web of life and live sustainably (Capra, 2006).

"Being ecologically literate, or 'eco-literate', means understanding the organizing principles of ecological communities (ecosystems) and using these principles to create sustainable human communities" (Capra, 2006, p. 231).

Both human communities and ecological communities are living systems that exhibit the same basic principles of organization, they are organizationally closed networks, but they are open to energy and resource flows, in addition to being intelligent due to cognitive dimensions that are inherent in the processes of life; have structures determined by the history of structural changes (Capra, 2006). This issue is connected to the principle of self-eco-organization proposed by Morin.



Capra considers some basic organization principles of ecology to be essential: the principle of interdependence, the cyclical nature of ecological processes, partnership or cooperation, the flexibility of ecosystems, diversity, and sustainability. There is an intricate network of relationships that forms the web of life and the members of an ecological community are all interconnected in this network, with a mutual dependence of all vital processes of organisms. To understand this ecological interdependence, it is essential to understand the relationships. The relationships between members of the ecological community are not linear and involve a great diversity of feedback loops. Thus, a disturbance is not limited to a single effect but can spread and be amplified by feedback loops (Capra, 2006).

Ecological literacy aims to nurture a feeling of affinity with the natural world and the web of life, with direct experience with nature being essential. It presupposes understanding the place occupied by human beings in evolutionary history (Macie, Santos & Teran, 2012).

Education for sustainability

It is a problem to have sustainable development as a goal of EE because in this case it is seen as an instrument at the service of long-term conservation of the environment, considered as a reservoir of resources to be exploited as a result of sustainable economic development (growth) (Sauve, 2005).

Environmental education should not be restricted to the perspective of sustainable development, it is essential that it becomes a space for social criticism. It forms part of a project to improve each person's relationship with the world, whose meaning it helps to build, depending on the characteristics of each context in which it intervenes, linked to an ethics of responsibility, which involves a responsibility to be, to know and act (Sauvé, 2005).

It is necessary to "rethink sustainability, in order to ensure the biophysical conditions of all life and the resilience of nature" (Acosta & Brand, 2017, p. 142), considering the actual capacity of nature to withstand disturbances, without subordinating to anthropocentric demands.

This requires new ethics to organize life and the recognition that post-economic growth, the search for capital accumulation, leads to a dead-end path (Acosta; Brand, 2017).

Gudynas (2019) examines three currents of sustainability: weak, strong, and super strong. Weak sustainability includes positions that propose technical solutions to environmental problems, defend the possibility of managing the limits of nature, and make intense use of economic valuation, introducing environmental issues into classical economic analyses. Environmental issues are accepted from this perspective, but there is an attempt to articulate progress with environmental management. Ecological limits are seen as modifiable, due to the emphasis on economic valuation (Gudynas, 2019).

Strong sustainability, on the other hand, recognizes economic valuation and technical solutions but adds other components such as the awareness that it is essential to ensure that at least part of nature is preserved. It considers that it is impossible to ensure a simple replacement of natural capital by other forms of capital of human origin. There are requirements to preserve critical natural capital. It supports criticism of the ideal of progress and a technical-political approach (Gudynas, 2019).

Super strong sustainability advocates broader changes and a plural valuation of nature, in which valuation as natural capital is just one of them, as there are also ecological, aesthetic, religious, cultural values, etc. As much as technical solutions are essential, from this perspective it is seen that they are insufficient to deal with multiple valuations, requiring political scenarios, in search of alternatives to development (Gudynas, 2019).

Sustainability does not imply untouched nature, but it does not accept sumptuous consumption or capital accumulation generated by the exploitation of natural resources. The productive processes typical of the biocentric perspective are austere, they are more concerned with a good life (Gudynas, 2009).

Sustainability, in its strong and super strong versions, is a primordial principle for EE, so it is not based on weak sustainability or on the mere greening of harmful conducts to the environment, but it brings a critical view of the



necessary changes for the performance in nature.

So, education for superstrong sustainability implies showing the need to protect nature for its intrinsic value, and respect for its needs, in addition to preventing human activities from affecting these primordial values for life. Thus, it is up to the educator to propose a sustainability that really values the capacity of nature and its protection, and that the proposed activities are based on this.

Education for sustainable consumption

EE for sustainable consumption advocates a comprehensive approach to consumption, encompassing the entire life cycle of products, in which the impacts generated from production and product development, obtaining raw materials and inputs, the production process, consumption, and even the final disposal, or even until another product is formed (from cradle to cradle). It is important to teach about the life cycle, the stages a product goes through, and the environmental and social impacts it causes, aiming at reducing damage to nature by reducing the consumption of ecological components, reducing waste, reusing and recycling components that have already been extracted, and reducing the generation of waste.

EE for sustainable consumption seeks to encourage reflection on the act of consumption, considering the waste generated and the use of natural resources for the production of each product. It can also teach reflection on the induction of consumption from advertising, fashion, and planned obsolescence, teach that everything consumed has an environmental trace before and after consumption, and work on possible ways to make consumption more sustainable through choosing more products *in natura* than packaged and/or processed industrially, consume locally to reduce the impacts of transport, try not to buy disposable goods, nor replace those that can still be used with new ones.

