Environmental Education: the challenge of constructing a critical, complex and reflective thinking

Pedro Jacobi
Universidade de São Paulo

Abstract

The proliferation of risks, particularly of those of severe environmental and technological consequences, is a key element to understand the features, limitations and transformations of our modernity. The complexity of this process is more and more clear in a society not only increasingly threatened but also increasingly affected by socio-environmental risks and harms. The contemporary risks expose the limits and consequences of social practices, bringing with them a new element: the "reflectiveness". The society, a producer of risks, becomes more and more reflective, which means that it becomes a theme and a problem to itself. The concept of risk assumes a strategic role in understanding the characteristics, limitations, and transformations of the historical project of modernity, and to reorient collective and individual lifestyles. In a context marked by the continual degradation of the environment and of its ecosystem, this involves an array of actors from the educative universe in all its levels, stimulating the involvement of the various systems of knowledge and their preparation in an interdisciplinary perspective. Educators play a strategic and decisive role in the insertion of environmental education in school everyday life, preparing their students for a critical attitude before the socio-environmental crisis, having as their horizon the transformation of social habits and practices, and the constitution of an environmental citizenship that will motivate them to the issue of sustainability in its wider meaning.

Keywords

Environmental education – Risk society – Sustainable development – Interdisciplinarity.

Contact:
Pedro Jacobi
Rua Cayowaa 1082- apto. 61
05018-001 – São Paulo – SP
e-mail: prjacobi@usp.br

Thinking sustainability

The concept of development has been the object of controversies and, until recently, the approach consisted in seeing development and economic growth as synonyms. The work of 1998 Nobel Prize in Economics laureate Amartya Sen (2004) represents a new moment for the reflection on development as the process of expansion of the individuals' abilities to have options, to make choices. Relativizing material factors and economic indicators, Sen insists on the expansion of peoples' social and cultural horizons. The material basis of the development process is fundamental, but must be considered as a means and not as and end in itself. Going beyond the production capacity by postulating the improvement of the quality of life in common, and peoples' trust in each other and in the future of society, he highlights the possibilities of people to carry on initiatives and innovations that will allow them to materialize their creative potential and contribute effectively to collective life. Sen summarizes his ideas about development as the possibilities that cooperation and solidarity between the members of society bring when turning economic growth from the destroyer of social relations into process of formation of social capital or into "development as freedom" (Sen, 2004). To Sen, the expansion of freedom is the principal end and means of development, and development only exists when the benefits contribute to the expansion of human capabilities. According to him, this requires overcoming the

> major sources of unfreedom: poverty as well as tyranny, poor economic opportunities as well as systematic social deprivation, neglect of public facilities as well as intolerance or overactivity of repressive states (Sen apud Veiga, 2005, p.34).

And how does the complex relationship between development and environment emerge? The incorporation of the ecological perspective in the economic and sociopolitical decisions has in the construction of the concept of sustainable development a reference that gains visibility, and situates development as a form of modification of nature that must therefore balance the objectives of fulfilling human needs on one side and their impacts on the other, and among them those affecting the ecological basis. The incorporation of the ecological perspective in the economic and political decisions implies recognizing that the ecological consequences of the way in which the population uses the planet's resources are associated to the development model. This is made explicit, according to Guimarães (2001, p. 51), in the crisis affecting the planet, "which configures the collapse of a style of development ecologically predatory, socially perverse, politically unfair, culturally alienated, and ethically repulsive". Despite these basic premises being reasonably consensual, "sustainable development" has become a variegated concept: not only different conceptions of development exist, but also of what is understood by sustainability.

The tensions between development and environment conservation still persist, and the strong economicist bias is one of the reasons why environmental organizations question the concept. Different approaches are defined displaying a conceptual diversity emphasizing, however, the huge differences in meaning for societies of the North and the South.

The transformations in the "environment-development" debate begin to take place in the 1970s with the increased visibility of publications aimed at revealing the finiteness inside the capitalist mode of production and its global impacts. From then on, the concept of sustainable development emerges under different denominations in the search for a consensus and its institutionalization. The purpose is to raise the visibility level of the environmental issue in the international political agenda, and to make the theme permeate and shape the decisions about policies in all levels (Nobre and Amazonas, 2002). The

institutionalization projects find in the concept of sustainable development an adequate instrument of dissemination. In this sense, the Rio'92 Conference can be characterized as the culmination of this process of institutionalization and of a new theoretical and political arrangement around the environmental theme. Sustainability becomes the spearhead of the development paradigm of the 1990s. The expression "sustainable development" began to be employed with such diverse meanings that it became a phrase suitable for everyone, and thus acquired a pervasive character. It becomes the password for international funding agencies, jargon of the development planner, the theme of conferences and papers, and the slogan of activists of development and environment (Nobre and Amazonas, 2002). Two interpretive trends stand out along this process. The first one – economic and technical-scientific – proposes the articulation of economic growth and environmental preservation, influencing changes in the approaches to economic development, notable since the 1970s. The second one, related to the environmental criticism of the contemporary way of life, is disseminated after the 1972 Stockholm Conference, when the environmental issue grows in the public eye and the environmental dimension wins a place in the international agenda. Two diametrically opposed positions were assumed: those predicting abundance (the cornucopians) and the catastrophists (doomsayers) (Sachs, 2000, p. 50-51). Both positions were discarded and an intermediate position emerges between the deterministic economicism (precedence to economic growth) and the ecological fundamentalism (inevitability of the growth of consumption and exhaustion of natural resources). The paradigm of the middle way – ecodevelopment or sustainable development – proposed a development that harmonized the social, environmental and economic objectives. The idea or focus of sustainable development quickly acquires relevance, taking on a directive character in the debates about the way ahead for development.

In the 1980s and 1990s the growing convergence of the two trends – economicist and environmentalist – was largely due to the intensification of the environmental crisis, and to the escalation of economic and social problems for most nations. Among the worldwide changes of those two decades, those connected with the environmental degradation and to the growing inequality between regions assume a prominent position that underlined the importance of adopting integrative schemes. Although both processes were initially conceived in a fragmented way, without any obvious links, their articulation becomes today more explicit to the comprehension at the level of a crisis that takes on global dimensions. Thus, on one side, the impacts of the economic crisis of the 1980s articulate with the need to rethink the existing paradigms, and on the other side the alarm raised by the phenomena of global warming articulates with the depletion of the ozone layer, among other problems (Jacobi, 1997; Guimarães, 2001; Conca et al., 1995).

Thus, what is observed is that, while the social problems got worse and the gap between the poor nations and industrialized countries widened, several manifestations of the environmental crisis emerged, relating directly with the prevailing production and consumption patterns.

The signs of growing awareness can be observed in some perspectives that gather proposals of environmental, social and developmental sustainability to the dimension of the discourse, as is the case of the social movements in defense of ecology, the international conferences organized by the UN, particularly since the UN Conference on the Human Environment that happened in 1972 in Stockholm to discuss the issues of environment and development, the reports of the Club of Rome[1], and, more or less directly, the works of pioneering authors from various fields who reflected on the same questions. The book *Silent*

1. The Club of Rome is a free association of scientists, businessmen and politicians from several countries that gathered in Rome in the early 1970s to reflect, debate, and formulate proposals about the problems of the global system (McCormick, 1992).

spring by American scientist and ecologist Rachel Carson, published in 1962, describes a questioning in the USA of the conventional farming model and of its growing dependence on oil as an energy source. By dealing with the indiscriminate use of toxic substances in agriculture, it warned about the progressive loss of quality of life caused by the indiscriminate and excessive use of chemical products and the effects of such use upon the environmental resources (Martell, 1994; Dobson, 1994). This book's contribution[2] was related to the need for society to be concerned with the problems of preserving natural resources, something that had already been the object of many other works that since the 19th century inspired the conservationist public polices adopted in the USA early in the 20th century (McCormick, 1992).

Soon after the publication of *Silent spring*, works such as that of Paul Ehrlich (The Population Bomb, 1966) and of Garret Hardin (Tragedy of the Commons, 1968), endorsed the Malthusian theory, relating the environmental degradation and that of the natural resources to the population growth. In 1972, with the publication by the Club of Rome of the book *Limits to growth*, the scientists, led by Dennis Meadows, argued in a catastrophistic way that society would have to confront in a few decades the limits of its growth due to the depletion of the natural resources. To find economic and ecological stability, it is proposed that the growth of global population and of industrial capital should be arrested, revealing the reality of the limited resources and indicating a strong bias towards demographic control. These works are grounded on the premise that the use of finite natural resources is a fundamental variable of the economic and social process. Its interpretation is that the finiteness of the mode of production of goods can only mean "catastrophe".

In that same year the UN promoted the Stockholm Conference, in which the environmental issue was discussed in a planetary scale, and the environmental discussion was included in the international agenda. At this conference were outlined the main elements that, according to Moll (1991), lead us "from shortage to sustainability".

In 1973 the concept of ecodevelopment is employed for the first time, to characterize an alternative idea of development whose principles were later incorporated by the so-called Brundtland Commission[3]. They admitted the existence of five dimensions to ecodevelopment, namely: 1) social sustainability; 2) economic sustainability; ecological sustainability; 4) spatial sustainability; 5) cultural sustainability. These principles articulate with theories of self-determination espoused by the non-aligned countries since the 1960s (Sachs, 1986; Guzman, 1997; Jacobi, 1997). According to this concept,

> it is about establishing that the welfare increases when the standard of living of one or more individuals increases without decay in the standard of living of other individuals, and without diminishing the reserves of natural or man-made capital. (Nobre and Amazonas, 2002, p. 35)

The concept of sustainable development created by the Brundtland Commission in 1987 when it put forward the phrase "sustainable development" is, according to Hobsbawn (1995), "conveniently meaningless", based on a vague set of analyses and recommendations and, according to Brookfield (1998), "intentionally a political document, more than a scientific

2. The author showed how DDT entered the food chain and accumulated in fat tissues, including those of men (the presence of DDT was detected even in human milk!), with the risk of causing cancer and genetic diseases. The big controversy caused by this instigating and provocative book is due to the fact that it not only exposed the dangers of DDT, but also questioned eloquently humanity's blind faith in technological progress. In so doing, the book made way for the then emergent environmental movement.