It is important to teach how to consume consciously, but saying this does not mean putting the burden on the consumer, much less in a country with great social inequality, where many go hungry and do not even have

the minimum consumption for a healthy life. One way for educators to insert complex and critical thinking when dealing with the issue of consumption and waste involves an analysis of the generating causes, the form of development adopted, the consumption patterns of today's society, the incentive to consumerism, the form of appropriation of nature, the exploitation of natural resources and the need to interconnect disciplines and knowledge in general, in a transdisciplinary way. Educators can promote an integrative view of the whole and the parts, because if only part of the problem is faced, EE is likely to fail.

Education for animal liberation

It is also important to bring up the issue of education for animal liberation and make it increasingly present in people's minds so that they can modify their conduct accordingly. There are two fundamental bases for this subject: the mistreatment of animals and the environmental problem triggered by the production of animals for consumption, which is related to deforestation, greenhouse gas emissions, and river pollution.

Non-human animals are used by human animals for food, clothing, scientific research, entertainment, and workforce, and there is great animal suffering involved in these practices (Orselli & Conte, 2019). Defenders of animal rights propose an end to the exploitation of other animals by human beings, that they are no longer treated as mere means to human ends, bringing a totally different way of relating to other beings and the environment (Reis & Guimarães, 2013).

Speciesism can be defined as any form of discrimination of human beings against other species, a prejudice, in which the observation of difference leads to a lack of equity, understood as equal consideration of interests. The abolitionist ethical posture preaches the end of these practices and a world without cages, and not with larger or more comfortable cages. Animals also have interests that must be protected, especially not to suffer (Brugger, 2012).

Veganism is a powerful driver of change towards an ecocentric ethic, and has benefits for the entire biosphere; if carried out on a planetary



scale, it would allow the rescue and maintenance of genetic diversities. It requires building a new relationship between humans and other animals, incorporating non-anthropocentric worldviews that consider the intrinsic value of life (Brugger, 2012).

Then EE would inform people about the harmful consequences of raising and consuming animals, and about the harm done to both animals and the environment. Based on this information, a change in positioning and awareness that leads to the replacement of speciesist habits becomes possible and viable (Orselli; Conte, 2019).

It is crucial to have an increasingly critical view of what is done with other living beings and alimentation practices, and to seek to make choices that preach for the good of the lives of other living beings.

FINAL CONSIDERATIONS

The civilizational crisis is above all a crisis of the dominant forms of human organization (nation-state, large companies, and their interactions) in their relations with nature. The fragmentary or dichotomous view between culture and nature, without a contextual view of existing interconnections, has fundamentally contributed to the crisis of the human species and to the mass extinction of other species. We consider it plausible to conclude that such a vision is an expression of the disjunctive-reducer paradigm – and that the resistances against overcoming it feedback the same paradigm. Such questions are part of a context in which environmental education has growing social, civilizational, and academic relevance.

Environmental education approaches are diverse and aim to face the environmental issue from different angles and aspects. If applied in isolation, they may end up reproducing the disjunctive-reducer paradigm, but when practiced in combination and under interdisciplinary and transdisciplinary perspectives, they become more apt to promote complex, reflective, critical, and self-critical thinking. Under a complex view, the interaction of different parts, in this case, the different approaches to environmental education, can promote organizational forms in

which new knowledge and new visions emerge, bring a new understanding of nature, and enable the understanding of environmental issues consistently.

It can also be seen that there are different issues that are focused on in a unique way by EE currents, in addition to having some similarities and complementarity between them. The application of an EE approach can form a more enriched practice when related to other approaches. If environmental education involves a critical view, the formation of ecological meta-citizens, awakening the feeling for contact with nature, knowing the ecological principles, how nature organizes itself and sustains itself to try to learn from it how to have a more sustainable life, using a pedagogy based on learning from everyday life and respect for all other beings and nature as a whole, as well as working on issues related to the lives of non-human animals, seeking to modify consumption habits, rethinking of what we need to live well, in addition to leading students to carry out practical actions and to seek solutions to local problems, among other issues, it will provide a vision of the complexity of the environmental problem.

The combination of EE approaches in a critical, systemic, and complex perspective goes far beyond market management resources, such as ESG criteria, or criteria such as state command and control. EE as defended here is a form of resistance to the self-destructive course of globalized Western civilization since the industrial, capitalist, statist, and market-centric revolutions.

Universities, schools in general, and the various forms of organizations, in their inevitable educational role (although not fully conscious or assumed by management) face the immense challenge of changing the course of events, such as successive climatic events extremes, exemplified by heat waves, sudden drops in temperature, storms with the destruction of territories and lives, desertification, fires in large areas of forests, cyclones, hurricanes, rising sea levels, etc. EE, if considered broadly, is also a policy of mitigation and adaptation to new and unusual biophysical conditions on the Planet.



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