3. This report is the result of the work of the UN World Commission on Environment and Development chaired by the then Norwegian Prime Minister Gro Harlem Brundtland. The commission was set up by the UN in 1983 to study the relationship between development and environment, and to create a new perspective to approach these issues. The Report entitled "Our Common Future" produced by the Commission was published in 1987 (McCormick, 1992).

treatise on the world problems". Hence all sorts of criticism that greeted the report, even from those who stressed the importance of the initiative. To Lélé (1991, p. 613), "the Sustainable Development movement was not capable of developing a coherent or consistent set of concepts, criteria and policies, either from an internal point of view or from that of the social and physical reality".

At the beginning of the 21st century, the results still fall quite short of the expectations, following from the complexity of establishing and agreeing on limits for emissions and protection to biodiversity, particularly by the more developed countries.

Despite the criticisms it has received, the notion of "sustainability" can become almost universally accepted because it has gathered under it contradictory, and even opposite, theoretical and political positions (Nobre; Amazonas, 2002, p. 8). The question here is delimiting a wide enough field in which the political struggle about its meaning will take place, considering that the institutionalization of the notion of sustainable development has always been permeated by different interpretations, apart from serving as a pivoting point for international politics through the UN agencies.

Taken in a wide sense, the notion of sustainable development relates to the necessary redefinition of the connection between human society and nature, and therefore to a substantial change in the civilizing process itself. However, the totalizing aspirations and the lack of specificity have made the concept of sustainable development difficult to be classified in concrete, operational and analytically precise models. For this reason, we can say that the concept still has not constituted a paradigm in the classical meaning of the term, but that it is a guideline or approach, or still, a perspective that includes normative principles (Jacobi, 1997; Ruscheinsky, 2004; Guimarães, 2001).

The notion of sustainability implies then the truth of the premise that it is necessary to determine a definite limitation to the possibilities of growth, and a group of initiatives that take into account the existence of relevant interlocutors and social participants, active through educative practices and through an informed process of dialogue, which reinforces a sense of co-responsibility and constitution of ethical values (Noorgard, 1997; Daly, 1997; Goulet, 1997; Sheng, 1997; Floriani, 2003; Boff, 1999, 2002). Redclift observes in shrewd and questioning fashion that

> the connections between the environment, social justice, and governability have become increasingly vague in some discourses of sustainability, and that the structural relationships between power, awareness, and the environment have been gradually obscured. (2003, p. 48)

The obstacles are immense, for there is limited awareness in society about the implications and destructive impacts of the current model of development. Also, the social differences, economic inequalities, and huge asymmetries between countries of the North and the South must be stressed.

The 1990s marked significant changes in the international debate about environmental problems. The UN Conference on Environment and Development – Rio'92 – was an important moment to the institutionalization of the environmental issue, the themes of sustainability and sustainable development being adopted as references to preside over the process of debates, declarations and formulation of documents. Despite the fact that the objective was the institutionalization of the environmental issue, the results of the Conference fell short of those intended by the proposing bodies, and the environmental discussion suffered "a refraction, in which, on one side, the separation is consecrated between negotiations around the global environmental agreements and those related to the implementation of projects of sustainable development of national amplitude, notably the Agenda 21" (Nobre and Amazonas,

2002, p. 68). The notion of sustainable development gradually loses the totalizing character that marked it since its first moments, and becomes "deliberately vague and inherently contradictory" (O'Riordan, 1993, p. 7).

According to Guimarães (2001, p. 17), the international debate that began in Stockholm and widened at the Rio'92 conference, transcends the technocratic perspective of dealing with the environmental crisis, the naïve illusion that the advances in scientific knowledge would suffice to allow the emergence of a sustainable style of development.

Another noteworthy initiative, which had extensive repercussion, was the Earth Charter, a result of the mobilization and articulation of the civil society that started after the publication of *Our Common Future* in 1987, and whose first version was discussed at the Eco 92 during the NGOs Global Forum. It was only in March 2000, after wide public discussion processes in 46 countries during eight years that it was ratified by UNESCO. The Charter is a declaration of global principles that guides individual and collective actions towards sustainable development, and suggests global ethical parameters. Boff (2002, p. 54-55) highlights three points: rescuing the values of solidarity, inclusion and reverence; overcoming the narrow concept of sustainable development; and the ethics of care.

The expectations generated from the developments of Rio'92 were substantially reduced before and after the most recent World Summit on Sustainable Development – Rio + 10, carried out in Johannesburg in 2002, where the objectives of deepening the debate around the sustainable development did not materialize, and new steps ahead were not agreed upon, either in the theoretical front, or in the field of practical measures.

Despite the improvement observed in several sectors, the principles of environmental protection and of "sustainable development" continue to be regarded as a hindrance to economic growth, and the results are conspicuous: loss of biodiversity, degradation of the quality of the environment in the large cities of developing countries, reduction of non-renewable resources.

The current picture, clearly demonstrated by scientific studies, indicates that the ecosystems continue to feel the impact of untenable patterns of production and urbanization. Besides, during the last decade, many countries have increased their vulnerability to a more intense and frequent series of phenomena that make the ecological and social systems more fragile, causing environmental, economic, and social insecurity, undermining sustainability, and generating uncertainties with respect to the future. The ideology of progress still prevails, dismissing or minimizing the environmental issues, either in the discourse or in practice.

Despite this troublesome portrait, the "good practices of sustainability" on a local scale, which rely on the endeavor of local or regional agents, must not be overlooked.

One must remark that the proliferation of positions about sustainability is a positive symptom of dynamism, since the current debates were unimaginable a few years ago. This serves to show that changes are possible, and that the question of sustainability has many readings, some of them contradictory and others convergent, although they may be incorporated differently by groups and individuals acting under the perspective of proposing a sustainability articulated to new material realities and new epistemological positions.

Risk society, reflectiveness and complexity

The multiplication of the risks, in particular the environmental and technological risks of severe consequences, is a key element to understand the features, the limits, and the transformations of modernity. The contemporaneous risks (Beck, 1997, p. 16-17) expose the

limits and the consequences of the social practices, bringing with them a new element: "reflectiveness". Society, a producer of risks, becomes more and more reflective, which means becoming more and more self-critical and, at the same time that mankind puts itself in danger, it recognizes the risks and reacts to them. The global "reflective" society is forced to confront what it has created, either positive or negative. The concept of risk takes on a strategic role in the understanding of the characteristics, limits and transformations of modernity's historical project (Beck, 1997, p. 16-17).

The large accidents involving nuclear plants and the toxic contaminations of huge proportions, such as the incidents in Three-Mile Island (1979), Love Canal (1979), Bhopal (1984), and Chernobyl (1986), besides others of smaller scale but with significant local impact, arouse the public and scientific debate about the issue of the risks in contemporary societies. The risks are directly related to modernity and to the still unpredictable effects of globalization, as a radicalization of the principles of modernity (Beck, 1997, p. 18). The development of the industrial system has created a world ruled by uncertainty and the "reflective modernization" of the high modernity. In the risk society, the impact of globalization, the transformations of the daily life, and the emergence of the post-traditional society are characterized by their instantaneity, albeit contradictory, that interrelates the global and the local, and configures new forms of inequality. The progress generated by the advancement of science and technology is then regarded as a potential source of self-destruction of the industrial society, from which new risks, of a global nature, are then produced – affecting the planet, challenging national and class boundaries (Guivant, 1998, p. 18).

The new post-traditional reality of radicalized modernity engenders increasing uncertainty, mutability and reflectiveness. Progress may turn into self-destruction, in which one kind of modernization destroys another and changes it. There is, therefore, the possibility of reinventing, or rethinking, industrial civilization by suggesting a creative (self)destruction (Beck, 1997, p. 12-13). There is a transformation of industrial society, originating the risk society. In this sense, for Beck (1997, p. 28), the "subpolitics[4]" results from a non-institutional rebirth of the political, parallel to the political vacuum of the institutions. Beck thus explains "subpolitics" as the dissemination of a political commitment and of an activism derived from politics that migrated from the parliament to unidirected pressure groups in society (ecologism, women's movement, gay movement etc).

It is ever more clear the complexity of this process of transformation of a society not just increasingly threatened but directly affected by socioenvironmental risks and damages. In a context characterized by the continual degradation of the environment and of its ecosystem, the problem involves a set of actors from the education universe in all its levels, promoting the involvement of the various systems of knowledge, the preparation of professionals and the university community in an interdisciplinary perspective.

The dawn of the 21st century sees an emergence that, more than an ecological crisis, represents a crisis of the style of thinking, of the social imaginary, of the epistemological assumptions and of the knowledge that were the mainstay of modernity. A crisis of the being in the world, which is manifested in all its plenitude: at the internal spaces of the subject, in the self-destructive social conducts, and at the external spaces, in the degradation of nature and of peoples' quality of life.

The essence of the environmental crisis is the uncertainty, and this shall have a greater or lesser impact according to the way in which society, in the words of Beck (1997, p. 17), "raises the question of the self-limitation of development, as well as that of the task to

4. Subpolitics for Beck (1997, p. 35) means, "to shape society bottom-up".

redefine the standards (of responsibility, safety, control, damage limitation, and distribution of the consequences of the damage) reached at that point, taking into consideration the potential threats".

The issue of sustainability clashes with the paradigm of the "risk society". This implies the need to multiply the social practices based on the strengthening of the access to information and to education in an integrative perspective.

It can be observed the need to advance the means and the accessibility to information, as well as the inductive role of the public authorities in the educational and informative contents offered by them, as possible paths to alter the current picture of socioenvironmental degradation. We are faced with the need to promote the development of a higher responsiveness of people to the environmental problems as a way of reinforcing their co-responsibility in the surveillance and control of environmental degradation (Jacobi, 2003).

Along these lines, the environmental problem constitutes a very adequate theme to extend the reflection and the practice around the restricted impact of the actions of resistance and expression of demands from the population in the areas more affected by the constant and increasing environmental damages. But it also represents the possibility of opening stimulating spaces to implement diversified alternatives of social participation, particularly the assured access to information and the consolidation of open channels.

The populations' posture of dependence and non-responsibility follows mainly from lack of information and environmental awareness, and from a deficit of community practices grounded on the participation and involvement of the citizens, proposing a new culture of rights based on the motivation and co-participation in the management of the environment in its various dynamics.

In this context, educative practices must point towards pedagogical proposals centered on the change of habits, attitudes and social practices, development of competences, and capacity of evaluation and participation of those being educated. This poses society the challenge of developing new epistemologies that will make possible what Morin (2003) calls "a reform of thought" (apud Floriani, 2003, p.116). Within the new context of knowledge from which the new socioenvironmental, plural and differentiated epistemologies emerge Capra (2003) represents the search for the unification of knowledge with nature and society; Morin (2003) thinks complexity as a central reference to explain the new meanings of the world; and Leff (2001) stands for a new environmental rationality capable of subverting the order prevailing between the logics of life and the fate of societies (Floriani; Knechtel, 2003, p. 16). Thus, the concept of environment lies within a category not just biological, but constituting "a social rationality, configured by behaviors, values and knowledges, as well as by new productive potentials" (Leff, 2001, p. 224).

A paradigmatic change implies in a change of perceptions and values, and that must guide in a decisive manner the formation of the current generations, not only to accept uncertainty and the future, but also to produce a complex thinking, open to indeterminacies, changes, diversity, and to the possibility of building and rebuilding in a continuous process of new readings and interpretations, configuring new possibilities for action (Morin, 2001; Capra, 2003; Leff, 2003). Although the first records of the use of the phrase "environmental education" date back to a 1948 meeting of the International Union for the Conservation of Nature (UICN) in Paris, the directions of environmental education are defined from the Stockholm Conference, at which the establishment of international programs is recommended. In 1975 the International Program of Environmental Education is released in Belgrade, in which the principles and guidelines to the future are defined[5]. Since then,

5. On this occasion the Belgrade Charter is written and signed by representatives of 65 countries.

three moments have marked the trajectory of the process of institutionalization and agreement on the need to insert environmental education at a planetary level.

Five years after Stockholm, in 1977, the Intergovernmental Conference on Environmental Education takes place in Tbilisi, Georgia. It sets off a global process oriented to create the conditions to form a new awareness of the value of nature, and to reorient the production of knowledge based on the methods of interdisciplinarity and the principles of complexity. It

> points at that moment to environmental education as an educative means through which one can understand in an articulate manner the environmental and social dimensions, problematize reality and search for the roots of the civilization crisis (Loureiro, 2004, p. 71).

During the Rio'92 event the *Treaty on Environmental Education for Sustainable Societies and Global Responsibility* was written establishing sixteen fundamental principles of education for sustainable societies, emphasizing the need for a critical thinking, for a collective and solidary doing, for interdisciplinarity, and for multiplicity and diversity. It equally establishes a set of collective commitments for the planetary civil society.

In Thessaloniki in 1997, the document resulting from the *International Conference on Environment and Society: Education and Public Awareness for Sustainability* underlines the themes proposed at the Eco'92, and draws attention to the need to articulate actions of environmental education based on the concepts of ethics and sustainability, cultural identity and diversity, mobilization and participation, in addition to interdisciplinary practices. What the researchers observe is that the recommendations are vague and with no significant practical results, many of them just serving to feed the logic of the market and the liberal policies.

The planetary initiatives to agree on practices of environmental education leave clear the challenge of building a conceptual formulation that can establish a communication between the social and exact sciences. Morin (2003) defines that the complexity paradigm corresponds to the irruption of the antagonisms in the heart of the organized phenomena – a complex view of the universe through certain intelligibility principles linked to one another.

To Morin (2003) the complex thinking – distinction, conjunction and implication – opposes the logical operations that characterize the simplifying thinking – disjunction and reduction – that "have produced the blind intelligence that destroys the ensembles and the totalities, isolates and separates the objects from their environments". In the argument about the complex thinking, he emphasizes three guiding principles: the dialogical – keeping duality in the heart of unity; the organizational recursiveness – a society that, in producing itself, acts back onto its individuals; and the holographic – the part is in the whole and the whole is in the part. And thus, he recognizes the complexity that permeates the systems/organizations (Floriani, 2003, p. 114). This reform of the thinking allows the integration of the context and the complex, embracing the interrelations, multi-dimensionalities, and dynamics that respect and assimilate the unity and the diversity, based on ethical principles and on the recognition of the differences (Morin, 2002; Morin et al., 2003). The paradigm of complexity sets the challenge of the dialogue between certainty and uncertainty, helping individuals to experience a reality characterized by indeterminacy, interdependence, and the causality between different processes. This, however, should not turn into a conceptual and methodological straitjacket, but in an articulation between the subjective and objective processes present in the production of knowledge and of meanings.

To reflect upon the environmental complexity opens up a stimulating space to understand the gestation of new social actors

that mobilize to incorporate nature, to an educative process articulated and committed to sustainability and participation, supported by a logic that favors dialogue and interdependence of different areas of knowledge. But the reflection also questions values and premises that guide the prevailing social practices, implying a change in the way of thinking, a transformation of knowledge and of educative practices.

It is ever more clear the complexity of the process of transformation of a planet not just increasingly threatened but directly affected by socioenvironmental risks and damages.

Floriani (2003, p. 81-132) shows how Morin and Leff point, each in his own way, to alternative matrices of integration of knowledge that overcome the dualist paradigm, and emphasize the complexity and interdisciplinarity as constitutive elements of a new way of thinking about the society-nature relations. The premise that guides the paradigm proposed is the dialogue of knowledges, allowing the construction of new spaces of frontiers (Sauvé, 1999, p. 19-20) that confront us with the various reductionisms and conceptual pragmatisms.

The need to approach the theme of environmental complexity follows from the perception of the incipient process of reflection about the existing practices and the multiples possibilities that present themselves to define reality, when thinking it in a complex way, as a new rationality and a space in which nature, technique and culture articulate.

Environmental Education: challenges and construction of practices of environmental citizenship

The theoretical premises around the dialogue of knowledges between education and environment, in its multiple dimensions and as theoretical field under construction, have been incorporated in different ways by environmental educators seeking a new transversality of knowledges, a new way of thinking, researching and creating knowledge that allows the integration of theory and practice.

It must, however, be remarked that the educational practices inserted at the interface of the socioenvironmental problems have to be understood as part of the social macro-system, obeying the existing development context that shapes their pedagogical and political directions. When we refer to environmental education, we situate it in a wider context, that of the *education for citizenship*, in which it constitutes a principal element in the consolidation of citizen subjects (Jacobi, 2000). The main line of action must seek, above all, the solidarity, the equality and the respect for the difference through democratic forms of action based on interactive and dialogic practices. We understand that *education for citizenship* deals not only with the individual's ability to exercise his/her rights in political choices and decisions, but also to assure his/her complete dignity within the social structures. Thus, the exercise of citizenship implies autonomy and responsible freedom, participation in the political democratic sphere and in the social life. Citizens develop actions of social integration, conservation of the environment, social justice, solidarity, safety and tolerance, which constitute concerns of current society. The idea is then to sensitize students and teachers to a more conscious participation in the context of society, questioning behaviors, attitudes and values, and also proposing new practices.

Our argument goes therefore in the direction of reiterating that educative practices articulated with the environmental problems should not be seen as an adjective, but as an integral part of an education process that emphasizes a way of thinking education geared towards reflecting upon environmental education in a context of environmental crisis, of growing insecurity and uncertainty before the risks produced by the global society, which, in synthesis, can be summarized as a civilization crisis of a model of society. In this sense, the formulation found in Leff (2001, p. 256) allows

us to highlight that this education process must be capable of creating a critical, creative thinking, in tune with the need to propose answers for the future, capable of analyzing the complex relationships between the natural and social processes, and of acting onto the environment in a global perspective, respecting sociocultural diversities. The objective is of affording new attitudes and behaviors towards consumption in our society, and of stimulating change in individual and collective values (Jacobi, 1997). This requires thinking critically about environmental education and, therefore, the definition of an ethical-political standpoint, "situating the conceptual and political environment where environmental education can search for its foundation as an educative project that intends to change society" (Carvalho, 2004, p. 18)

From the syntheses elaborated by Lima (2002, p. 109-141) and Loureiro (2004) two axes can be devised for the discourse of environmental education: one *conservative*, and the other *emancipative*, each with its own readings. The *conservative* approach, based on a reformist vision, proposes instrumental answers. It can actually be seen that its predominant *modus operandi* is of punctual actions, decontextualized from the generator themes, frequently unattached to a pedagogical proposal, not questioning the civilization pattern, just reinforcing a simplistic and reductionist view.

The *emancipative* approach, having as a reference in the field of education the critical thinking (Paulo Freire, Snyder, Giroux[6]) and, with respect to the environment, authors such as Capra, Morin, Leff, and Boff, amongst others, proposes an education based on practices, guidelines and contents that transcend the preservation of the environment. Paraphrasing Morin (2002, p. 36), "in the critical environmental education, knowledge, to be pertinent, cannot derive from separated and compartmentalized knowledges, but from apprehending reality by a few conceptual categories indissociable from the pedagogical process".

For the critical stance, environmental education needs to build instruments to promote a critical attitude, a complex understanding and the politicization of the environmental issue, the participation of the subjects, making explicit an emphasis on less rigid social practices, centered on the cooperation between actors.

Under the perspective of *reflective modernization*, environmental education has to face the fragmentation of knowledge and develop a critical and political, but also reflective, approach.

The environmental dimension represents thus the possibility of dealing with connections between different human dimensions, allowing interweaving and movement between multiple knowledges. Currently, the challenge of strengthening the education for a convergent and multi-referenced environmental citizenship emerges as a priority to make viable an educative practice that articulates incisively the need to face simultaneously the environmental crisis and the social problems. Thus, the understanding about the environmental problems happens through viewing the environment as a field of knowledge and socially constructed meanings, traversed by cultural and ideological diversity and by the conflicts of interest.

Educators must be ever more prepared to rework the information they receive and, among them, the environmental, so that they can transmit and decode for the students the expression of the meanings around the environment and ecology in their multiple determinations and intersections. The emphasis must be on the preparation to perceive the relations between areas and as a whole, highlighting a local/global formation, trying to secure the need to confront the logic of exclusion and inequalities. Within this context, the management of the socioenvironmental risks reveals more and more clearly the need to expand the involvement of the public through

6. For these authors, the school presents openings through which it is possible to exercise critical practices and work on the resistance to reproduction and to ideologial comination (Loureiro, 2004, p. 121).

initiatives that raise the level of concern of educators with the environment, guaranteeing the information and the institutional consolidation of open channels for participation in a pluralist perspective.

In this way, environmental education increasingly assumes the form of an active intellectual process, as a social learning, based on dialogue and interaction in a constant process of rebirth and reinterpretation of information, concepts and meanings originated from the learning at the classroom and from the student's personal experience. The approach to the environment at the school takes on the role of articulating the knowledges of the various disciplines in a context in which the contents are resignified. By interfering in the learning process and in the perceptions and representations about the relation between individuals and environment in the daily behaviors that impact the quality of life, environmental education promotes the instruments for the construction of a critical view, reinforcing practices that make explicit the need to problematize and act upon the socioenvironmental problems, having as horizon, based on an understanding of the conflicts, the sharing of an ethics concerned with environmental justice.

The new perspective is related to the way in which the object of knowledge is apprehended, and to the dynamics that is created between the social actors who propose a new form of integration and articulation of the environmental knowledge. The educative practice must be geared towards forming an individual that will go beyond what Guimarães (2004, p. 30) has called the "paradigmatic traps[7]", contributing to the exercise of an active citizenship that seeks to change the current picture of socioenvironmental crisis.

This approach tries to overcome reductionism and stimulate the thinking and doing about the environment directly connected to the dialogue of knowledges, to participation, to the ethical values as fundamental values to strengthen the complex interaction between society and nature. In this sense, the role of teachers is essential to boost the transformations of an education that commits itself to the sustainable development and also to the future generations. Authors such as Carvalho (2003); Leff (2003); Sauvé (1999) and Gaudiano (2000) warn us that an environmental discourse dissociated from the socio-historical conditions can be alienating and lead to politically conservative positions, insofar as it mobilizes what Carvalho (2003, p. 116-117) calls a dissimulated agreement, based on generalization and draining of the term sustainable development, of the ideological differences, and of the conflicts of interest that collide in the world of environmental ideas.

This leads us to reflect upon the need to prepare a reflective professional to develop practices that articulate education and environment in a critical perspective, that open vistas to an ecological participation grounded on the principles of creativity and on the ability to formulate and develop emancipative practices guided by the empowerment and by social and environmental justice.

The insertion of environmental education into a critical perspective occurs as the teacher assumes a reflective posture. This stimulates the understanding of environmental education as a political-pedagogical practice, and represents the possibility of motivating and sensitizing people to transform the various forms of participation into potential factors to invigorate society and to expand the socioenvironmental responsibility. The latter will materialize chiefly by the growing presence of a plurality of actors which, through the activation of their potential for participation, will be more and more prepared to intervene consistently and unsupervised in the decision processes of public interest, legitimizing and consolidating

7. It is the reproduction in the educative practices of the paradigms that constitute the modern society tied to a dominant rationality that aspires to be unquestionable.

proposals of management based on guaranteeing the access to information and on the consolidation of open channels to participation.

The interdisciplinary experiences are recent and incipient, even at the graduate level. The most common are multidisciplinary practices and, according to Tristão (2002, p. 175), "since the disciplines of Geography and Biology have some affinity of contents with respect to the environmental dimension, the insertion of environmental education occurs through a multidisciplinary exercise, sometimes even a cooperation between the contents of these two disciplines".

Tristão (2002, p. 173-181) observes that there are four interrelated challenges for Environmental Education, which are associated to the role of the educator in contemporaneity. The first challenge is "to face the multiplicity of visions", and that implies preparing the educator to make the connections (Capra, 2003, p. 94-99) and to articulate the cognitive processes with the contexts of life. Thus, understanding the environmental complexity, not as a "fad" or "reification" or "indiscriminate usage", but as construction of meanings fundamental to identify interpretations and generalizations made in the name of the environment and ecology. The second challenge is "to overcome the specialist's view", and to that end the path is the rupture with disciplinary practices. The third challenge is "to overcome the pedagogy of certainties", and that aligns with the premises that guide the preparation of the "reflective teacher", which implies understanding modernity, the "produced risks" (Giddens, 1991, p. 140) and their potential for reproduction, apart from developing in the pedagogical space a sensitivity to the complexity of contemporary society and its multiple causalities. The fourth challenge is to overcome the logic of exclusion, which adds to the challenge of sustainability the need to overcome the social inequalities.

The current moment is for consolidating pedagogical practices that stimulate interdisciplinarity in its diversity. We draw from Stengers (1990, p. 148) to express our point of view: "The notion of complexity is dangerous from the viewpoint of the politics of the knowledges. It is, indeed, a fashionable notion, and such fashion harbors a trap. The trap of the big discourses about complexity".

The challenge of interdisciplinarity is faced as a learning process that seeks to create transversal cuts into the understanding and explanation of the context of teaching and research, aiming for the interaction between the disciplines and overcoming the scientific compartmentalization brought about by the excessive specialization.

As a combination of several areas of knowledge, interdisciplinarity presupposes the development of interactive methodologies, defining the scope of the approaches and considering a new articulation of the connections between the natural, social and exact sciences. It is worth pointing out that the epistemological context of Environmental Education allows an open, process-based and reflective knowledge derived from a complex and multi-referenced articulation. In this sense, transdisciplinary knowledge emerges as a bolder horizon of knowledge. To Morin (2000, p. 37), transdisciplinarity would be closer to the exercise of complex thinking due to the fact that it is grounded on transmigration and dialogue of concepts across several disciplines.

The preoccupation to consolidate a dynamics of teaching and research based on an interdisciplinary perspective emphasizes the importance of the social processes that determine the forms of incorporation of nature and its transformations through the social participation in the management of environmental resources, taking into account the evolution dimension in its widest sense, and including the connections between the biological and cultural diversities, as well as the practices of the various social actors and the impact of their relation with the environment.

In this way, the emphasis on interdisciplinarity in the analysis of environmental questions

derives from the observation that the problems affecting and sustaining life in our planet are of a global nature, and that the comprehension of their causes cannot be confined to the strictly biological factors, overlooking the political, economic, institutional, social and cultural dimensions.

However, it is not enough for the interdisciplinary exercise to gather different disciplines. Environmental education must be founded on systematic exchanges and on an association of disciplinary knowledges that includes more than just problems at the interface of the various natural and social sciences, and that will only materialize from an organic action of the several disciplines overcoming the multidisciplinary view.

Considering that the environmental problems transcend the different disciplines, both the disciplinary intensification and the expansion of knowledge between disciplines constitute essential elements, although of great complexity as to their implementation. Taking as a point of departure a complex socioenvironmental reality, this process increasingly demands the internalization of an emergent environmental knowledge in a group of disciplines, aiming at the construction of a field of knowledge capable of capturing the multi-causalities and the relation of interdependence of the processes of natural and social orders that determine the socioenvironmental structures and changes.

We conclude by saying that the political-ethical challenge of Environmental Education, founded on the transformation potential of the social relations, is closely related to the process of strengthening of democracy and construction of an environmental citizenship. In this sense, the role of educators and teachers is essential to boost the transformations of an education that assumes a commitment to the creation of a critical view, based on values, and of an ethics to the construction of an environmentally sustainable society.

The need for a growing internalization of the environmental issue, a knowledge still under construction, demands an effort to reinforce integrating views that, centered on development, stimulate the reflection around the diversity and the construction of meanings in the individual-nature relationships, in the global and local environmental risks, and in the environment-development relationships. Within this context, Environmental Education points to the need to formulate pedagogical proposals centered on improved awareness, change of attitudes and social practices, development of knowledges, capacity to evaluate, and the participation of those being educated.

The relation between environment and education assumes an ever more challenging role, demanding the emergence of new knowledges to apprehend social processes more and more complex, and environmental risks that intensify. In its multiple possibilities, it opens a stimulating space to rethink the social practices and the role of educators in the creation of an "ecological subject" (Carvalho, 2004).

The restricted presence of the environmental debate, either as discipline or as an articulating axis in the curricula of teachers' education courses (MEC, 2000) is a good indicator of the challenge of internalization of environmental education in the educative spaces. It poses the need for a permanent sensitization of teachers, educators and instructors for their role as conveyers of the knowledge necessary for students to acquire an adequate basis to understand the socioenvironmental problems and risks, and their impact on the local and global environment, the interdependence of problems, and the need for cooperation and dialogue between disciplines and knowledges.

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Pedro Jacobi **is Assistant Professor at the Faculty of Education, University of São Paulo.**